

CHAPTER THREE

*Affected Environment
and
Environmental Consequences*



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Chapter 3

The affected environment *and* environmental consequences

Purpose and organization of this chapter

Chapter 3 combines two chapters often published separately in environmental impact statements, **The Affected Environment** and **Environmental Consequences**. The purpose of this chapter is to describe the physical, biological, and social environments of the White River National Forest, and to convey how each of the alternatives will affect these environments. These two discussions have been combined to provide a clearer understanding of how each forest resource may be affected depending on the alternative selected to guide future management of the forest.

Chapter 3 frames this understanding by reviewing the background science and analysis we use to predict how each alternative will affect forest resources. Forest resources include not only ecosystem components such as soils, forested vegetation, or wildlife, but also human uses and values such as domestic livestock grazing, timber, recreation, heritage resources, or scenic byways. We evaluate each of these resource subject areas separately. They are organized by topic area, each of which corresponds to a revision topic identified during the forest plan revision process (see the Preface and Chapter 1 of FEIS Volume 1 for more information). We review the current conditions of each resource as well as relevant scientific information in the **affected environment** discussion. This is followed by an **environmental consequences** section, which presents an analysis of the effects of the alternatives due to differences in management emphasis, management area prescription allocations, management activities, and projected outcomes.

The chapter begins with an introductory discussion of Topic 1—*Biological diversity and ecosystem components*, which serves as the framework for understanding the natural resources of the White River National Forest and their interactions. This topic discussion has been somewhat reorganized from the presentation in the draft environmental impact statement (DEIS). Part One of this chapter, **Physical Elements**, reviews soil, geological, water, air, and mineral resources. These physical components help to determine patterns and distributions of botanical and biological communities on the forest, as well as provide resources for human use. Part Two, **Biological Diversity**, provides an overview of biodiversity and summarizes the historic range of variability, ecosystem-level, and species-level analyses for the White River National Forest. Part Three, **Biological Elements**, reviews more specific biological components such as wildlife, aquatic resources, and forested and non-forested vegetation. Additional sections discuss the management of domestic livestock grazing, noxious weeds, and fire.

Further sections of the chapter evaluate the remaining revision topics: travel management, recreation, roadless areas, special areas, and timber harvest. The chapter also includes a discussion of the social and economic setting; these settings were not identified as separate revision topics but are important considerations in forest planning.

Supporting information concerning the affected environment and environmental consequences can be found in Appendices A through M, P and Q, of the final

environmental impact statement (FEIS) Volumes 2, 3, and 4. If you would like more information, you may consult the individual specialist reports, which are available for review at the Forest Supervisor's Office in Glenwood Springs, Colorado.

Environmental consequences

The discussion of environmental consequences focuses on the direct, indirect, and cumulative effects on the environment that are likely to result from activities and resource output levels of each alternative. If you do not find a discussion of the effects of a particular management activity on a specific resource, then we have determined that there are no direct or indirect effects under any of the alternatives from this activity.

Direct environmental effects are those that occur at the same time and place as the initial cause or action. Indirect effects are those that occur later or in another location.

Cumulative effects result from actions taken to achieve the goals of each alternative, along with past, present, and reasonably foreseeable future activities undertaken by the Forest Service or other entities, public or private.

Federal laws require us to ensure long-term productivity of the lands we manage. The Forest Service has established specific regulations and policies to implement these laws. Additionally, each national forest establishes a set of forest-wide standards and guidelines to protect the environment from extreme or undesirable consequences. These apply to all management activities and desired future conditions regardless of the alternative selected for implementation.

In most cases, the rank order of how alternatives affect the environment is not dependent upon forest budget levels. Unless otherwise indicated, we report the likely environmental effects for the full funding level.

Resource protection measures

Mitigation measures, as defined by 40 CFR 1508.20, include:

- Avoiding the impact altogether by declining to take an action or part of an action;
- Minimizing impacts by limiting the degree or magnitude of an action or its implementation;
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of an action; and/or
- Compensating for the impact by replacing or providing substitute resources or environments.

At the programmatic planning level, forest-wide and management area standards and guidelines should provide the appropriate mitigation measures for all alternatives (see the accompanying 2002 Forest Plan). In each resource section, only the key legal and administrative guidance such as laws, regulations, policies, and forest-wide standards are listed. Appendices A through D of the 2002 Forest Plan present some of these laws, regulations, and policies in greater detail.

At the project level, analysis may indicate the need for additional mitigation to resolve site-specific issues.

Finally, monitoring efforts will determine the effectiveness of mitigation measures. You may refer to the monitoring and evaluation section in Chapter 4 of the 2002 Forest Plan for more information.

***Relationship
between
programmatic
and site-specific
analysis***

This final environmental impact statement is a programmatic document. It discusses environmental effects on a broad scale. Over the lifetime of the forest plan, the selected alternative and the accompanying forest-wide standards and guidelines will set forest management direction by establishing and affirming rules and policies for use of natural resources.

Because this document contains a forest-wide level of analysis, it does not predict what will happen when forest-wide standards and guidelines are implemented on individual, site-specific projects. Nor does it convey the long-term environmental consequences of any site-specific project. These actual effects will depend on the extent of each project, environmental conditions at the site (which can vary widely across the forest), mitigation measures, and their effectiveness.

In preparing this document, we have concentrated on explaining which consequences are most likely to occur and why. By combining this broad assessment with site-specific information, a reader can make a reasonable prediction about the kinds of environmental effects that would result from a specific project.

We do not describe every environmental process or condition within the White River National Forest in this document because this would be an impractical if not impossible undertaking, given the complexity of natural systems. The purpose of the FEIS is to provide a survey of the broader environmental and social factors that are relevant to the programmatic planning process.

After the 2002 Forest Plan is approved, the accompanying analysis in this FEIS will be used in “tiering,” so that the broader analysis and conclusions in this document can be used as a starting point for site-specific project planning. Each project’s environmental effects analysis document will incorporate, by reference, the information found in this FEIS, without the need to repeat it.

Topic 1

Biological Diversity and Ecosystem Components

Introduction

Part 1 – Physical elements

Section 1 – *Soils and geology*

Section 2 – *Watersheds*

Section 3 – *Air resources*

Section 4 – *Mineral resources*

Part 2 – Biological diversity

Section 1 – *Historic range of variability*

Section 2 – *Ecosystem-level assessment*

Section 3 – *Species-level assessment*

Section 4 – *Species of viability concern and
management indicator species*

Part 3 – Biological elements

Section 1 – *Terrestrial wildlife*

Section 2 – *Aquatic resources*

Section 3 – *Forested vegetation*

Section 4 – *Non-forested vegetation*

Section 5 – *Domestic livestock grazing*

Section 6 – *Noxious weeds*

Section 7 – *Fire management*

Introduction

The conservation of biodiversity is of national and global concern. Biodiversity may be defined as “the full variety of life in an area, including the ecosystems, plant and animal communities, species and genes, and the processes through which individual organisms interact with one another and with their environments” (1992 *Rocky Mountain Regional Guide*).

Biodiversity encompasses both the physical and the biological environments. Both are influenced by and in turn influence the human environment. The physical environment consists of soils and geological features, mineral deposits, water features and watersheds, and air resources. The physical characteristics of a given area often strongly influence the types of plant and animal communities that inhabit it. The biological environment is the pool of available species that exist in a particular area or were historically present there. This includes the full complement of living organisms, from inconspicuous soil bacteria and fungi to the more visible plants and animals.

We may consider biodiversity in terms of the natural and historical numbers and distributions of plants and animals, habitats, and communities. To evaluate the biodiversity of the White River National Forest, we need to know something about its variability over the course of very long time scales. Over these long periods, plants and animals have fluctuated with changes in climate, and their numbers and distribution have changed because of species interactions, migrations into and out of the region, reactions to natural and human-induced disturbances, and other factors.

Natural processes – Many plants and animals evolved in response to natural disturbances and are adapted to live in an environment in which they occur. One way to promote biodiversity is to accept, where appropriate, the outcomes of such natural processes as fire, windstorms, and insect infestations. For instance, wildfire has played a role in the origin of the forest’s extensive shrublands and spruce-fir, lodgepole pine, and aspen stands. Insects and disease and the conditions that favor them have shaped the structure and composition of these forest communities, and decomposition processes are vital to nutrient cycling.

Human influences – Human influences also play a role. Some species, such as rainbow, brown, and brook trout or noxious weeds, have been intentionally or unintentionally introduced to the forest, while others, like wolves, grizzlies, and mountain bison, have been extirpated. Intensive human activity, including mining, timber harvest, domestic livestock grazing, and fire (either intentionally or accidentally ignited) during the period of early European settlement significantly altered the composition and structure of many forest ecosystems. Suppression of wildfire, meanwhile, has altered disturbance patterns for many forested stands, resulting in a higher proportion of older-aged stands than would be expected under natural fire regimes. This has limited the habitat for some animals while extending it for others.

Variability – Biodiversity is never stable through time. It fluctuates in response to ever-changing human and environmental influences. What we see today is not the same as what was present before the period of settlement by Europeans, nor is it the same as during the period of unregulated resource exploitation of the late 1800s. This revision of the forest plan includes a study of the *historic range of variability* (HRV) of natural

resources and ecosystems in the planning area before large-scale European settlement began. This range represents the forest's baseline ecological conditions. We can compare current conditions to this range in order to better understand the effects of human activity and forest management practices since that time.

Scales of biodiversity – Biodiversity occurs at the following four scales:

- *Genetic diversity*—the genetic variation within and among individuals and populations of a species, which influences such things as adaptability and resistance to stress.
- *Species diversity*—the variety of different species found in an area. Some species are commonplace; others have small, reduced, or even threatened populations.
- *Community or ecosystem diversity*—the association of different species and their interactions with one another and the physical environment.
- *Landscape or regional diversity*—the variety of communities or ecosystems over a larger area.

The conservation of biological diversity requires a dual strategy that addresses both the habitat needs of individual species and entire communities. The traditional species-level approach is important for assuring the viability of management indicator species, sensitive or rare species, threatened or endangered species, and species of viability concern. Additionally, we must develop a more comprehensive strategy focused on higher levels of biological organization to conserve rare or declining habitats, communities, or ecosystems.

Considering ecosystems as a whole in this manner is the *ecosystem-level* approach. A key component of ecosystem-level management is to determine the current ecological conditions on the White River National Forest. Although American Indians did inhabit the region and had some effect on the environment, large-scale human-caused habitat alteration did not begin in earnest until the era of European settlement. Therefore, we can compare current forest conditions to research findings about pre-settlement ecosystem conditions and disturbance patterns to reveal human-caused effects and their consequences. Since ecosystems and biodiversity patterns are dynamic and fluctuate over time, research on pre-settlement conditions attempts to determine their normal, or **historic**, range of variability under natural disturbance regimes. The complete report of these research findings is on file at the Supervisor's Office in Glenwood Springs. A summary of this report is found in FEIS Volume 3, Appendix D—*Historic Range of Variability*. Part 1, Section 1 of this topic lists highlights of the HRV findings and discusses the environmental consequences of the alternatives to HRV conditions on the forest. Resource managers can use this analysis to help determine desired future conditions and management direction at the forest plan level. In most cases, managing within HRV conditions requires less expenditure of energy and money than managing outside of HRV.

In addition, ecosystem-level analysis focuses on the ecological province and section levels of which the White River National Forest is a part; these are derived from the National Hierarchy of Ecological Units (McNab and Avers 1994). A full discussion of this hierarchy as it applies to the forest is found in Appendix E.

The discussion of this topic is organized as follows:

- **Part One** reviews the physical elements of the White River National Forest—its soil, geological, water, air, and mineral resources.
- **Part Two** provides an overview of biodiversity considerations on the White River National Forest. Section One provides a review of HRV report conclusions and environmental consequences. Section Two discusses the ecosystem-level assessment, and Section Three presents the species-level analyses conducted as a part of the forest plan revision process.
- **Part Three** examines the biological elements of the White River National Forest—its forested and non-forested vegetation, wildlife, and aquatic resources, as well as such management concerns as fire, noxious weeds, and domestic livestock grazing.

Part 1, Section 1

Soils and geology

Introduction

Abstract

The soils and geology of the White River National Forest are diverse, complex, and subject to various forms of degradation from ground-disturbing management activities. Federal law requires the Forest Service to manage for the long-term site productivity of National Forest System lands and ensure that irreversible damage will not occur. Region 2 and the White River National Forest have developed soil quality standards to help ensure this protection. The White River National Forest is committed to maintaining long-term site productivity, and will meet this responsibility by thoroughly evaluating potential impacts of management activities on soil and geologic resources. Mitigation measures will be required on a site-specific basis to keep the impact of management activities within White River National Forest and regional soil protection standards.

Summary

Soils are a primary component of ecosystems, functioning as more than simply a medium for plant growth. They influence vegetation, watershed condition, minerology, and land uses. Soils are a relatively dynamic ecological component, continuously evolving with the influences of climate, organisms, topography, parent material, and time. Due to their slow rate of formation, soils are essentially a non-renewable resource.

The primary goal of soil management is to maintain or enhance soil productivity and all of the chemical, physical, and biological functions and processes that contribute to healthy soils. Although productivity is typically considered the primary function of soil, other functions like the capture, storage, and slow release of water are just as integral to ecosystem maintenance. Compaction, displacement, erosion, puddling, and severe burning, as defined in Forest Service Handbook (FSH) 2509.18-92-1, are the five disturbances that can all be detrimental to various soil functions and processes.

Past land management practices resulted in detrimental soil impacts on the forest. Before it came under Forest Service management, much of the land area was overgrazed to the point that erosion was common. Mining activity displaced, compacted, and chemically contaminated soils, and many areas are still not healthy or productive today. Ski areas may displace large amounts of soil to shape slopes. Revegetation projects at ski areas are ongoing and some require topsoil replacement. Past timber sale activity also affected soils, but to a relatively limited extent. Today, soils are generally healthy and productive on most of the White River National Forest. This can be attributed to many things, including soil resilience, the evolution of modern technologies, and more comprehensive best management practices.

To provide better soils and geologic information to land managers, forest staff began various inventories in the late 1970s and early 1980s. A study by Lampiris (1979) of the landforms and geologic hazards on the White River National Forest provides a description of geologic features. Additionally, two draft soil surveys have been conducted on the forest, the Flat Tops Soil Survey and the Holy Cross Soil Survey. These references provide good baseline information for project-level analysis.

Soils information is used at various planning levels and for various types of analysis. For the purposes of this document, the effects on soils from the proposed alternatives will be presented and analyzed in a general context. During site-specific project planning, more detailed discussion and analysis will occur with appropriate mitigative measures applied based on these findings.

Key Indicators

- Acres of timber harvest
- Miles of road construction
- Acres of potential roaded areas
- Acres of livestock grazing
- Acres of prescribed fire
- Acres of ski area expansion

Legal and administrative framework

- The Forest and Rangeland Renewable Resources Planning Act (RPA) (1974) requires an assessment of the present and potential productivity of the land. Regulations are to specify guidelines for land management plans developed to achieve the goals of the program that “. . . insure that timber will be harvested from National Forest System lands only where . . . soil, slope, or other watershed conditions will not be irreversibly damaged.”
- The National Forest Management Act (1976) amended RPA by adding sections that stressed the maintenance of productivity, the protection and improvement of soil and water resources, and avoidance of permanent impairment of the productive capability of the land.

Affected environment

INTRODUCTION

The White River National Forest contains more than 200 ecological map units which describe soil types and the environmental factors that contribute to their formation. Describing each of these units individually is not practical for our purposes. To summarize these units in a concise but meaningful way, they have been divided into fifty-two landtype associations (LTAs), and then grouped to reflect the forest’s dominant landscapes of mountains, hills, valleys, and tablelands/mesas. The hills, valleys, and tablelands landscapes generally make up the northern portion of the forest, while the southern portion is dominated by mountainous landscapes. **Table 17** summarizes the geology, climate zones, dominant landforms and potential vegetation of each group. Also included is the common range of erosion hazards within each group. This information is provided because erosion is the most common soil disturbance on the forest. The process for determining erosion hazards is described in FEIS Volume 3 Appendix J. A Draft LTA, which provides a narrative description of each LTA group, is available at the White River National Forest Supervisor’s Office.

Table 17 White River National Forest general ecological map units/LTA groups

Dominant Landscape	LTA Group	Dominant Geology	Climatic Zones	Dominant Landforms	Potential Vegetation	Erosion Hazard	% of Forest
Mountains	M1	hard sedimentary, granitic/metamorphic	Alpine	Mountain slopes, Cirques	Low shrubs, grasses, sedges and forbs	Low to Moderate	13
“	M2	hard sedimentary, soft sedimentary, igneous extrusive, granitic/metamorphic, mixed source glacial till	Subalpine	Mountain slopes, Lateral moraines	Engelmann Spruce, sub-alpine fir, lodgepole pine, mixed grass/forb meadows	Low to Moderate	15
“	M3	hard sedimentary, soft sedimentary, granitic/metamorphic, mixed source glacial till	Subalpine, Montane	Mountain slopes, Ground moraines, Lateral moraines	Subalpine fir, Engelmann spruce, aspen	Moderate to High	23
“	M4	soft sedimentary, hard sedimentary, igneous extrusive	Montane	Mountain slopes, Mountain valleys	Aspen forests (cool sites), Douglas-fir (dry, steep sites)	Low to High	12
“	M5	soft sedimentary, hard sedimentary	Lower Montane	Mountain slopes,	Gambel oak, mountain big sagebrush, mountain mahogany, serviceberry	Low to High	3
“	M6	soft sedimentary	Semi-arid	Strongly dissected low mountain slopes	Pinon-Juniper woodlands, mixed shrub/grasslands	Low	< 1
Hills	H4	soft sedimentary, hard sedimentary	Montane	Hills, Low relief mountain slopes	Aspen, Douglas-fir, subalpine fir	Low to Moderate	3
“	H5	soft sedimentary, hard sedimentary	Lower Montane	Hills, Low relief mountain slopes	Gambel oak, mountain big sagebrush, low sagebrush, serviceberry, mountain mahogany	Moderate to High	2
“	H6	soft sedimentary	Semi-arid	Strongly dissected hills	Pinon-Juniper woodlands, mixed grass/shrublands	Low to Moderate	< 1
Valleys	V2	granitic/metamorphic mixed source glacial till	Subalpine	U-shaped valleys, Cliffs	Engelmann spruce, subalpine fir, mixed graminoid/forb meadows	Moderate to High	2
“	V3	soft sedimentary, hard sedimentary, igneous extrusive over soft sedimentary, mixed source glacial till	Subalpine, Montane	U-shaped valleys, lateral moraines, ground moraines, terraces	Engelmann spruce, subalpine fir, Douglas-fir, Aspen	Low to High	8
“	V4	hard sedimentary, undifferent. Bedrock, igneous extrusive over sedimentary, mixed source glacial till	Montane	Valleys, Stream terraces	Aspen, Douglas-fir, subalpine fir	Low to High	4
“	V5	soft sedimentary, hard sedimentary, mixed glacial deposits, undifferent. Bedrock	Lower Montane	Valleys, Stream terraces	Mixed shrub communities, Mixed grasslands	Moderate to High	1
“	V6	hard sedimentary	Semi-arid	Valleys, Cliffs	Woodland with mixed shrub/grasslands	Low to Moderate	< 1
Tablelands and Mesas	T2	igneous extrusive, hard sedimentary, igneous extrusive over hard sedimentary	Subalpine	Plateaus (high elevation), Cliffs, Scree slopes	Engelmann spruce, subalpine fir, lodgepole pine, broad forb/grass meadows	Moderate to High	6
“	T3	igneous extrusive over soft sedimentary, Hard and soft sedimentary, igneous extrusive	Subalpine, Montane	Plateaus	Subalpine fir, Engelmann spruce, Aspen	Low to High	5
“	T4	hard sedimentary, soft sedimentary	Montane	Plateaus, Ridges	Aspen and subalpine fir (cool, moist sites), Douglas (dry, steep)	Low to Moderate	2

In addition to erosion, most soils on the White River National Forest are generally susceptible to compaction, puddling, displacement, and severe burning, particularly when land management treatments are applied haphazardly.

Compaction and puddling are dependent on soil texture, soil structure, soil moisture, ground cover, and activity type. Because these factors vary within all LTA groups and landscapes on the forest, compaction potentials vary. Generally speaking, however, wet or moist soils with loamy or clay textures and weak structure are inherently more susceptible to detrimental compaction and puddling, regardless of ground cover or type of activity.

All soils are generally susceptible to displacement during heavy equipment-based management treatments. During non-heavy equipment-based land management activities, displacement is largely dependent on soil texture, soil structure, soil moisture, rock fragments, and ground cover. Soils are typically most susceptible to displacement when they have sandy textures, weak structure, are dry, and have few rocks and ground cover.

Given low soil moisture conditions and site conditions that allow for relatively slow, hot fires, all upland soils on the White River National Forest are generally susceptible to severe burning.

RESOURCE PROTECTION MEASURES

To maintain the various functions and processes of healthy, productive soils, soil disturbances that degrade or inhibit such functions and processes must be kept in check. The threshold for allowable detrimental soil disturbance has been identified by the Region as 15 percent of an activity area. In other words, soils must be maintained in a non-detrimentally disturbed condition on at least 85 percent of an activity area.

Tools like the regional *Watershed Conservation Practices Handbook* (WCP) provide various means of meeting soil management objectives. By reference, the 2002 Forest Plan has incorporated all 17 WCP standards to be applied as forest-wide standards. Implementation of forest-wide standards and guidelines, and other mitigation measures like site-specific best management practices (BMPs) will help ensure soil disturbance thresholds are not exceeded.

Environmental consequences

GENERAL EFFECTS

Management actions with the greatest potential to affect soils are those that involve ground disturbance or vegetation removal. These include timber harvesting, travelways, recreation, grazing, oil and gas exploration, fire, and ski area development. The potential detrimental impacts of concern are compaction, erosion (including mass wasting), displacement and detrimental soil burning.

Soil compaction is caused by ground pressure from vehicles, animals, or humans. It can reduce productivity and other soil functions by impairing infiltration, root growth, and soil organisms. Soil compaction can also lead to increased erosion resulting from reduced infiltration and increased overland flow. Detrimental erosion can impair long-term soil productivity and degrade water quality through increased sedimentation. Detrimental soil displacement can reduce soil productivity and other soil functions by removing humus and topsoil. It can also lead to expanded noxious weed populations by exposing soil strata favorable to their establishment. Detrimental soil burning is caused by hot fires that occur when large fuels or heavy concentrations of fuels are dry and consumed near the ground. Detrimentally burned soils can alter many chemical, physical, and biological soil functions and processes including infiltration and nutrient cycling. Long-term soil productivity can also be reduced when excess leaves and limbs are taken off-site in whole tree yarding or fuels reduction operations.

Over the life of the plan, the previously discussed management activities are expected to occur on fewer than 8,000 acres. Forest-wide standards and guidelines and the incorporated WCPs set forth practices that are effective in minimizing impacts. Localized impacts can occur and will be discussed in the following section. Site-specific analyses take into account the specific limitations of soils and geology.

DIRECT AND INDIRECT EFFECTS

Effects on soils and geology from mineral exploration and extraction (leasable)

Oil and gas exploration can result in detrimental compaction, displacement and erosion, and contamination of soils from drilling wastes. However, implementing the mitigation measures outlined in the *1993 Oil and Gas Leasing Environmental Impact Statement* can effectively minimize the extent, severity, and duration of many detrimental soil impacts. While limiting the extent of disturbance is relatively straightforward, mitigating severity and duration are not. For example, post-treatment mitigation measures such as subsoiling (mechanically breaking up compacted layers) are only partially successful in reducing the severity and duration of compaction. This type of mitigation only provides a “jump start” for the recovery process, leaving various physical and biological conditions and processes altered in the short-term. Similarly, seeding, mulching, and fertilizing operations only provide for maximum protection against erosion in the long-term. Overall, impacts are expected to be localized and not extensive across individual watersheds or the forest.

Effects on soils and geology from domestic livestock grazing

The effects from livestock grazing on soils are similar to those from recreation and timber management activities. Livestock can compact, puddle, displace and accelerate soil erosion processes, especially when not properly managed. Properly managed livestock grazing has few detrimental impacts on soils. Under a properly managed grazing system, livestock are well distributed across the landscape with minimal congregation, particularly in sensitive locations such as riparian areas. Additionally, enough vegetation is left to protect against erosion, retain site moisture, and contribute organic matter inputs for nutrient cycling.

When livestock grazing is not properly managed, detrimental soil disturbances can and do occur. Because they exert relatively high ground pressures from their hooves, livestock can compact moist or dry soils with repeated trailing or puddle wet soils common to riparian areas. Given soil moisture constraints, livestock should generally not be turned out to graze while upland soils are still wet from spring runoff. Although compacted livestock trails are typically localized and not extensive, they can be subject to accelerated erosion.

Grazing within forest plan standards provides range conditions that allow for flexibility in using various adaptive management tools given unforeseen circumstances such as drought. Tools like managing animal numbers, season of use, and types of grazing systems can all contribute to sustainable grazing.

Except for Alternative B, grazing does not vary significantly by alternative. The vacant allotment decision does two things. First, it ensures that some currently ungrazed areas will remain ungrazed. Second, it takes away some flexibility by eliminating the possibility of using these areas in the future to mitigate impacts on active allotments. The following table displays the number of allotments that are to be either partially or fully retained.

Table 18
Number of allotments partially or fully retained by alternative

	ALTERNATIVE						
	B	C	D	E	F	I	K
Allotments retained	51	20	24	8	34	21	23

Effects on soils and geology from fire

Wildfire can detrimentally affect soil productivity and site stability should it occur under any alternative. Wildfire can result in the physical effects of lost soil organic matter, loss of soil structure, increased hydrophobicity (water repellency) and accelerated erosion, chemical effects of lost nutrients through volatilization or leaching, and biological effects of lost soil organisms and their habitat (Poff, 1996). Also, severe stand-replacing fires can contribute to various mass wasting processes such as debris flows and slumps on the forest. Other potential effects to soils following wildfire include those associated with fire suppression efforts and salvage operations. Following severe fires, burned areas commonly receive emergency rehabilitation to prevent or at least minimize soil

degradation and mass wasting processes. Wildfire effects on soils and mass wasting ultimately vary by geology and soil types, slope, and fire intensity, all of which can be somewhat controlled with the use of prescribed fire.

Prescribed fire is subject to the same hazards as wildfire. However, avoidance and/or minimization of soil degradation and mass wasting processes can be achieved through careful prescribed fire planning and implementation. Additionally, there are often benefits to soils following cool fires done within prescription. Specifically, some nutrients previously tied up in unburned materials are released and made available to plants. These nutrients are almost all held on site by plant roots, microorganisms and the soil (Martin and Dell, 1978). There will be immediate losses in nitrogen as it becomes volatilized in consumed fuel. However, various nitrogen-fixing species may respond favorably to fire, leading to increased productivity for all plants that occupy the site behind it. Additionally, nitrogen fixation may be enhanced by an increase in soil surface temperature and pH, both favoring nitrogen-fixing bacteria (Martin and Dell, 1978). With prescribed fire, detrimental burning typically only occurs under large fuel sources where there is a long residence time of burning. Large logs and slash piles are the primary sources of long residence burning. Time of year may also influence the effects of prescribed fire. On some soils or ecological types, fall burns may not be desirable as they often burn hotter, often mimicking the effects of wildfire. Questions on the effects of season of burning will need to be answered site-specifically as the White River National Forest moves forward with the prescribed burning program. Alternatives B and D have the highest acreage of prescribed fire treatment.

Alternatives F and I have the most acres of total fuels reduction treatments. These include prescribed fire as well as mechanical treatments such as pre-commercial thinning. If successful in reducing the threat of wildfire, these two alternatives would provide the most protection against mass wasting processes and detrimental soil impacts associated with wildfire. However, in the event of an escaped prescribed fire the potential for detrimental effects would increase. While mechanical treatments may accomplish fuels reduction objectives without greatly increasing the risk of mass wasting processes, there may be direct soil effects from compaction, puddling, displacement, and erosion. Deciding the potential risks of various fuels reduction treatments will be done on a site-specific basis. In any event, fuels reduction does not come without risks to soils.

Table 19
Estimated annual prescribed fire acreage by alternative

	ALTERNATIVE						
	B	C	D	E	F	I	K
Total	5,700	6,200	6,000	4,500	3,750	4,000	6,200

Effects on soils and geology from travelways

Travelways are associated with many activities, including timber harvesting, recreation, ski areas, utility corridors, and mineral extraction. The building and reconstruction of roads requires vegetation removal, soil disturbance, and slope recontouring. Soils are intentionally compacted and hardened, taking them out of production. While developed roads can be located and constructed to minimize problems associated with weak, highly erodible soils, steep slopes, and wet areas, they are not benign in terms of effects. As mentioned in the discussion of timber harvest effects, erosion rates are typically highest during the two years following construction. Under a proper maintenance schedule, from the third year forward roads are relatively stable and generally do not pose chronic erosion problems except on site-specific locations.

Overall, road systems can be designed and constructed to minimize resource damage. **Table 20** provides a relative comparison of potential road impacts based on the percentage of White River National Forest lands with roads.

Table 20
Percentage of White River National Forest lands having roads by alternative

	ALTERNATIVE						
	B	C	D	E	F	I	K
% with Roads	42	38	43	44	51	27	32

During the upcoming Travel Management Plan process and roads analysis, construction, maintenance, and decommissioning of roads, trails, and various other travelways will be considered in detail. Using LTA-level mapping, geologic erosion hazards can be used as an indicators for prioritizing where, when, and how these treatments should be done.

Decommissioning ranges from simple gating that allows administrative use only to full restoration by recontouring and revegetating the cut and fill slopes. Gating reduces impacts from the use of eroding or unstable roads, but does not actively restore natural drainage or soil productivity. Restoring stable grades, natural drainage, and vegetative ground cover are key items in effectively decommissioning roads and improving soil productivity. Considering user needs is also integral to travel management planning, as satisfied users are less likely to participate in illegal off-road use, which can detrimentally impact soils.

Effects on soils and geology from recreation management

Recreation activities can have the same effects on soils as those associated with timber harvest activities. People, OHVs, packstock, and mountain bikes degrade vegetation and compact, puddle, displace, and erode soils in the same way that log skidders do. However, most of these activities generally occur on designated sites such as trails and campgrounds, which are classified as lands taken out of production. Therefore, rather than soil productivity, maintaining site stability to protect other resources (i.e. streams from sedimentation) is the priority. Developed campsites and trails are constructed similarly to roads and are fairly stable in the long-term given appropriate maintenance.

Trails, while similar to roads, are generally less impacting due to their smaller size and lack of use by heavy vehicles.

Dispersed recreation is generally less intensive than on designated sites and usually does not result in detrimental soil impacts. Dispersed camping can occur throughout the forest and, with the exception of frequently used or traditional camps, generally has very little impact. Localized detrimental impacts are relatively small and limited in extent across the landscape.

Alternatives C and E have the most land allocated in dispersed and high-use recreation. However, overall recreation use on the forest will not vary significantly as a result of the forest plan.

Effects on soils and geology from ski areas

In general, the effects on soils and geology from ski areas are similar to those from timber harvesting and recreation. However, ski areas require intensive development and maintenance. Unlike timber harvesting where restocking is required, trees removed from ski slopes are not allowed to regenerate. Additionally, ski trails are typically cleared on much steeper slopes than most timber harvest units. More detail on how soils are impacted by timber clearing is discussed in the section on effects from timber management. In addition to vegetation/tree clearing, ski area development can result in various effects to soils. Contouring and grading slopes typically results in large amounts of soil displacement. Also, compaction associated with construction and maintenance activities can be extensive. Finally, salts and fertilizers used in some areas to condition the snow for races can alter soil structure, vegetation patterns, and density. Overall, the impacts to soils from ski area development are more severe than those of other activities because of their intensity and permanence.

The following table summarizes the acreages allocated for ski area expansions by alternative.

Table 21
Acres (in thousands) allocated for ski areas by alternative

	<i>ALTERNATIVE</i>						
	B	C	D	E	F	I	K
MA 8.25 Acres	93	58	43	84	68	43	51

Effects on soils and geology from timber management

Timber harvesting and its related activities can affect soils in several ways. Harvesting activities such as felling, skidding, and machine piling can result in detrimental soil compaction, puddling, displacement, and accelerated erosion. Skidding on slopes greater than 20 percent can cause excessive displacement and often lead to gullying.

Additionally, machine piling of logging slash has been shown to be the single most impacting activity. Intensive soil-monitoring results (Sullivan 1989) have shown that sale units logged more than once and machine piled commonly exceed regional soil protection standards for detrimental soil disturbance. All of these potentially damaging activities can

be mitigated through the implementation of best management practices, which include the use of designated skid trails, subsoiling, grass seeding for erosion control, water barring, winter logging, and equipment limitations.

When considering the potential effects of timber harvest activities on soils, the type of silvicultural and harvest systems used are of prime importance. Clearcut, shelterwood, and select tree silvicultural systems can each affect soils differently. In comparing effects, there are advantages and disadvantages to each system. For example, compared to shelterwood treatments, clearcutting generally results in overall greater disturbance per unit area/time, and may potentially limit regeneration on drier sites. However, clearcutting is typically a one-time event that allows for continuous and complete recovery. Shelterwood and selection type harvests typically result in multiple entries over relatively short periods of time. In the absence of a permanently dedicated skid trail and landing system, repeated impacts will occur, continuously setting back recovery. The percentages of each silvicultural system used does not vary significantly by alternative. Each alternative is expected to utilize clearcutting on 59 to 60 percent of the total harvested acres, shelterwood treatments on 39 to 40 percent, and selection harvest prescriptions on 1 percent.

The type of harvest system used plays an important role in determining the direct effects of timber harvest activities on soils. Timber harvest operations employ either conventional harvest or mechanized harvest systems. Conventional harvest systems utilize hand-falling of trees with chainsaws, followed by skidding them to landings with rubber-tired or tracked crawler-skidders. Before the inception of designated skid trails, this was very physically disturbing to soils due to the wide extent of machine travel across a site. Today, the use of best management practices, such as endlining trees to designated skid trails, has made conventional harvesting relatively less disturbing.

Several types of mechanized harvest systems have become increasingly popular, particularly on forests dominated by relatively small diameter timber resources. Feller-buncher systems are commonly used on the White River National Forest. Feller-bunchers are typically low ground pressure machines that systematically cut and stack entire trees into piles that are then skidded on designated trails to landings where they are processed. Processing involves removing the limbs and tops, which are then piled and burned. While this system has the potential to minimize physical impacts to soils, it may have long-term nutrient cycling implications as most of a tree's nutrients are tied up in the branches and foliage.

Cut-to-length harvest systems employ a systematic two-step approach that allows for relatively low impacts. First, a mechanized processor cuts, tops, delimbs, and piles trees. This is followed by a machine called a forwarder which comes in behind and transports self-loaded trees to a landing over a physically protective slash layer. Because limbs, tops and foliage are retained on-site, processor-forwarder systems allow for better long-term nutrient management. Due to advances in technology and the systematic nature of operation, mechanical harvest systems can be effectively used while minimizing detrimental impacts to soils and vegetation.

Suspension cable systems are generally very low impact, but have not been historically used on the forest. These systems keep ground-based heavy equipment to a minimum, thereby minimizing direct impacts to soils.

An indirect effect of timber harvest is the removal of the organic debris that is important to the long-term productivity of the site. Graham, et al. (1987) recommend leaving a minimum of 10 to 15 tons per acre of coarse woody debris (CWD) following vegetation management treatments in the Rocky Mountains. In recognizing the importance of CWD, we include a standard that will help ensure minimal levels are maintained. The minimum tonnage densities are based in part on the findings of Graham et al. (1994) and are consistent with standards set by the Rio Grande National Forest.

The determination of suitable acres for timber harvesting takes severe soil and geology limitations into account and does not anticipate harvest that will contribute to ASQ in those areas. Site-specific analyses are done prior to any activity to determine if the area is prone to mass movement such as landslides or debris flows. Total harvest acres, which are a small fraction of the suitable acres, are displayed in the following table.

Table 22
Harvest acres (in thousands) by alternative per decade

Budget Level	ALTERNATIVE						
	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
<i>Experienced</i>	12	5	9	5	19	5	10
<i>Full</i>	17	7	14	7	27	7	16

Roads are commonly the greatest contributors of erosion and sediment in timber sale areas, and should be closely analyzed at the site-specific level to determine their effects. There is typically a pulse of erosion from roads (includes cut and fill slopes) during the first two years following construction or reconstruction before this levels off at the third year (USDA Forest Service, 1981). Under the experienced budget level, Alternative F has the most potential miles of road construction associated with timber harvest. This is followed by Alternatives B and K, which have around 60 percent of the potential miles of Alternative F. Alternative D contains less than half of the potential miles of Alternative F. Finally, Alternatives C, E, and I contain around 25 percent of the potential road miles of Alternative F.

CUMULATIVE EFFECTS

The cumulative effects for soils are similar in all alternatives. **Table 24** summarizes the potential acres that are likely to be impacted by various ground disturbing activities implemented on the White River National Forest over the life the plan.

Because soils are relatively sedentary, effects in a particular area do not strongly influence soil conditions in adjacent areas. However, soil conditions do influence vegetation patterns and watershed conditions. Therefore, it is appropriate to include all lands within the forest boundary as well as the private and Bureau of Land Management lands between the forest's two major divisions. As discussed in the introduction section, past management practices have led to some detrimental soil conditions on National Forest system Lands, some of which still persist. Additionally, private lands in the Roaring Fork, Vail Valley, and Silverthorne areas have been and continue to be developed at a rapid pace. Development compacts and displaces soil and removes vegetation. Productivity in these areas is lost for all practical purposes. Although the amount of developed acres is slight in comparison with the total acreage in a given watershed, this development is concentrated in the valley floors near large rivers where the possibility of impacting downstream resources is significant.

Table 24
Summary of effects by alternative

Activity	Unit	ALTERNATIVE						
		B	C	D	E	F	I	K
Potential area for Timber Harvest	Acres (in thousands) Exp/Full Budget	12/17	5/7	9/14	5/7	19/27	5/7	10/16
% of forest with potential for road construction	% of forest	42	38	43	44	51	27	32
Number of Allotments potentially grazed	Number	51	20	24	8	34	21	23
Potential Area for Prescribed Fire	Acres Exp Budget	5,700	6,200	6,000	4,500	3,750	4,000	6,200
Potential Area for Ski Area Development	Acres (in thousands)	93	58	43	84	68	43	51

Part 2, Section 2

Watersheds

Introduction

Abstract

A significant portion of the Upper Colorado River's water originates in the headwater regions of the White River National Forest. These waters are a supply for irrigation needs as well as for municipalities on both sides of the Continental Divide. They also provide for recreational pursuits including fishing, boating, and camping. Aquatic and terrestrial plants and animals depend on healthy streams and riparian areas for critical habitat.

There are 4,000 miles of perennial streams, 14,000 acres of lakes, and 120,000 acres of riparian and wetland areas on the forest. They vary in condition from nearly pristine water bodies in wilderness areas to streams and wetlands impaired by mining, heavy recreational use, road construction, and timber harvest.

Watersheds are areas of land that drain rainfall and snowmelt into a common stream, stream network, body of water, or closed basin. Region 2 of the Forest Service has adopted the hydrologic unit code (HUC) system developed by the U.S. Geological Survey (USGS). It divides watersheds into a series of progressively smaller nested levels, with first level being the largest land area relative to higher-numbered levels in that watershed. Each level is identified systematically by a hydrologic unit code number, or HUC. A first level watershed can be divided into a number of second level watersheds, each second level watershed may be further subdivided into third-level watersheds, and so forth. For forest planning purposes, fourth through sixth level watersheds are the most appropriate scale of analysis. Fourth level watersheds are often referred to as sub-basins; fifth level watersheds are often just called watersheds, and sixth level watersheds may also be called subwatersheds. The terms HUC, level, and field are often used interchangeably.

We conducted broad scale assessments for 354 sixth-level watersheds with greater than 10 percent forest-managed land. The size of these watersheds ranges from 2 to 60 square miles. There are 29 sixth-level watersheds with a high risk of degradation from future management activities, 177 watersheds at moderate risk of degradation, and 148 at low risk. The ratings of these assessments consider watersheds with stream segments listed by the State of Colorado as having insufficient controls to attain water quality standards.

Watershed conservation practices and forest plan standards and guidelines prescribe extensive measures to protect watershed resources. Adverse impacts from any of the alternatives will be minimized if applicable and effective measures are implemented. However, as the level of activity increases in a watershed, so too does the risk of failure in implementation or effectiveness of a conservation measure. Therefore, alternatives that propose higher levels of activity for various resources pose greater inherent risks to watershed resources.

Monitoring the impacts of forest management activities on watershed resources as well as on the implementation and effectiveness of watershed protection measures will be an inherent part of the forest's management program.

Introduction

Watersheds are naturally dynamic systems. Their health is reflected in the physical and biological conditions of its aquatic, riparian, wetland, and soil resources that respond to both direct and indirect disturbances that may be natural or human-caused. Examples of such disturbances within a watershed include vegetation modification, flow reduction, pollution, soil compaction, and changes to topography. These disturbances affect water quality and quantity, fish and wildlife habitat, slope stability, and soil productivity and are of concern when they adversely impact watershed health.

Stream flows in alluvial, perennial, and fish-bearing streams are an important component of aquatic and riparian resources. Aquatic and riparian systems are adapted to experiencing seasonal high and low flows. When they occur without significant artificial influence, important stream processes are maintained that protect aquatic and riparian habitats as well as recreation and aesthetic values.

Healthy watersheds are critical to protecting water quality, sustaining dependent ecosystems, providing a reliable water supply, and preventing or reducing the downstream impacts of high-runoff events. In a natural state, watersheds are in dynamic equilibrium determined by geologic and climatic variables. Significant disturbances, whether caused naturally (such as landslides, stand-replacement fires, or floods) and/or by human impacts (such as roads, large-scale timber removal, and/or livestock grazing), can throw a watershed out of equilibrium.

Healthy watersheds often can recover from these stresses. Others require restoration efforts that factor in physical and biological requirements of a specific watershed. Changes in management activities within an impacted watershed are often a critical part in its recovery. However, some impacts cannot be easily mitigated and, as long as they remain, result in permanent changes within a watershed, affecting its resources beyond the historic range of variability. These include water storage impoundments, transbasin diversions, irrigation ditches, mines, and roadways.

Key indicators

- Management activities that affect the health of watershed resources, including:
 - a) Acres of timber harvest;
 - b) Acres of prescribed fires;
 - c) Acres of dispersed site rehabilitation; and
 - d) Acres of ski area development.

Legal and administrative framework

- The **Organic Administration Act** (1897) recognizes watersheds as systems that have to be managed with care to sustain their hydrologic function. It states that one purpose for establishing national forests is to secure favorable conditions of water flow.
- The intent of the **Clean Water Act**, a series of Acts and amendments from 1948 to 1987, is to maintain and restore the chemical, physical, and biological integrity of the nation's waters. It requires compliance with state and federal pollution control measures; prohibits degradation of instream water quality needed to support designated uses; requires control of nonpoint sources of water pollution through conservation or "best management practices;" encourages federal agency leadership in controlling nonpoint pollution from managed lands; and sets rigorous criteria for controlling pollution discharges into waters of the U.S.
- The **National Forest Management Act** (1976) directs national forests to protect watershed conditions from irreversible damage and to protect streams and wetlands from detrimental impacts. Land productivity must be preserved. Fish habitat must

maintain viable populations of existing and desired non-native vertebrate species.

- The **Endangered Species Act** (1973) requires federal agencies to conserve threatened and endangered species and the ecosystems they depend on, including riparian and aquatic ecosystems.
- The **Safe Drinking Water Act** (1976) and amendments requires federal agencies having jurisdiction over any federally owned or maintained public water system to comply with all authorities respecting the provision of safe drinking water. The State of Colorado has primary enforcement responsibility through its drinking water regulations.
- **Executive Orders 11988 and 11990** direct federal agencies to avoid to the extent possible the impacts associated with the destruction or modification of floodplains and wetlands. Agencies are directed to avoid construction and development in flood plains and wetlands whenever there are any feasible alternatives.
- The **Forest Service Manual (FSM) 2500** provides additional laws and executive orders as well as agency policy pertaining to watershed management.
- The Rocky Mountain Region's **Watershed Conservation Practices Handbook** (Forest Service Handbook 2509.25) provides standards that must be met through the implementation of appropriate design criteria.

Affected environment

INTRODUCTION

The White River National Forest forms the headwaters of the Blue, Eagle, and Roaring Fork Rivers, all of which are direct tributaries to the Colorado River. Portions of the forest also lie within the headwaters of the White, Yampa, and Piceance-Yellow Rivers, tributaries to the Green River. All of the lands administered by the forest are located within the headwaters of the Colorado River Basin.

Annual precipitation on the forest ranges from 40 to 50 inches in the higher elevations to about 16 inches in the lower elevations. The majority of runoff from the forest results from snowmelt between April and July. An estimated 75 percent of the total annual runoff occurs during this period with peak flows generally occurring in late May or early June.

Watershed elements

The forest's watershed resources can be described in terms of the following elements or water bodies:

- surface waters
- riparian areas and floodplains
- groundwater

Watershed conditions

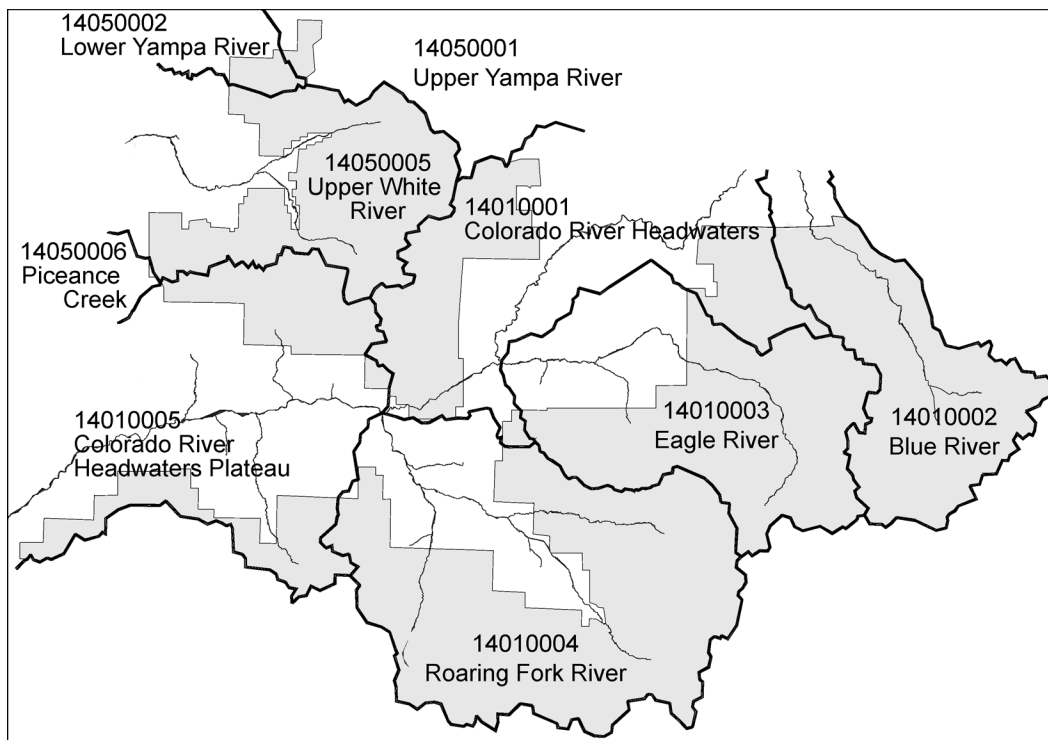
The forest's watershed resources can be further described in terms of the following conditions of watershed :

- water quality
- watershed condition ratings
- water uses

Geographic Units

Because the forest covers a broad range of terrain that varies widely in natural and human-caused sensitivities to watershed disturbances, further description of watersheds is provided in terms of six geographic units. These units roughly correspond to the fourth-level HUC watersheds on the forest (**Figure 15**). Each geographic unit presents a unique set of resource management issues.

Figure 15
Fourth-code watersheds by USGS hydrologic unit codes (HUCs)



SUMMARY OF CONDITIONS AND TRENDS

Surface waters There are approximately 3,400 miles of perennial streams and 4,200 miles of intermittent streams on the forest, yielding an average annual flow of about 2.5 million acre-feet. This annual runoff from the forest accounts for 16 percent of the flow of the Colorado River measured at Lee's Ferry, Arizona, although the White River National Forest comprises less than 4 percent of the total watershed land area above this point. On a more local scale, the forest produces the equivalent of about 75 percent of the flow of the Colorado River above Grand Junction. Open water covers about 13,900 acres. An estimated 113,000 acres of riparian/wetland communities are associated with these surface waters.

Water resources on the forest contribute significantly to public water supplies as well as to agricultural and recreational uses. They also support habitat for fisheries and wildlife and contribute to aesthetic values important to many forest users.

The total annual transbasin diversion for both municipal and irrigation use has averaged approximately 190,000 acre-feet between 1980 and 1999 (**Table 25**). Use between 1993 and 1999 averaged more than 210,000 acre-feet of water per year, or 10 percent of the average annual water yield from the forest.

Communities served by these transbasin diversions include Aurora, Colorado Springs, Denver, and Pueblo. Overall, transbasin diversions remove approximately 30 percent to 50 percent of the total water yield of a contributing sixth-level basin. In months when annual flows peak, these diversions can be as much as 70 percent to 80 percent of the monthly water yield of a contributing basin.

Table 25
Transbasin diversions

<i>Structure</i>	<i>Source basin</i>	<i>Receiving basin</i>	<i>Average annual diversion (1980-99) in acre-feet</i>
Boreas Pass Ditch	Blue River	Platte River	95
Vidler Tunnel	Blue River	Platte River	635
Roberts Tunnel	Blue River	Platte River	49,795
Hoosier Pass Tunnel	Blue River	Arkansas River	9,209
Columbine Ditch	Eagle River	Arkansas River	1,809
Ewing Ditch	Eagle River	Arkansas River	1,155
Wurtz Ditch	Eagle River	Arkansas River	2,930
Homestake Tunnel	Eagle River	Arkansas River	24,965
Twin Lake Tunnel	Roaring Fork River	Arkansas River	37,560
Boustead Tunnel	Roaring Fork River	Arkansas River	56,716
Busk-Ivanhoe Tunnel	Roaring Fork River	Arkansas River	5,368

Most of the major reservoirs in and around the forest either store water for transport to the Eastern Slope or provide compensatory storage for Western Slope water users. **Table 26** shows the location, capacity, and operating authority for each of these reservoirs.

Table 26
Major reservoirs

<i>Structure</i>	<i>Capacity (acre-feet)</i>	<i>Location</i>	<i>Operating authority</i>
Dillon Reservoir	262,200	Blue River	Denver Water Department
Green Mountain Reservoir	146,900	Blue River	USDI Bureau of Reclamation
Grizzly Reservoir	1,000	Lincoln Creek	Twin Lake Reservoir and Canal Co.
Homestake Reservoir	44,360	Homestake Creek	Aurora and Colorado Springs
Ruedi Reservoir	102,300	Fryingpan River	Bureau of Reclamation

Water uses

Within the Colorado River Basin, the forest provides water for consumptive uses such as agriculture, municipal, and snowmaking needs as well as non-consumptive uses such as aquatic and riparian habitat, wetlands, fisheries, and recreation. Over 400 irrigation ditches and reservoirs divert water from streams on National Forest System lands for agricultural, recreation, domestic, and municipal uses on private lands both within and downstream of the White River National Forest.

In the past, the majority of municipal use of forest water was by Eastern Slope users. However, the last decade has seen substantial population growth in the Western Slope, adding to the demand for additional supplies of municipal water. Today, thirty-seven sixth level watersheds on the forest supply water for municipal use (**Table 27**). A public water supply watershed is the contributing drainage area to surface and/or ground water to a community water system as defined by the Safe Drinking Water Act amendments of 1996 (P.L. 104-182, 110 STAT. 1613). Forest management activities that occur in such watersheds must not contaminate public supply water. This may require the application of additional mitigation measures, reducing the extent of the activity, or eliminating it altogether in order to protect this water use.

The State of Colorado is currently developing a source water protection program that will delineate public water supply protection areas and identify their potential sources of pollution. Delineations are expected to be completed by August, 2003 and may include additional watersheds to those listed in **Table 27**.

Table 27
Public supply watersheds

<i>Name</i>	<i>Area served</i>	<i>White River NF district</i>
Hunter Creek	Aspen	Aspen
Castle Creek	Aspen	Aspen
Maroon Creek	Aspen	Aspen
Snowmass Creek	Snowmass	Aspen
Roaring Fork River	Aspen	Aspen
White River	Meeker	Blanco
Straight Creek	Dillon, Dillon Valley	Dillon
North Tenmile Creek	Frisco	Dillon
North Fork of the Snake River	Arapahoe Basin Ski Area	Dillon
North Fork of the Snake River	Loveland Pass Village	Dillon
North Fork of the Snake River	Keystone	Dillon
Lehman Gulch	Breckenridge Ski Area	Dillon
North Fork of Cucumber Gulch	Blue River Water District	Dillon
North Fork of South Barton Gulch	Blue River Water District	Dillon
Cucumber Gulch	Blue River Water District	Dillon
Indiana Gulch	Breckenridge	Dillon
West Tenmile Creek	Copper Mountain	Dillon
Morgan Gulch	Montezuma	Dillon
Fryingpan River	Basalt	Sopris
Nettle Creek	Carbondale	Sopris
East Creek	Redstone	Sopris
North Fork of the Crystal River	Crystal	Sopris
Carbonate Creek	Marble	Sopris
Brush Creek	Eagle	Eagle
Mosher Creek	Gypsum	Eagle

Name	Area served	White River NF district
Resolution Creek	Camp Hale	Holy Cross
Fall Creek	Gilman	Holy Cross
Cross Creek	Minturn	Holy Cross
Turkey Creek	Redcliff	Holy Cross
Beaver Creek	Beaver Creek Ski Area	Holy Cross
Booth Creek	Vail	Holy Cross
Gore Creek	Vail	Holy Cross
Black Gore Creek	Vail	Holy Cross
Mill Creek	Vail	Holy Cross
Grizzly Creek	Glenwood Springs	Rifle
No Name Creek	Glenwood Springs	Rifle
East Elk Creek	New Castle	Rifle
Beaver Creek	Rifle	Rifle
Oasis Creek	West Glenwood	Rifle

The most significant recreational consumptive use of forest water is for ski resort operations. Snowmaking currently uses an average of 2,106 acre-feet annually throughout the forest. This use typically diverts water from streams during the winter baseflow period when flows are at their lowest during the year. Storage of snowmaking water helps alleviate the impacts of direct diversions during critical baseflow times, thus reducing the frequency of anchor ice and the loss of aquatic habitat, such as viable spawning areas.

Other recreational uses include: drinking water for campgrounds, picnic areas, and special-use areas; aesthetics (the visual quality of stream and lake waters and the amount of water present); fishing; and boating.

Instream flows are one other water use on the forest. Current Colorado law stipulates that instream flow rights can only be held by the Colorado Water Conservation Board (CWCB). Prior to this law's implementation, the forest secured instream flow rights on a segment of Castle Creek near Aspen, Colorado. The CWCB holds minimum instream flow rights on about 170 stream segments that occur on the forest. Most instream flow rights are for environmental protection and are junior water rights, subject to calls from upstream senior rights.

Groundwater

Forest snowmelt recharges ground-water aquifers. Recharge to deep, confined aquifers occurs almost exclusively near or at mountain fronts. Major aquifers on or near the forest include the Piceance Basin and the Paleozoic aquifer systems (*Colorado Department of Public Health and Environment 2000*). Streams originating on the forest also contribute to the recharge of smaller, unconfined aquifers within and outside of the forest boundary.

Groundwater use on the forest is limited to special-use permittees and National Forest System campgrounds and administrative sites in which wells are used for domestic purposes. Other groundwater uses include domestic livestock and wildlife uses of springs. Most groundwater use occurs outside the forest boundary.

A comprehensive database for ground water quality in the Colorado and Green River basins in Colorado does not currently exist. Past state reports indicate that in general, groundwater quality in Colorado is excellent in mountain areas where snowfall is heavy (*Colorado Department of Public Health and Environment 2000*).

Typical forest management activities have limited impact on groundwater quality. Those activities that pose the greatest risk to contaminating groundwater quality include mining such as oil and gas development.

Water quality

Within the White River National Forest, high quality water is a critical ingredient in healthy ecosystems as well as in providing for municipal and recreation needs such as potable supplies, aesthetics, and water-based activities. Overall, water quality in the Upper Colorado River Basin is good (Colorado Department of Public Health and Environment 2000). Most of the waters that flow in designated wilderness areas on the forest have been classified by the State of Colorado as outstanding waters. Water quality concerns in this basin include mining operations, agriculture, grazing, and recreation. Impacts to higher elevation streams are often associated with metals mining as well as residential and recreation development (Colorado Department of Public Health and Environment 2000).

Water quality in the Green River Basin, which includes the Yampa and White River Basins, is extremely good in the high mountain headwaters. Water quality concerns related primarily to oil shale and agricultural developments are associated with these impacts along the lower elevations of these river basins (Colorado Department of Public Health and Environment 2000).

Active and inactive mining sites have contributed to degradation of water quality in several streams within the forest, including the headwaters of the Blue, Eagle, and Roaring Fork Rivers. Water-quality standards that most often are exceeded include those for cadmium, lead, silver, mercury, manganese, iron, and zinc.

Additional impacts to water quality on the forest are associated with roads, ditch diversions, ski resort development, livestock grazing, and dispersed recreation, as well as naturally occurring debris flows. Resource management impacts, if unmitigated, have the potential to result in sedimentation, increased water temperatures, and chemical and biological pollution. Agricultural practices on private lands also can contribute to downstream water quality impacts on National Forest System lands.

Water quality monitoring on the White River National Forest includes chemical analyses of streams to determine mining runoff impacts and of wilderness lakes to determine the occurrence and trend of acid deposition. Macro-invertebrate sampling also occurs on streams throughout the forest to determine aquatic health.

Under certain provisions in the Clean Water Act of 1977, states must report on the status of their surface and ground water quality (Section 305(b)) as well as identify those stream segments for which water quality controls are inadequate to achieve applicable water quality standards (Section 303(d)). Colorado meets the requirements under Section 305(b) by biennially preparing a report that summarizes the water quality of surface water, ground water, and drinking water supplied by public water systems in the state. Surface water quality is assessed for each specific stream segment and lake in terms of its suitability for designated uses such as drinking, fishing, boating, irrigation, and support of wildlife and fisheries habitat.

Segments and lakes where such uses are impaired are identified by the state in its report along with the pollutant and its sources. This is typically called the “303(d) list.” For each segment that appears on the 303(d) list, the State must develop a total maximum daily

load (TMDL) for each pollutant of concern. Those stream segments identified by the State that occur on or immediately downstream of the forest are summarized in Appendix J. Forest management activities must factor in state-listed stream segments during planning and implementation of projects to avoid further water quality degradation.

The State of Colorado also has identified stream segments that meet the criteria for designation as “Outstanding Waters.” The Colorado Department of Public Health and Environment (CDPHE) anti-degradation rules for water quality (5 CCR 1002-8 3.1.8(1)(a)) state that no degradation of water quality is allowed on “Outstanding Waters.” The following are designated segments of “Outstanding Waters” that occur on the White River National Forest:

- *White River Basin—Segment 2:* Trappers Lake, including all tributaries to Trappers Lake
- *Upper Colorado River—Segment 9:* All tributaries to the Colorado River and from rivers within the Flat Tops Wilderness
- *Blue River—Segment 16:* All tributaries to the Blue River including all wetlands, lakes, and reservoirs within Eagles Nest and Ptarmigan Wilderness Areas.
- *Eagle River—Segment 1:* All tributaries and wetlands to the Eagle River system within the Eagles Nest Wilderness and Holy Cross Wilderness excluding the Homestake Water Project.
- *Roaring Fork River—Segment 1:* All tributaries to the Roaring Fork River system, including all lakes and reservoirs, within the Maroon Bells-Snowmass Wilderness and the Hunter-Frypan Wilderness.

Those stream segments not identified by the state as outstanding or use-protected, fall under “an intermediate level of water quality protection,” which requires protection of existing water quality unless a lower water quality is necessary to, “accommodate important economic or social development in the area in which the waters are located” (Colorado Department of Public Health and Environment 2001).

Riparian areas, wetlands, and floodplains

Although riparian areas and wetlands occupy only 5 percent of the lands managed by the White River National Forest, they are key to productive fisheries and wildlife habitat, attenuated flooding, quality water for downstream users, continuous ground water recharge, and diverse scenery and recreation sites. They also are important to sustaining timber and forage production.

Riparian ecosystems constitute the transition area between the aquatic ecosystem and the adjacent terrestrial system. The aquatic ecosystem includes the stream channel, lakebed, water, and the biotic communities and habitat found in these features.

Wetlands are areas inundated by surface or groundwater with a frequency sufficient to support vegetation or aquatic life that requires saturated or seasonally saturated soil conditions. Wetlands generally include marshes, bogs, wet meadows, river overflows, mud flats, and natural ponds. Federal policy dictates that no net loss of wetlands on federal lands will occur.

About 120,000 acres of riparian areas and wetlands occur on the forest. **Table 28** displays inventoried riparian areas and wetlands by zone type. This inventory is based upon aerial photographic interpretations and did not map riparian areas that were not visible from

aerial photographs such as wetlands less than two acres in size and narrow ribbons of riparian areas located beneath tree canopies.

The primary forest management activities that impact the condition of riparian areas and wetlands include recreation use and development, timber harvest, road construction, and grazing. Routine applications of measures that protect riparian areas and wetlands such as those in the Rocky Mountain Region's Watershed Conservation Practices Handbook must be incorporated into range-use permits, road construction specifications, and field operation plans for timber harvest, mining, and recreational uses.

Table 28
Acres of riparian area

<i>Riparian zone</i>	<i>Acres</i>	<i>Riparian zone</i>	<i>Acres</i>
Lake	12,560	Stream	34,500
Meadow	7,930	Floodplain	6,620
Springs and seeps	500	Wetland	56,150
Pond	1,410		

Floodplains are relatively flat areas adjoining a riverway that are prone to flooding. Statistically, these areas are subject to a 1 percent (100-year recurrence) or greater chance of flooding in any given year. Floodplains occupied by healthy vegetation communities reduce the severity of floods by allowing floodwaters to spread out over the floodplain. Vegetation slows the speed of the water and allows sediment to settle out and water to infiltrate. Water is slowly released from alluvial aquifers back to the channel during drier periods of the year.

Watershed condition ratings Watershed health is dependent upon its ability to absorb the impacts of natural and human-caused disturbances. On the forest, human-caused disturbances include road development and maintenance, timber harvest, grazing, fire and fire suppression activities, mineral extraction, ski area and other recreation development, and residential development. The response of a watershed to any of these disturbances depends not only on the location and degree of disturbance but on the sensitivity of its inherent soils, geology, and ground cover.

The watershed condition assessment has been revised from the assessment presented in the DEIS. The revisions are identified in the following descriptions of the process used to rate the condition of 6th level watersheds on the forest.

There are 385 sixth-level watersheds that contain at least a portion of National Forest System lands administered by the White River National Forest. Of these, 44 sixth-level watersheds are made up entirely of National Forest System lands. In the DEIS, 371 of these watersheds were assessed for risks to watershed health. For this analysis, an assessment was made of 354 sixth-level watersheds where National Forest System lands make up 10 percent or more of the watershed.

The watershed condition rating displayed in the DEIS relied on individual assessments of landscape processes (natural sensitivity) and existing resource conditions (human influence) to come up with a combined rating value for each 6th level watershed. These values ranged from 17 to 33 and were displayed by color gradation on a map accompanying the DEIS. A complete explanation of this process, used for both the DEIS

and FEIS, is contained in Appendix J. These assessments are general in scale and do not take the place of site specific analyses required for proposed project specific activities.

We went a step further for the FEIS by evaluating the watershed condition ratings of natural sensitivity and human influence to assign each 6th level watershed into one of the following three condition classes:

- *Class I (functional)*—The watershed is fully functioning and in good condition. The drainage network is generally stable and only major events have the potential to cause long-term changes. Physical, chemical, and biological conditions indicate that soil, aquatic, and riparian systems are not compromised by human disturbances.
- *Class II (at risk)*—The watershed is functional, but its condition is fair. Watershed condition may be in a downward trend or at risk of degradation. Physical, chemical, and biologic conditions indicate that soil, aquatic, and riparian systems are at risk in supporting watershed functions.
- *Class III (non-functional)*—The watershed is dysfunctional and in poor condition. A majority of the drainage network may be unstable. Physical, chemical, and biologic conditions suggest that soil, aquatic, and riparian systems are not supporting watershed functions.

The resulting watershed condition classes are listed for each sixth-level watershed in FEIS Volume 3, Appendix J. Overall, 148 watersheds were rated as functional, 177 were rated at risk, and 29 were rated non-functional. Reasons for at risk and non-functional ratings include mining runoff, channel modifications, reduced or disrupted streamflows, bank damage from recreation or livestock, noxious weeds, and sedimentation from road sanding of major highways.

It is important to note that these condition classes do not prohibit future management activity. Site specific information pertaining to proposed management will be required before ascertaining if an activity will further degrade a watershed or have little to no contribution to the overlying cause of degradation. Such site-specific information will also allow us to determine what, if any, watershed improvement is needed and to prioritize those needs.

Geographic units

The White River National Forest encompasses a diverse array of landform types and resources that vary from one end of the forest to the other. Watershed resource issues can differ widely due to the variety of natural and human impacts that exist throughout the area. A manageable perspective of the watershed conditions on the forest is presented in terms of six geographic units, which generally are based on fourth-code watershed boundaries (**Figure 15**). These six units are:

- Blue River
- Eagle River
- Roaring Fork River
- Upper Colorado River (Colorado River Headwaters HUC)
- Lower Colorado River (Colorado River Headwaters Plateau HUC)
- Upper White River

The following descriptions include the amount of surface water and wetlands in each geographic unit as well as stream densities and linear feature densities. Linear density includes roads, trails, ditches, and other linear disturbances on the landscape. The greater the linear disturbance, the greater the risk is of adverse watershed impacts. Stream density indicates the efficiency through which a stream system can receive pollutants.

Water uses in each geographic area include reservoirs, transbasin diversions, and diversions from sixth-level streams for public water supplies. **Tables 25, 26, and 27** provide additional information on the number and types of these water uses.

Other descriptions include physiographic features as they generally relate to erosion hazards, the number of state-listed degraded stream segments, and an identification of mines rated as having significant environmental degradation. A table of these mines for the forest is located in Appendix J.

BLUE RIVER UNIT

The Blue River Unit is located entirely within the Dillon Ranger District. Of the 62 sixth-level watersheds that contain at least a portion of lands administered by the White River National Forest, 55 contain at least 50 percent National Forest System lands. None are 100 percent within forest boundaries. There are 6 fifth-level watersheds within this unit, five of which occupy 50 percent or more National Forest System lands.

Within the unit are 758 miles of perennial streams and 445 miles of intermittent streams. Lakes and ponds occupy 6,470 acres; there are 14,080 acres of wetlands. About 25 percent (30,000 acres) of the riparian/wetland communities that occur on the forest are found in the Blue River basin.

Watershed condition assessments were made on 59 of these sixth-level watersheds. These assessments suggest that soil, aquatic, and riparian systems are predominantly functional in 22 watersheds, at risk in 21 watersheds, and unstable in 16 watersheds. **Table J-1** in FEIS Volume 3 Appendix J lists the condition class of each watershed in the Blue River Unit.

Linear disturbance density within this part of the forest is 2.4 miles/square mile. Stream density is 3.1 miles/square mile. Straight Creek is listed by the State of Colorado as having impaired water quality due to sediments from Interstate 70 (Colorado Department of Public Health and Environment 2000).

The Blue River Unit contains two major reservoirs (Green Mountain and Dillon) and 63 sixth-level watersheds. Transbasin diversions from the forest that are located in this watershed average 60,000 acre-feet of water annually from four structures. Hoosier Pass Ditch diverts water to the Arkansas River Basin. The Boreas Pass Ditch, Vidler Tunnel, and Roberts Tunnel transfer water to the Platte River Basin. Nine streams on the forest contribute to 11 public water supply entities.

Physiographically, most of the Blue River Unit is made up of high-relief, crystalline, and hard-sedimentary mountainous lands. The soils in these lands have a moderate-to-severe erosion hazard. Along the course of the Blue River, the lands fall into low-relief, mixed-sedimentary mountainous lands. The erosion hazard in these lands ranges from low to severe.

Mineral exploration for gold and silver occurred in this unit from the mid-1860s to 1905. Water quality impacts of these mining forays continue to the present. Four of the five stream segments designated by the Colorado Department of Health as “use impaired” (Colorado Department of Public Health and Environment 2000) have mine related water quality impairments. The fifth segment is Straight Creek for sediment. Under the Abandoned Mine Land Inventory Project, nine of the mines located in this geographic area are rated as having significant environmental degradation (Excelsior Mine/Mill, Governor Mine, Hamilton Mine, Jessie Mine, Oro Saints John Mine, Silver Spoon Mine, Lower Climax Mine, Willard Tunnel, and Wellington/Oro Mine) and two (Warden Mine and IXL/Royal Tiger) as having potentially significant degradation (Streufert 1994).

EAGLE RIVER UNIT

The Eagle River Unit represents the National Forest System lands that occur within the Eagle River Basin, a fourth-level watershed. Lands within this unit fall within the Eagle and Holy Cross Ranger Districts. There are 71 sixth-level watersheds that contain at least a portion of National Forest System lands with five of these watersheds that are entirely administered by the White River National Forest and 55 with between 50 and 100 percent National Forest System lands. There are eight fifth-level watersheds, six of which occupy 50 percent or more National Forest System lands.

Within the unit are 727 miles of perennial streams and 1,288 miles of intermittent streams. Lakes and ponds make up 1,440 acres and wetlands occupy 3,680 acres. About 12 percent (15,000 acres) of the riparian/wetland communities that occur on the forest are found within the Eagle River basin.

We assessed watershed conditions on 69 of these sixth-level watersheds. These assessments suggest that soil, aquatic, and riparian systems are predominantly functional in 25 watersheds, at risk in 38 watersheds, and unstable in 6 watersheds. Table J-2 in FEIS Volume 3 Appendix J lists the condition class of each watershed in the Eagle River Unit.

Linear disturbance density within this part of the forest is 2.6 miles/square mile. Stream density is 3.4 miles/square mile.

Homestake Reservoir, which stores water for diversion to Aurora and Colorado Springs, lies within the Eagle River Unit. Transbasin diversions from the forest that are located in this watershed average 30,000 acre-feet of water annually from four structures: the Columbine Ditch, Ewing Ditch, Wurtz Ditch, and Homestake Tunnel, all of which divert water to the Arkansas River Basin.

Eleven watersheds within this unit are a source of water to eight municipalities.

Three physiographic units are found within the Eagle River Unit. The high-relief, crystalline, and hard-sedimentary mountainous lands are generally found within the Eagles Nest and Holy Cross Wilderness Areas. Soils in these lands have a moderate-to-severe erosion hazard. A relatively small area around Muddy, Red Canyon, and Cache Creeks, located within the northern part of the Eagle River Unit, is low-relief, soft-sedimentary mountainous and volcanic mesa lands. Soils in this physiographic area generally have low fertility with a severe limitation for revegetation. Their erosion hazard potential is severe; mud and debris flows can be common occurrences. The remaining

area within the Eagle River unit are lands that fall into low-relief, mixed-sedimentary mountainous lands. The erosion hazard in these lands ranges from low to severe.

Ranching, logging, and mining were the dominant activities in this unit from the late 1800s to 1970s. Two major influences dominated early development of the eastern portion of this unit: mining at Climax, Gilman, and Redcliff; and the development of a military training base at Camp Hale where a portion of the Eagle River that flows through the area was channelized.

Three stream segments are designated “use impaired” (Colorado Department of Public Health and Environment 2000). Development of total maximum daily loads (TMDLs) for all three segments is scheduled to be completed by 2006 (Colorado Department of Public Health and Environment 2000). Mining is the source of the majority of the water quality problems within this unit. Other sources include municipal wastewater facilities. Under the Abandoned Mine Land Inventory Project, two mines, Discovery Tunnel Area and Holy Cross City, are rated as causing potentially significant degradation (Neubert and Ellis 1998; Streufert 1998).

ROARING FORK RIVER UNIT

The Roaring Fork River Unit represents the National Forest System lands that occur within the Roaring Fork River Basin, a fourth-level watershed. Lands within this unit fall within the Aspen and Sopris Ranger Districts. There are 109 sixth-level watersheds that contain at least a portion of National Forest System lands with 16 of these watersheds that are entirely administered by the White River National Forest and 70 with between 50 and 100 percent National Forest System lands. There are 10 fifth-level watersheds, seven of which occupy 50 percent or more National Forest System lands.

Within the unit are 951 miles of perennial streams, 1847 miles of intermittent streams, 2,270 acres of lakes and ponds, and 22,400 acres of wetlands. About 31 percent (37,500 acres) of the riparian/wetland communities that occur on the forest are found within the Roaring Fork River basin.

Watershed condition assessments were made on 101 of these sixth-level watersheds. These assessments suggest that soil, aquatic, and riparian systems are predominantly functional in 50 watersheds, at risk in 47 watersheds, and unstable in 4 watersheds. **Table J-3** in Appendix J lists the condition class of each watershed in the Roaring Fork River Unit.

Linear disturbance density within this part of the forest is 2.1 miles/square mile. Stream density is 3.8 miles/square mile.

The unit contains one major reservoir, Ruedi Reservoir, operated by the Bureau of Reclamation to supply compensatory water for Western Slope water uses. Transbasin diversions from the forest that are located in the Roaring Fork watershed remove 100,000 acre-feet of water annually via three structures, the Twin Lakes, Boustead and Busk-Ivanhoe Tunnels, all of which divert water to the Arkansas River Basin. Ten watersheds within this unit are a source of water to seven municipalities.

There are five physiographic units within the Roaring Fork River Unit. Most of the unit is high-relief, crystalline, and hard-sedimentary mountainous lands that are generally found

within the headwaters portions of the watershed. Soils in these lands have a moderate-to-severe erosion hazard.

Much of the lower Fryingpan River area and the valley portions of the Crystal River are high-relief, mixed-sedimentary mountainous lands. The erosion hazard of soils in these areas is generally moderate-to-severe, with mud and debris flows common in areas with steep, barren slopes. Soil fertility ranges from low to high and the limitation for revegetation ranges from slight to severe. Avalanche Creek regularly experiences mudflows that are large enough to close the access road into the campground.

The area around Marble as well as along the lower slopes of the Elk Mountains falls within the low-relief, mixed-sedimentary mountainous lands. There are a variety of soils here due to sedimentary formations as well as glacial and landslide deposits. Ratings for erosion hazard, soil fertility, and revegetation limitation vary widely. A few relatively recent and significant mudflows have occurred in the Marble area, most of which have originated within the Carbonate and Slate Creek basins (Rogers and Rold 1977).

The area around Basalt Mountain as well as the upper reaches of Fourmile and Thompson Creeks is low-relief, soft-sedimentary mountainous and volcanic mesa lands. Soils in this area generally have low fertility with a severe limitation for revegetation. Their erosion hazard potential is severe; mud and debris flows can be common occurrences.

The lower reaches of Fourmile and Thompson Creeks as well as Coal Creek are within strongly dipping, soft sedimentary mountainous lands. These lands generally have poor stability. Soils typically have severe erosion hazard ratings with mud and debris flows common. Soil fertility is low to moderate and has a severe limitation on revegetation.

Tributaries to the Roaring Fork River, including all wetlands, lakes, and reservoirs, located in the Maroon Bells-Snowmass, Holy Cross, Raggeds, Collegiate Peaks, and Hunter-Fryingpan Wilderness Areas are classified by the State of Colorado as “Outstanding Waters” (Colorado Department of Public Health and Environment 2002a). The main-stem of the Roaring Fork River and some of its tributaries have been designated by the state as use-impaired due to sediments and un-ionized ammonia. Coal Creek is designated use-impaired due to iron levels. A tributary to the Crystal River, Coal Creek is targeted by the state for development of a TMDL for iron concentrations by 2008 (Colorado Department of Public Health and Environment 2000). Extensive coal mining activity took place in this basin throughout this century, ending only recently. Current efforts are under way to rehabilitate the watershed.

Under the Abandoned Mine Land Inventory Project, four of the mining sites (Hope Mine, Pitkin Iron Mine, Ruby Area, and Upper Yule Creek) are rated as having significant environmental degradation, eight as having potentially significant degradation (Highland Tunnel, West of Hunter Peak along East Maroon Creek, Lower workings along E. Maroon Creek, Conundrum Creek—West Side, Sandy Creek, Coal Basin, Lost Trail Creek Workings, and Paradise Basin), and one (Montezuma Mine Area) as having slight environmental degradation (Neubert et al. 1998a; Neubert et al. 1998b).

UPPER COLORADO RIVER UNIT

The Upper Colorado River Unit represents lands managed by the White River National Forest that occur within the Upper Colorado River Basin to Glenwood Springs, excluding the Blue, Eagle, and Roaring Fork river basins. Lands within this unit fall within the

north portion of the Holy Cross Ranger District, the northwest portion of Eagle Ranger District, a small northwest segment of Sopris Ranger District, and an eastern portion of the Rifle Ranger District. Of the 55 sixth-level watersheds that contain at least a portion of National Forest System lands, nine are entirely administered by the White River National Forest and 33 are between 50 and 100 percent National Forest System lands. There are 11 fifth-level watersheds, six of which occupy 50 percent or more National Forest System lands.

Within the unit are 574 miles of perennial streams, 1,702 miles of intermittent streams, 1,470 acres of lakes and ponds, and 8,270 acres of wetlands. About 13 percent (15,600 acres) of the riparian/wetland communities that occur on the forest are found within the Upper Colorado River basin.

We assessed watershed conditions on 50 of these sixth-level watersheds. These assessments suggest that soil, aquatic, and riparian systems are predominantly functional in 20 watersheds, at risk in 28 watersheds, and unstable in 2 watersheds. **Table J-4** in FEIS Volume Appendix J lists the condition class of each watershed in the Upper Colorado River Unit.

Linear disturbance density within this part of the forest is 1.8 miles/square mile. Stream density is 3.9 miles/square mile.

There are no major reservoirs or transbasin diversions on the forest within the Upper Colorado River Basin. Two watersheds within this unit provide a source of water to Glenwood Springs.

Five physiographic units are found within the Upper Colorado River Unit. Volcanic plateau lands generally occur within the upper portions of Derby Creek basin. These lands are typically stable except at the margins of basalt flows, which are prone to landslides. Soils in these lands typically have a slight-to-moderate erosion hazard.

In the grasslands and forblands, soil fertility and the degree of limitation for revegetation are moderate. In the coniferous forest lands, soils are rated low for inherent fertility and severe for their degree of limitation for revegetation.

The high-relief, mixed-sedimentary mountainous lands occur within the portion managed by the Sopris Ranger District as well as within the upper elevations of the lands managed by the Holy Cross Ranger District. Much of the Deep and Sweetwater Creek basins are also made up of these physiographic land units. The erosion hazard of soils in these areas is generally moderate to severe, with mud and debris flows common in areas with steep, barren slopes. Sweetwater Creek saw a significant mudflow in the 1970s. Soil fertility ranges from low to high and the limitation for revegetation ranges from slight to severe.

The Derby and Sunnyside Creek basins fall within the low-relief, mixed-sedimentary mountainous lands. There are a variety of soils here due to sedimentary formations as well as glacial and landslide deposits. Ratings for erosion hazard, soil fertility and revegetation limitation vary widely as well.

The lower portion of land in the Upper Colorado River Basin managed by the Holy Cross Ranger District is low-relief, soft-sedimentary mountainous and volcanic mesa lands. Soils in this physiographic area generally have low fertility with a severe limitation for revegetation. Their erosion hazard potential is severe; mud and debris flows can be common occurrences.

Finally, hard-sedimentary plateau and canyon lands can be found within the portions managed by the Rifle Ranger District, generally No Name and Grizzly Creeks. These lands contain relatively flat terrain that is deeply incised by tributaries to the Colorado River. The terrain is fairly stable except in the steep canyons, which are subject to rockfall. Soils in the plateau lands have a slight erosion hazard with a high inherent fertility and a slight degree of limitation for revegetation. Soils in the canyon lands are rated severe for erosion hazard. Fertility is high with a moderate degree of limitation for revegetation.

No segments have been identified as “use impaired” (Colorado Department of Public Health and Environment 2000).

LOWER COLORADO RIVER UNIT

The Lower Colorado River Unit represents lands managed by the White River National Forest that occur within the Lower Colorado River Basin from Glenwood Springs and downstream. Lands within this unit fall entirely within the Rifle Ranger District. Of the 46 sixth-level watersheds that contain at least a portion of National Forest System lands, one is entirely administered by the White River National Forest. Twenty sixth-level watersheds are between 50 and 100 percent National Forest System lands. There are seven fifth-level watersheds, two of which occupy 50 percent or more National Forest System lands.

Within the unit are 456 miles of perennial streams, 2461 miles of intermittent streams, 290 acres of lakes and ponds, and 1,420 acres of wetlands. Four percent (5,000 acres) of the riparian/wetland communities that occur on the forest are found within the Lower Colorado River basin.

Watershed condition assessments were made on 36 of these sixth-level watersheds. These assessments suggest that soil, aquatic, and riparian systems are predominantly functional in 6 watersheds, at risk in 29 watersheds, and unstable in 1 watershed. **Table J-5** in FEIS Volume 3 Appendix J lists the condition class of each watershed in the Blue River Unit.

Linear disturbance density within this part of the forest is 2.5 miles/square mile. Stream density is 3.9 miles/square mile.

There are no major reservoirs or transbasin diversions on the forest within the Lower Colorado River Basin. Three watersheds within this unit provide water to three municipalities (see Table 27).

Two physiographic units are found within the lands managed by the forest in the Lower Colorado River Unit. The hard-sedimentary plateau and canyon lands occur within the northeastern portion of the Rifle Ranger District, which includes Elk, South Canyon and Mitchell Creeks. These lands contain relatively flat terrain that is deeply incised by tributaries to the Colorado River. The terrain is fairly stable except in the steep canyons, which are subject to rockfall. Soils in the plateau lands have a slight erosion hazard with a high inherent fertility and a slight degree of limitation for revegetation. Soils in the canyon lands are rated severe for erosion hazard. Fertility is high with a moderate degree of limitation for revegetation.

The rest of the district contains high-relief, mixed-sedimentary mountainous lands. The erosion hazard of soils in these areas is generally moderate to severe, with mud and

debris flows common in areas with steep, barren slopes. Soil fertility ranges from low to high and the limitation for revegetation ranges from slight to severe.

No segments have been identified as “use impaired” (Colorado Department of Public Health and Environment 2000).

UPPER WHITE RIVER UNIT

The Upper White River Unit represents lands managed by the White River National Forest that occur within the Upper White River Basin as well as small portions of the fourth-level watersheds that drain into the Upper and Lower Yampa River and Piceance Basin. Lands within this unit fall entirely within the Blanco Ranger District. Of the 42 sixth-level watersheds that contain at least a portion of National Forest System lands, 13 are entirely administered by the White River National Forest and lie within the Upper White River Basin. Twenty sixth-level watersheds are between 50 and 100 percent National Forest System lands. There are seven fifth-level watersheds, two of which occupy 50 percent or more National Forest System lands.

Within the unit are 521 miles of perennial streams, 1,706 miles of intermittent streams, 2,040 acres of lakes and ponds, and 6,300 acres of wetlands. About 15 percent (16,500 acres) of the riparian and wetland communities that occur on the forest are found within the Upper White River basin.

Watershed condition assessments were made on 39 of these sixth-level watersheds. These assessments suggest that soil, aquatic, and riparian systems are predominantly functional in 25 watersheds and at risk in 14 watersheds. No watersheds were assessed to be unstable. **Table J-6** in FEIS Volume 3 Appendix J lists the condition class of each watershed in the Upper White River Unit.

Linear disturbance density within the part of the forest in the Upper White River Unit is 1.5 miles/square mile. Stream density is 3.8 miles/square mile.

There are no major reservoirs or transbasin diversions on the forest within the Upper White River Basin. The White River provides a water supply to Meeker.

Two physiographic units are found within the lands managed by the White River National Forest in the Upper White River Unit. High-relief, mixed-sedimentary mountainous lands occur generally in the lower elevation lands that drain into the White River as well as those that are within the Piceance Basin. The erosion hazard of soils in these areas is generally moderate to severe, with mud and debris flows common in areas with steep, barren slopes. Soil fertility ranges from low to high and the limitation for revegetation ranges from slight to severe.

The higher-elevation lands within the Upper White River basin are volcanic plateau lands. These lands are generally stable except at the margins of basalt flows, which are prone to landslides. Soils in these lands typically have a slight-to-moderate erosion hazard. In the grasslands and forblands, soil fertility and the degree of limitation for revegetation are moderate. In the coniferous forest lands, soils are rated low for inherent fertility and severe for their degree of limitation for revegetation.

Under the Abandoned Mine Land Inventory Project, two of the mining sites (Butterfly and Burrell Claims) located in this geographic area are rated as having potentially significant degradation (Neubert and Ellis 1998).

There are no “use impairment” water quality designations within this portion of the forest (Colorado Department of Public Health and Environment 2000). Within this unit all tributaries to the White River, including all wetlands, lakes, and reservoirs within the boundaries of the Flat Tops Wilderness Area, are listed as an “Outstanding Water” (Colorado Department of Public Health and Environment 2000).

Future trends

The quantity and quality of water will become more critical with expanding municipalities near the White River National Forest. Water supply will require careful balancing between meeting the streamflow needs of sustained aquatic ecosystems and the domestic, commercial, and recreation needs of an expanding population. Water rights held by the forest will become important in protecting Forest water uses such as for developed campgrounds. As snowmaking increases at ski resorts, water withdrawals during critical base flow periods will require alternative methods of diversion to ensure that ecosystems and fisheries are maintained downstream.

Water quality and quantity will continue to be a concern as runoff from mining sites carries toxic pollutants downstream. Sediment sources such as roads and diversion ditches will continue to require regular maintenance to protect water. Oil and gas development, with its potential for affecting surface and ground water, will require regular inspections and restoration actions to protect these resources.

Resource protection measures

Watersheds and their streams can sustain some resource use and disturbance without serious long-term consequences. Not all watersheds are alike and some watersheds, because of their geology, are more resistant to disturbance than others. Resource development must factor in the sensitivity of a watershed to disturbance and be carried out in such a way that watershed and stream health are not compromised.

Management on the White River National Forest will provide protection of aquatic, riparian, and wetland resources by implementing the following measures:

- Follow the *Watershed Conservation Practices*, which provide standards for all management activities to protect soil, aquatic resources, and riparian areas. Each standard specifies design criteria that describe in more detail how an activity will be conducted to protect soil productivity, stream channels, and water quality. Following these standards will limit impacts to stream health and help maintain the chemical, physical, and biological integrity of White River National Forest waters. Their use complies with nonpoint source pollution control regulations and NFMA.
- Perform site-specific analyses of proposed management activities and assess the overall impacts of past and proposed activities in terms of stream and riparian health. In watersheds in which the human-caused or natural risks are high, watershed improvement needs may be required or extraordinary mitigation measures may be used to offset the impacts of the proposed project. See FEIS Volume 3 Appendix J for watershed risk ratings.
- Establish reference streams and use them to compare stream conditions in high-quality watersheds to those of similar stream type in disturbed watersheds. This will help determine if the latter has been adversely affected by a management activity.
- Maintain sufficient flows for streamflow-dependent resources such as fish and wildlife habitats, threatened and endangered species, outdoor recreation uses

such as rafting, and aesthetics. Acquire water necessary for administrative uses such as campgrounds, ranger stations, administrative sites, work centers, livestock, and wildlife watering (Glasser 1996).

Environmental consequences

GENERAL EFFECTS

A healthy watershed operates in dynamic equilibrium. This balance can be affected by forest management activities. Activities that disturb the soil surface as well as those that impede stream flow have the greatest potential to affect aquatic and riparian resources. The risk of adverse impacts increases as the distance between a ground disturbing activity and a stream or wetland decreases.

Surface water, groundwater, floodplains, and riparian areas are all closely related. Because the effects on these resources are typically similar, they are discussed together unless specifically noted and described.

Water yields from timber harvests and prescribed burns can be significant on a small scale such as in a sixth-level watershed, resulting in channel degradation if significant. On a larger scale, such as from the forest as a whole, these yields are a very small fraction of the forest's overall water yield and are not measurably detectable on a year-to-year basis.

DIRECT AND INDIRECT EFFECTS

Watershed conservation practices and forest plan standards and guidelines prescribe extensive measures to protect soil, riparian, and aquatic resources. Generally, adverse impacts to these resources can be minimized when all applicable measures are applied and are effective. There is a point of diminishing returns, however, where the risk that these protective measures fail to be fully effective. Hence, alternatives that propose greater levels of management activity may increase the risk of adverse impacts to aquatic and riparian resources.

Effects on water yield from timber harvest and prescribed fire

The White River National Forest is a source of water for municipal, commercial, and agricultural uses as well for streamflows necessary to maintain healthy aquatic and riparian resources. Streamflow from forested watersheds results from total precipitation less losses from evaporation, transpiration, and groundwater storage. Trees have an impact on water available to streamflow by intercepting precipitation in their canopies which is then evaporated back into the atmosphere. Trees also transpire significant amounts of water which depletes water reserves in the soil and increases the groundwater capacity for subsequent rainfall or snowmelt (Troendle and Kaufmann 1987).

Consequently, water yield can be influenced by timber harvest and wildland fires. However, streamflow increases that result from vegetation removal occur mostly during spring runoff. These are typically greatest during wet years, and unlikely to be significant during dry years when the need for more water is greater (Schmidt and Wellman).

For the forest plan revision, estimates of water yield increases as a result of timber harvest were modeled for each alternative and for the timber benchmark using methods

outlined in WRENSS (U.S. Environmental Protection Agency 1980). The timber benchmark is an estimate of the maximum timber harvest that could be sustained on the forest, excluding those lands legally withdrawn from harvest (i.e. wilderness) or not physically suitable for such operations. Water yields modeled for benchmark harvests provide an estimate of the amount of water that might be realized if timber harvest was maximized on the forest. The water yield analysis for this FEIS indicates that annual water yield increases realized through maximum timber harvest on the forest would be 15,400 acre-feet at the end of five decades. (An acre-foot of water is roughly equivalent to flooding a football field one foot deep). This would be a 0.62 percent increase over the forest's annual average water yield of 2.5 million acre-feet. Under Alternative B, water yield increases at the end of five decades would be 4,200 acre-feet, 0.17 percent of the average annual water yield from the forest.

Table 29 compares the water yield increases for each decade from timber harvest for Alternative B and for the timber benchmark. Timber removal does not permanently increase streamflow. As trees re-establish within an area, water available to streamflow is gradually reduced as transpiration and evaporation increase. Research on the Fraser Experimental Forest indicates that water yield increases from timber harvest consistently decline for about 80 years (Troendle and King 1985). For this analysis, it is assumed that there is a progressive addition of water yield values from previous decades to each successive decade minus the fraction lost to revegetation.

Table 29
Aggregated water yield from timber harvest (acre-feet/year)

	<i>1st Decade</i>	<i>2nd Decade</i>	<i>3rd Decade</i>	<i>4th Decade</i>	<i>5th Decade</i>
Alternative B	1,200	2,200	3,000	3,700	4,200
% of Forest's annual average water yield	0.05	0.09	0.12	0.15	0.17
Timber benchmark	3,800	6,800	9,800	12,500	15,400
% of Forest's annual average water yield	0.15	0.27	0.39	0.50	0.62

Prescribed fire also removes trees and contributes to water yield increases. Between 1,000 and 3,000 acres are proposed annually for prescribed burn treatment in the alternatives. While research on watersheds less than three square miles indicate measurable increases in streamflow following timber harvest, these changes become proportionately smaller with larger streamflow rates, eventually becoming lost in the natural variance of a larger watershed's system. Physical measurements of streamflow from larger watersheds are not capable of detecting such a change in water yield. Therefore, none of the timber and fire management activities in the proposed alternatives would result in a substantial gain in the forest's overall contribution to water yield.

Effects on water resources from mining (locatable minerals)

Mining activity can cause significant long-term impacts to surface and groundwater quality. Metal ores can contain sulfides of metals such as iron, zinc, lead, and copper. Deep in the ground, sulfides are normally stable. Mining exposes these ores to air or water and the result is oxidation to metal sulfates and sulfuric acid. Metals that come in

contact with acidic runoff dissolve easily and enter a water body in solution. Aquatic life and riparian vegetation are poisoned by acidic water. Without protective vegetation along stream banks, channel erosion also will occur.

Some mining activity, such as exploration, simply disturbs the soil, leaving surfaces exposed to erosive forces.

Past problems with mining are discussed in the affected environment section. Future activities may occur, but will be required to mitigate impacts to water resources. Mining activity does not vary by alternative.

Effects on water resources from leasable minerals

Oil and gas development activity can potentially affect water quality and aquatic and riparian health by additional inputs of sediment and toxic substances from drilling, accidental spills, and road construction and maintenance activities.

Oil and gas leasing decisions were documented in the *Oil and Gas Leasing Final Environmental Impact Statement* (U.S. Department of Agriculture 1993b). However, lands not administratively available for oil and gas leasing will change under the 2002 Forest Plan depending on the alternative selected. Alternative I would result in the greatest acreage of reduced available lands for oil and gas leasing (200,500 acres), followed by Alternative E (106,600 acres), Alternative C (94,000 acres), Alternative K (81,600 acres), and Alternative D (47,200 acres). Alternatives B and F would not change because they do not include recommended wilderness. What this means is that there would be less land available for oil and gas leasing under Alternative I than under Alternative B with correspondingly lower potential to impact water quality and aquatic and riparian health. On those lands still available for oil and gas development, project specific analyses will still be required to address specific water resource issues and concerns. Water resource standards and guidelines stated in the *1993 Oil and Gas EIS* and in the 2002 Forest Plan will apply to such developments.

Effects on water resources from domestic livestock grazing

Grazing, as discussed here, refers to domestic livestock on National Forest System lands under a grazing permit. Grazing generally occurs in and near riparian areas where forage, water, and cover are in close proximity (Holechek 1983). Continuous season-long grazing in these areas can result in chronic damage and loss of beneficial habitat. The impacts can include erosion, sedimentation, loss of wildlife and fish habitat, decreased water quality, and lowered water tables.

When the impacts of livestock grazing range are substantial, modifications in the timing and/or amount of grazing activities reduce the overall impact in critical areas. Overgrazed areas generally are remedied by removing livestock from the affected area (Schulz and Leininger 1990).

Currently active allotments do not vary across alternatives. The number of vacant allotments that are retained for potential restocking varies by alternative. Any actual re-issuance of permits to restock any of the retained vacant allotments will be evaluated through site-specific NEPA analyses. Because vacant allotments that are retained have not been used for many years and will not be restocked without further analysis, there is no change in the risk of grazing to watershed resources from the forest plan decision.

Active allotment plans that recently have been updated stress grazing practices that protect watershed resources. Watershed conservation practices and grazing standards and guidelines designed to protect range and riparian areas will be included in grazing permits and allotment operating plans as they are revised and updated. Range specialists monitor allotments to ensure that these practices are implemented and effective.

Effects on water resources from fire management

The severity of impacts from wildfire and prescribed fire to aquatic and riparian resources depends on the fire's intensity as well as the degree of any suppression efforts. Low-intensity fires typically leave sufficient organic matter to protect the soil surface. In contrast, high-intensity fires can consume duff, litter, and much of the vegetation. A catastrophic wildfire has a greater potential to burn through riparian areas. A prediction of the acreage of high-intensity wildfires that might be expected over the life of the revised forest plan was not made. However, it is useful to compare the impacts typically related to wildfire with those from prescribed fire efforts.

Soils may respond to high-intensity fires by becoming hydrophobic (water repellant) thereby reducing the potential for infiltration and increasing overland flow. The loss of riparian vegetation removes buffers to streams. With little vegetation or organic matter to slow down overland runoff and intercept sediments, receiving stream systems can experience increased peak flows and sedimentation. Burned over watersheds that provide a source for municipal water supplies are of most concern. Downstream flooding from severely burned watersheds is also a concern where dwellings and other structures located in a floodplain are at risk. A watershed that has experienced particularly intense fire usually has the greatest potential for long-term effects on its stream system (Roby 1995).

Wildfire suppression efforts can also have impacts to watershed resources. Fire lines constructed with heavy equipment typically are indiscriminate toward sensitive riparian areas and soils. They can create disrupt subsurface flows and deliver these flows along with precipitation runoff to stream systems more efficiently.

Table 30 compares annual acres proposed for prescribed burning by alternative. Alternatives C and K propose the most acres burned under management-ignited fires; Alternative F proposes the least. The acreages presented represent both a risk to watershed resources as well as a protection measure from higher-intensity wildfires. Although all fire reduces vegetation, increasing the potential for erosion, the overall impacts to watershed resources of a prescribed fire typically are less than those of a wildfire. Management-ignited fires typically occur under wetter soil moisture conditions than exist for wildfires. These conditions are preferable for avoiding the formation of water-repellant soils (DeBano 1981). The intent of management-ignited fires generally is to reduce fuel loading without fire intensities so hot that they cause significant loss of vegetation or incur soil erosion problems.

Table 30
Potential annual prescribed fire acres by alternative

	ALTERNATIVE						
	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
Acres	5,700	6,200	6,000	4,500	3,750	4,000	6,200

With an increased fuel loading on the White River National Forest over most of the century, the potential for catastrophic wildfire has grown substantially. Prescribed wildland fire provides a means to burn under more controlled circumstances that determine a fire's location, size, timing, and intensity. In most cases, the intensity of the fire is less than that of a wildfire, leaving more ground cover and reducing the potential for erosion. Good interdisciplinary planning and implementation of watershed conservation practices at the project level are important to protecting aquatic and riparian areas prior to igniting a prescribed wildland fire.

Effects on water resources from travelways and travel management

Roads are associated with timber harvests, dispersed recreation, mining, and ski areas and are probably the most significant source of increased sediments into stream channels on the forest. Located adjacent to or across a stream, roads and trails can act as direct conduits of sediment-laden runoff into a stream system leading to sedimentation. Roads constructed along an unstable slope can weaken its structure, resulting in landslides and creating a source of sediments from the disturbed soil. These problems can persist long after a travelway is closed if measures are not taken to disconnect runoff pathways into a stream channel and/or onto a road surface. Proper design and location of travelways can significantly reduce the risk of flood flows, slope failures, sedimentation, and channel degradation. This includes avoidance of steep slopes, high-erosion hazard areas, stream channels, riparian and wetland areas, and areas of high mass movement potential.

By their nature, roads are a major cause of erosion. Unpaved, they are vulnerable to rainfall and runoff eroding their surface. Paved or unpaved, they serve to accelerate runoff which, when concentrated, can cause erosion on unprotected downslope surfaces. In addition, without any means of detention such as vegetation or downed material, runoff from roads can efficiently convey sediments into a stream system. To prevent a direct deposit of sediment into a stream system, it must be diverted either onto a stable and well-vegetated slope or into an adequately sized sediment basin.

Once sediment enters a drainage network, be it an ephemeral channel or perennial stream, it will be transported through the system as streamflow rates allow. Deposition of sediments occurs where or when flow rates are not sufficient for their transport in suspension. This process is called sedimentation and it can cause adverse economic and ecological consequences if the amount of sediment exceeds the transport capacity of a stream system. These impacts cannot be estimated at the programmatic level such as a forest plan. They will, however, be included in project-level analyses.

Sedimentation can inhibit flow through diversion structures, reduce reservoir capacity, and increase the costs of water treatment. It also can adversely affect aquatic habitat by burying important gravels needed for spawning, filling interstitial spaces in a streambed

inhabited by macro-invertebrates, reducing pool depths, and changing the balance of scouring and deposition within a stream system. Impacts of sedimentation will be analyzed during project-level analyses.

Ideally, roads must be located as far away from streams as possible to avoid direct deposits of sediment into the drainage channel. Stream channels, riparian areas, wetlands, and other sensitive watershed resources must be avoided as much as possible. Stream crossings, when necessary, must be well-armored with the road's approach as far from the channel as possible before its crossing.

Runoff from roads is affected by many of the same factors that determine sedimentation into a stream system. Road runoff is a concern due to the efficiency with which it can reach a stream. In an unroaded area, runoff from snowmelt or rain typically infiltrates into the soil of a vegetated slope before it can reach a stream channel. This process is interrupted when a road traverses a slope and collects the runoff. If no effective mitigations are applied to disperse the runoff collected on a road, it will flow directly into nearby channels, increasing the rate of streamflow. In turn, the available energy of a stream increases, resulting in accelerated erosion of banks and the streambed. Generally, the higher density of roads within a watershed, the quicker runoff is received by the stream network and the greater the risk of channel erosion.

Examples of road impacts from paved highways through the forest include Straight Creek and Black Gore Creek. Both are affected by road sand deposits from Interstate 70, which runs adjacent to these streams. Unsurfaced and gravel-surfaced roads are often severely damaged in the fall following rainfall or snowmelt when hunters attempt to access National Forest System lands with their vehicles. Runoff from ski runs often is directed into road ditches when other means of dispersion (such as detention basins or dispersion onto undisturbed and well-vegetated areas) are not possible or available. In areas in which ski run density is high and no detention of runoff is employed, roads provide a direct source of runoff and sediments into a stream system.

Roads maintained by the White River National Forest range from gravel to native surface; 2,400 miles of these roads are recognized as forest development roads (FDRs). There are also 1,900 miles of system trails. Other travelways within the forest include about 500 miles of user-created roads and trails, or ways, which we have inventoried but do not manage within the forest's official transportation system. About half of these ways are wider than 50 inches and thus classified as roads; the remaining half are trails. The density of travelways within a watershed can provide an indication of the degree of disturbance contributing to direct and indirect effects on water resources.

While the DEIS provided an analysis of road miles by analysis area and alternative, the FEIS does not because the forest travel plan will come under a separate decision from that for the revised forest plan. Management of the forest transportation system, including both official and user-created travelways, will receive further analysis and public input before a travel plan is finalized.

Compliance with revised forest plan standards and guidelines and with watershed conservation practices are expected to prevent adverse impacts from new or reconstructed roads. However, bringing existing roads into compliance with these new protection measures is a major challenge because 70 percent of the current transportation system on

the forest has not been maintained to the full standard, and most roads and trails were built prior to the adoption of the current watershed conservation practices.

Future road and trail management will bring existing roads into compliance with the new standards and guidelines as funding allows. This may entail obliteration or relocation away from stream channels, riparian areas, steep slopes, high-erosion-hazard areas, and areas of high mass movement. Realigning roads and other travelways to cross riparian areas and streams at a perpendicular rather than acute angle would reduce chronic sedimentation and improve the quality of riparian and aquatic habitats in presently impacted stream reaches. Road reconstruction may be necessary to provide stable cut and fill slopes as well as adequate drainage to allow runoff to be filtered through vegetated buffers or sediment traps before entering the stream channel. Effective seasonal road closures are also a viable management tool that would reduce severe road damage from ruts and serve to maintain a road's integrity thus reducing road maintenance needs.

Effects on water resources from land use authorizations for water use facilities

Permitted water developments on the forest include storage reservoirs, diversions, and transmissions for purposes of agricultural, recreation, and municipal use. Water transmission ditches can breach, causing erosion, gulying, and slope failures. Dams and water diversions can alter natural flow regimes, change channel dimensions, impact aquatic and riparian habitat, and obstruct fish migration. Reduced outflows from dams to meet the needs of users can result in lowered flows which dry up downstream reaches and alter natural flooding cycles. Conversely, large releases can cause channel cutting if volumes are greater than those that formed the downstream channel.

The establishment of a water right on National Forest System lands does not limit Forest Service authority to regulate land use or to prevent injury to these lands. Region 2's watershed conservation practices include standards for permitted water use facilities to sustain existing stream health. These practices will apply to both new permit applications as well as existing ones as they come up for renewal or amendment.

The effects of water use facilities on water resources are not expected to differ among alternatives because these use authorizations are driven by proponents outside of the Forest Service and not necessarily by forest programs or budgets. Site-specific analyses of proposed water use facilities will be done at a project-specific level.

Effects on water resources from recreation management

Water plays an important part in many aspects of recreation. Lakes and streams are attractions to those recreating on the forest. Water provides basic needs in campgrounds and other recreation sites. Ski areas often rely on artificial snowmaking in order to open earlier than natural snowfall will allow. Ski areas often change the hydrologic component of a mountain slope as well. The availability of water enhances most recreational uses, and conversely, recreational pursuits have varying degrees of impact on this resource.

Many developed and dispersed recreation sites are located in or near lakes and streams. Likewise, most wilderness visitors travel to and camp near lakes or streams. Such concentrated use typically results in trampling of riparian zones and stream banks, damage to riparian vegetation, and soil compaction. Erosion and sedimentation can occur. The risk of water pollution from human waste, dishwashing, trash accumulation, and

horse use is higher where people congregate. These risks can be reduced by carefully designing recreation sites and trails to avoid riparian areas. Stream crossings must be minimized and routes for motorized and non-motorized off-highway vehicles must terminate a distance from water bodies to avoid adverse impacts to riparian zones and water quality. Interpretive tools such as signs and the presence of forest staff on site can help to educate forest users about ways to reduce their impacts to water resources.

Overall, recreation use of the forest is expected to increase in all alternatives. Practical capacity at campgrounds is expected to be reached within the planning period (i.e., by 2020) in all alternatives. Most of the funds under the experienced budget will be likely be used for maintenance of existing developments rather than towards the development of new facilities. New campgrounds or day-use sites, if they are developed, would be covered under a capital investment program that is not a forest plan decision.

Rehabilitation of dispersed camping sites differs by alternative, as shown in **Table 31**. This would include ripping and seeding hardened sites, fencing off trampled areas to allow them to revegetate, and possibly closing some sites where needed. Acres rehabilitated represent a benefit to watershed resources by reducing soil compaction, increasing infiltration, and ultimately reducing erosion and sedimentation. Alternative C has the greatest potential to improve watershed resources. The least potential for such benefits is through Alternative F. Acreages of rehabilitated sites are based on the assumption that each site occupies one-fifth of an acre.

Table 31
Dispersed site rehabilitation in the first decade (acres under experienced budget)

	<i>ALTERNATIVE</i>						
	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
Number of sites rehabilitated	1,060	1,250	1,160	1,180	640	940	1,170
Acres rehabilitated	210	250	230	240	130	190	240

Effects on water resources from ski areas

Ski areas, in their goal to open by Thanksgiving each year, have been increasing their reliance on artificially made snow. Snowmaking occurs when streams are at or near their lowest annual flows. Diversions from streams during this time can put a strain on aquatic habitat by reducing winter base flows. Gravels used by spawning fish in the fall may be left high and dry or be more vulnerable to anchor ice during snowmaking diversions in the winter. Storing water for snowmaking can reduce the reliance on direct diversions from vulnerable streams. Limited storage occurs at Vail, Keystone, Copper, and Snowmass ski areas. Moderate storage capacity is available at Beaver Creek and Breckenridge ski areas.

Ski area development (**Table 32**) can increase soil erosion through timber clearing for ski runs, lifts, and other facilities. Surface grading of slopes that removes well-rooted vegetation and smooths rough surfaces substantially increases the chances of erosion by reducing the potential for infiltration. Overland flow will increase on ski slopes and

associated access roads from snowmaking and compaction, thus raising the risk of erosion and gullying, especially where ground disturbance has also occurred.

Table 32
Ski-based resort area allocation by fourth code watershed (acres)

Analysis area	ALTERNATIVE						
	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
Blue River	30,020	27,450	16,880	38,940	36,830	17,350	24,930
Eagle River	24,360	19,100	16,200	24,600	21,460	16,200	16,500
Roaring Fork River	34,140	11,120	9,880	15,540	9,980	9,730	10,100
Colorado Headwaters	0	0	0	0	0	0	0
Lower Colorado River	4,450	0	0	4,680	0	0	0
White River	0	0	0	0	0	0	0
Total	92,970	57,670	42,960	83,760	68,270	43,280	51,530

Generally, the greater the area devoted to ski area development, the greater is the risk to watershed resources. As such, Alternative B presents the highest risk and Alternative D presents the lowest risk to watershed resources. Good interdisciplinary planning of future developments that consider road and ski run placements as well as the cumulative effects of current and anticipated ski-area-related activities must minimize adverse impacts to watershed resources. Compliance with revised forest plan standards and guidelines and with watershed conservation practices must also minimize adverse impacts from new or reconstructed ski area development.

Effects on water resources from roadless area management

Roads have long been recognized as the primary human-caused source of soil and water disturbances in forested environments (Egan and others 1996). Alternative I provides the highest level of water quality protection in roadless areas by allocating 70 percent of the inventoried roadless to management area allocations that are most likely to retain their undeveloped character, followed by Alternatives C (40 percent) and K (32 percent).

Effects on water resources from timber harvest

The risks to watershed condition from timber harvest can include erosion, sedimentation, and increased water yield in small watersheds (i.e. sixth-level watersheds). Riparian ecosystems can be directly or indirectly affected by timber removal as well. Major increases in erosion from harvest areas themselves are unusual due to the ground roughness and downed vegetation available to contain sediment-laden runoff. Road and skid trails associated with harvest activity, however, can increase the risk of erosion and sedimentation.

The significance of water yields from timber harvesting is dependent on aspect, elevation, soils, geology, and vegetation cover as well as annual precipitation. Research indicates that removal of more than 20 percent of the forest canopy can measurably increase streamflow within the immediate watershed (Cheng 1989, Troendle and Olsen 1994). Typically such increases are seen during high runoff events as elevated peak flows over a longer duration. Higher flow rates create additional energy that can erode and transport

sediment within the stream system. Significant increases in peak flows and their duration can adversely impact channel stability and aquatic habitat.

Trees and other vegetation serve as thermal buffers along a stream. When removed, average stream temperatures can increase in the summer and decrease in the winter, stressing fish populations during these periods. Riparian vegetation also serves to stabilize stream banks as well as to provide hiding and resting cover for fish. Its removal can lead to bank erosion during high streamflows and reduce the availability of important fish habitat.

There is a balance needed in most streams that requires some downed coarse woody debris within the system itself. Its function includes sediment retention, energy dissipation, and shade and pool creation for fish habitat. Removal of riparian vegetation can reduce the supply of coarse woody debris critical for stream health. Conversely, logging slash and debris, if allowed to enter a stream system in sufficient amounts, can choke a stream channel and reduce dissolved oxygen levels as the material decays. Fish passage can be adversely affected and anoxic conditions toxic to fish and other aquatic organisms can result.

For the FEIS, criteria that determined the acreages suitable and available for timber harvest activity factored in a 100-foot buffer around perennial and intermittent streams, lakes, and wetlands. These are virtual buffers used to arrive at a more reasonable estimate of the acreages available to harvest; individual projects may incorporate some removal of riparian vegetation depending on management goals and restrictions to protect other resources.

Provided that timber harvest does not adversely impact the hydrologic condition of a watershed, and that applicable watershed conservation practices are implemented and effective, riparian and aquatic resources will remain viable. The desired conditions for these resources must be factored in during the planning and implementation of vegetation management projects. However, the potential for adverse impacts to water resources from vegetation management activities is proportional to scheduled harvest acres as shown in **Table 34**. This table indicates that Alternative F presents the highest risk to water resources, with Alternative I demonstrating the lowest risk.

Table 34
Harvest acres in the first decade by analysis areas (full budget)

Analysis area	ALTERNATIVE						
	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
Blue River	2,520	650	540	1,000	2,530	0	1,040
Eagle River	4,930	2,300	4,090	2,040	7,580	1,550	4,490
Roaring Fork River	1,550	660	3,450	1,300	3,610	780	2,730
Colorado Headwaters	4,200	910	730	270	6,630	2,560	1,800
Lower Colorado River	2,640	680	2,910	610	3,850	0	2,580
White River	940	1,500	1,430	1,290	2,540	1,490	2,370
Total	16,780	6,700	13,150	6,510	26,740	6,380	15,010

CUMULATIVE EFFECTS

The cumulative effects analysis for watershed resources pertains to the planning period and considers 6th level watersheds that contain all or a portion of National Forest System lands administered by the White River National Forest.

Runoff in a watershed ultimately reaches its streams, ponds, lakes, and wetlands and affects their physical and biological components. The impact of management activities to watershed health can be detected by assessing the conditions of its aquatic and riparian resources. As such, these resources are excellent indicators of cumulative effects.

Nearly all of the management activities conducted on the White River National Forest have the potential to affect water resources. Their cumulative impact to a watershed depends upon the effects of past and present management as well as the watershed's inherent ability to absorb additional disturbance to its biological and physical elements. These disturbances include those occurring on private and public lands not managed by the forest but located within some sixth-level watersheds. Appendix J identifies watersheds with higher relative natural and human-caused risks of adverse impacts due to management activities. These watersheds include, in most cases, a mix of public and private lands. Activities contributing to higher risk scores include mining, high linear feature density, and transbasin diversions. Some watersheds experience all three of these impacts, underscoring the need to take into account their cumulative effects.

Proposed management activity into high-risk watersheds will require site-specific analyses to assess the capacity to absorb additional disturbance. Where multiple ownership exists in a watershed of any level, it is important that the forest work with the appropriate agencies and individuals to protect watershed resources. Prioritization of significant restoration projects in watersheds of concern will consider legal requirements, costs and benefits, and available funding from partners outside the Forest Service.

Urbanization near and adjacent to the forest can contribute significantly to cumulative watershed impacts. In some cases, mixed ownership watersheds are rated high risk as a result of intensive development occurring on private lands. Increased urbanization has the potential to affect aquatic and riparian resources through increased runoff and pollutants from roads, roofs, driveways, and fertilized yards. Increased recreation resulting from expanded urbanization can lead to increased trail density, trampling of riparian areas, and other activities threatening to watershed health. These activities may limit management options in watersheds of mixed ownership where aquatic and riparian health are of concern.

The cumulative effects of water diversions can affect water quality as well as the health of streams, ponds, lakes, and wetlands. For instance, past mining has polluted several streams on the forest and led to long-term water quality impacts. Because dilution of a pollutant can reduce its impact, current and proposed diversions in a watershed must be evaluated for their cumulative impact to water quality. All proposed water diversions on National Forest System lands must be assessed in terms of their cumulative impact to the physical and biological components of affected water bodies, including springs and wetlands that depend on subsurface and groundwater flows to remain viable.

Cumulative effects to aquatic and riparian resources from forest management activities can be addressed by applying applicable watershed conservation practices and monitoring their effectiveness. High-risk watersheds will be evaluated and prioritized for rehabilitation based on feasibility, funds available, and overall benefits to watershed health. Project-specific analyses must be done in both high- and moderate-risk watersheds to identify specific areas of concern as well as to prescribe methods to improve watershed health and mitigate proposed activities. When appropriate, partnerships that emphasize watershed health will be pursued in watersheds of multiple ownership.

Part 1, Section 3

Air resources

Introduction

Abstract

Air quality on the White River National Forest rates among the best in the country. No violations of ambient air quality standards have occurred on the forest, nor have any activities on the forest caused violations of these standards elsewhere. As defined by the Clean Air Act, the Eagles Nest, Flat Tops, and Maroon Bells-Snowmass Wilderness Areas are Class I areas. The remainder of the forest, including its other wilderness areas, is Class II.

Summary

Air quality on the White River National Forest is affected by land management and development activities both on and off the forest. Collectively, these activities can reduce visibility, emit gaseous and particulate pollutants, and contribute to acidic deposition.

All lands managed by the forest are currently in attainment of national ambient air quality standards (NAAQS). Land-use practices within or adjacent to non-attainment areas, including expansion of ski areas, are closely scrutinized by local and state regulatory agencies to ensure that further violations do not occur. To date, the only non-attainment area adjacent to the forest is Aspen, Colorado. At the time of publication of this analysis, the Aspen area is listed by the Environmental Protection Agency (EPA) as non-attainment for PM₁₀, particulate matter less than 10 microns in diameter. Re-designation to attainment status is expected in March, 2002.

Through implementation of local, state, and federal regulations, forest-wide standards and guidelines, and the forest's air resource management plan, the White River National Forest will be able to protect its ecosystems and resources from unacceptable air pollution impacts and, where appropriate, improve degraded conditions.

Key indicators

- Visibility
- Ambient air quality

Legal and administrative framework

- The **Clean Air Act** (1963), as amended in 1977 and 1990, mandates the establishment of national ambient air quality standards to protect human health and welfare, prevent significant deterioration of air-quality-related values (AQRVs), and protect natural visibility. In Colorado, the primary responsibility for enforcing NAAQS rests with the Colorado Department of Health.
- The **Wilderness Act** (1964) directs the Forest Service to preserve and protect the natural condition of designated wilderness areas, including the intrinsic wilderness value of air quality.
- The **Forest and Range Renewable Resource Act** (1973), as amended by the National Forest Management Act, directs the Forest Service to "... recognize the fundamental need to protect and, where appropriate, improve the quality of soil, water, and air resources."

- The **Colorado Smoke Management Memorandum of Understanding (MOU)** requires the Forest Service to conduct its prescribed burns under the conditions permitted by the State Air Pollution Control Division.
- The **Grand Canyon Visibility Transport Commission (GCVTC)**, created by Congress in 1991, advises the EPA on strategies for protecting visual air quality in national parks and wilderness areas on the Colorado Plateau.
- The EPA's **Natural Events Policy** includes a provision to prevent an area from being redesignated as "non-attainment" for particulates when high concentrations result from wildfires.
- The EPA's **Interim Air Quality Policy on Wildland and Prescribed Fires** provides guidance on mitigating air pollution impacts caused by wildland and prescribed fires while recognizing the current role of fire in wildlands management.
- The EPA's **Regional Haze Regulation** specifies that states must establish goals to improve visibility to natural background conditions in Class I areas.

Affected environment

INTRODUCTION

Air quality on the forest is potentially affected by land management and development activities both on and off the forest. Air pollutants of concern include fine particulate matter, nitrogen oxides, sulfates, and carbon monoxide. These pollutants can affect human health, reduce visibility, and lead to acidic deposition in sensitive, high-elevation lakes. Potential impacts to air quality on the forest include regional haze caused by transported pollutants from large power plants located in the southwestern U.S. Industrial sources nearer to the forest such as power plants, mines, and oil and gas extraction activities contribute to local and regional air pollution. Urbanization and resort development near the forest bring additional traffic, wood-burning stoves, and de-icing of winter roads, which together contribute to localized air pollution problems.

Decades of successful fire suppression have led to an accumulation of fuels in brushlands and forested areas, raising the potential for more frequent and larger lightning-ignited fires to occur. Reducing this fuel loading is a forest management goal, and prescribed burns are expected to play a role in counteracting the adverse impacts of past fire-suppression efforts. However, increased urban development near the forest has engendered growing concern for smoke impacts and particulate concentrations as well as for the risk to property and human safety. In addition, federal air quality standards for fine particulates and regional haze concerns may pose additional barriers to the use of prescribed fire. Under the Colorado Smoke Management MOU, the agency must conduct its prescribed burns according to the conditions outlined in burn plans submitted to and approved by the State Air Pollution Control Division of Colorado. In addition, the Forest Service must coordinate its planned burns with local health agencies. Prescribed burns that present a potential for significant smoke impacts must have a plan that addresses nighttime smoke impacts. Also required is coordination with the National Weather Service to mitigate these impacts.

The Clean Air Act outlines different levels or classes of air quality protection. Class I areas include areas designated as wilderness as of August 7, 1977, that are 5,000 acres or greater in size. These areas have the most stringent degree of protection from current and future air quality degradation. On the White River National Forest are three Class I wilderness areas: Maroon Bells-Snowmass, Eagles Nest, and Flat Tops. Under the Clean Air Act, the Forest Service has “. . . an affirmative responsibility to protect the air-quality-related values (including visibility) . . . “ within a Class I area it manages. This responsibility includes reviewing and commenting on permit applications to emit air pollutants from large emission sources (such as power plants).

Class II wilderness areas in Colorado are given similar air quality protections under the Colorado Clean Air Act. Class II wilderness areas on the forest include Collegiate Peaks, Hunter-Fryingpan, Raggeds, Holy Cross, and Ptarmigan Peak.

Current monitoring of air-quality-related values indicates very-good-to-excellent air quality in the wilderness areas managed by the forest.

Ambient air quality and deposition monitoring data

One ambient air quality monitor is located on the forest, providing aerosol data useful for assessing visibility impacts to Class I areas. In addition, two acid deposition monitors also are located on the forest (USFS 1998).

The ambient air quality monitor is located on Ajax Mountain on the Aspen Ranger District as part of a nationwide visibility monitoring effort called “IMPROVE.” Data indicate that in the U.S., the lowest concentrations of fine particulates (those that contribute significantly to visibility degradation) are found on the Colorado Plateau, which includes part of the forest (Sisler 1996; Cahill 1996).

Two acid deposition samplers, part of the National Acid Deposition Program, are located near Sunlight Mountain on the Sopris Ranger District. Data from these and other monitors indicate that the Sunlight sites see relatively low concentrations of two acid precipitation components, sulfate and nitrate, as compared to the rest of Colorado.

Air-quality-related values and sensitive receptors

Air-quality-related values (AQRVs) on the forest include visibility, odor, water quality, soils, flora, fauna, and cultural resources. Sensitive indicators are elements of each AQRV that are most likely to be modified by air pollution. Additional information about these indicators is available in the forest’s air resources management plan. Modeling generally is used to predict air quality impacts to specific indicators from potentially significant resource management activities, such as prescribed burning, oil and gas development, and ski area resort expansion. On the forest, the following sensitive indicators are monitored to assess the overall condition of the corresponding AQRVs:

- **Flora**—Lichen communities as well as vascular plants have been inventoried, primarily in the Flat Tops Wilderness. Elemental analyses have been performed on lichens collected from this area to determine the presence of air pollutants.
- **Water Quality**—Water chemistry is monitored in various lakes in all three Class I wilderness areas on the forest. There are currently not enough years of data collected to date to indicate any strong trends.

- **Visibility**—In addition to the data collected under the IMPROVE program, two camera sites have been in operation on the forest to monitor visibility in the Eagles Nest Wilderness and Maroon Bells-Snowmass Wilderness Areas. Current data indicate that visibility at these two areas is the best found in the Rocky Mountain Region of the Forest Service.

FUTURE TRENDS

Sources of air pollution on the White River National Forest are both local and regional. Local sources that are expected to increase their impacts to air pollution include development of ski areas as well as continued growth in Western Slope communities. Specific contributors include vehicular exhaust and re-entrained road dust from increasing traffic. Smoke impacts from prescribed burns also are expected to increase as attempts are made to reduce fuel loading. Specific impacts include reduced visibility as well as short-term increases in the concentration of particulate matter in communities downwind of a burn.

The Grand Canyon Visibility Transport Commission is working toward reducing regional air quality impacts to the Colorado Plateau. Should this mission be successful, regional air quality impacts from sources such as coal-fired power plants in the Four Corners area as well as from large population centers such as Los Angeles are not expected to increase significantly.

RESOURCE PROTECTION MEASURES

Federal land managers are responsible for protecting air-quality-related values in Class I areas from adverse impacts of human-caused air pollution. Involvement in the permit of significant deterioration (PSD) permitting process is crucial to carrying out this responsibility. Such participation provides an opportunity for the Forest Service to identify, monitor, and request protection of AQRVs from air pollution sources that are not located on National Forest System lands.

The conformity regulations developed by the EPA in 1994 specifically require federal compliance with the Clean Air Act. Forest management activities must therefore be analyzed for their potential air quality impacts and these must be mitigated if necessary.

Wildland burns on the forest will be planned to consider alternative fuel reduction methods and will be conducted with smoke management techniques to minimize the amount and impacts of smoke produced.

Environmental consequences

GENERAL EFFECTS

None of the alternatives considered will substantially change existing air quality on the forest. Transient reductions in visibility and increases of fine particulate matter may occur in population centers downwind of sizeable wildland burns. Long-term air quality impacts to the forest will likely come from adjacent expanding communities, as well as from upwind regional sources such as fossil-fuel-burning power plants and large metropolitan areas.

DIRECT AND INDIRECT EFFECTS

Forest management activities that can directly affect air resources include management-prescribed fires, use of travelways, developed recreation, mining, and oil and gas development. Indirect impacts to air quality can occur from management decisions, such as the issuance of a special-use permit to expand a ski resort, resulting in increased vehicle emissions from additional people driving to the ski area to work or recreate there.

Effects on air resources from mineral exploration and extraction (leasable)

Air quality is affected by oil and gas development activities that include road and drill pad construction, development-related vehicle traffic, well drilling, well testing and gas compression. Air pollutants of concern include particulate matter from dust during well site construction and from vehicle traffic on unpaved roads; carbon monoxide and nitrogen oxides from gasoline and diesel engines (including both vehicle and stationary engines such as generators); and hydrocarbons released during natural gas extraction.

The air quality impacts of oil and gas development on the White River National Forest were evaluated and disclosed in the forest's *Oil and Gas Leasing Final EIS* (1993) and are not reanalyzed here for any of the alternatives. However, there are some amendments to the authorizations and stipulations of the 1993 EIS. Alternatives C and I propose a reduction of about 10,000 acres of land authorized for oil and gas leasing. Alternative D proposes a reduction of about 5,000 acres. All of the lands proposed to be removed from authorized leasing had no surface occupancy (NSO) stipulations restricting all ground disturbances on those lands.

These amendments should result in a reduction in emissions from exploration and development of oil and gas sites. Because of the NSO stipulations in these lands, there would be no change in particulate matter from roads and well pads.

Effects on air resources from fire management

Both wildfires and prescribed fires generate smoke and particulates, which can temporarily degrade visibility and ambient air quality conditions in downwind sensitive areas. The objectives for prescribed fire include fuel reduction, wildlife habitat enhancement, and range improvement. Smoke management planning must accompany every prescribed burn plan to reduce adverse impacts to air quality, both on National Forest System lands and in neighboring communities, as well as in other sensitive areas.

The management objective of about one-third of the potential prescribed fire acreage under each alternative is to reduce fuel loading that has accumulated during years of aggressive fire-suppression efforts. Reducing the amount of dead and downed vegetation mitigates the potential for wildfire and for adverse impacts to forest resources, including air quality.

The risk of adverse air quality impacts from fires increases with the acreage of land burned. Alternatives C, D and K pose the greater risk to air quality with more acres proposed for prescribed fire. **Table 34** shows the comparative difference of potential acres of prescribed fire activity and the amount of particulates produced between the alternatives.

Table 34
Potential annual prescribed fire activity and impacts to air quality by alternative

	<i>ALTERNATIVE</i>						
	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
Potential prescribed fire activity (acres)	5,700	6,200	6,000	4,500	3,750	4,000	6,200
Particulate matter less than 10 microns (tons)	58	64	62	46	38	41	64

Fire crews will continue to ignite when conditions favor good-to-excellent smoke dispersion, as is currently the practice. Smoke management planning is required by the Colorado State Air Quality Control Division before any prescribed burn is set in order to minimize adverse impacts to smoke-sensitive areas.

Effects on air resources from travelways

Air quality impacts from forest travelways are associated with vehicle emissions and dust from traffic on unpaved roads. These effects typically are localized and temporary, and their extent depends on the amount of traffic. Dust from unpaved roads increases with dryness as well as vehicle weight.

Travelways on the forest typically are unpaved. They are used both for recreational purposes such as off-highway vehicle (OHV) and four-wheel-drive use and for resource management purposes related to timber harvest, mining, and oil and gas development. Only Alternative F increases the mileage of Forest Development System roads. All other alternatives propose a decrease in these miles. Therefore, Alternative F presents a higher potential to affect air quality. Alternative I, with the least amount of miles, would have less potential to affect ambient air quality than the other alternatives.

Motorized recreation occurs year-round. Summer use includes off-highway, two-wheel, and four-wheel drive vehicles. Travel on unpaved surfaces by these vehicles can stir up dust. To date, these localized impacts have not adversely affected air quality in sensitive areas such as population centers and important scenic vistas. As use of Forest Transportation System roads increases with visitation, road dust impacts to sensitive areas may need to be addressed.

Winter motorized recreation use includes snowmobiles and snowcats. Emissions from these vehicles include carbon monoxide, oxides of nitrogen, and particulate matter. Most of the effects of motorized recreation are localized and temporary. Conflicts arise when this recreation use occurs alongside non-motorized recreation pursuits, where clean-smelling air is desirable. Overall air quality impacts of winter motorized recreation will not change by alternative. As more people venture onto the forest during winter months, air quality may become a localized issue where concentrated motorized use conflicts with non-motorized uses.

Vehicular travel on unpaved roads is heavy during such resource management activities as timber harvest, mining, and oil and gas development. Such use typically requires dust abatement measures to mitigate the air quality impacts of sustained and heavy traffic use.

Effects on air resources from developed recreation and ski areas

Most air quality impacts from developed and motorized recreation come from ski areas, motorized recreation, and campfires. Of these sources, ski areas are of most concern in terms of direct and indirect impacts to air quality.

The impacts of ski areas are influenced primarily by vehicle traffic volumes and population levels. Resorts are located in valley bottoms where temperature inversions are almost a daily occurrence during the winter. Inversions inhibit air dispersion, a necessary element for reducing air pollutant concentrations, and trap pollutants within a population center for hours and even days at a time. Increases in skiing capacity on National Forest System lands attract more visitors as well as employees, stimulating development of adjacent lands and necessitating an expansion of a regional infrastructure. This typically leads to greater vehicular traffic in the area along with greater emissions of carbon monoxide, oxides of nitrogen, and particulates.

Alternatives B and E have the greatest potential to adversely affect air quality because they provide the highest amount of acreage allocated to management area 8.25, ski areas. The agencies responsible for protecting air quality scrutinize ski area expansions during site-specific project analysis. Transportation alternatives to individual vehicle usage are encouraged and sometimes regulated in order to prevent an area from exceeding national ambient air quality standards.

The number of visitors using developed campgrounds does not change by alternative. Air quality impacts from campfires are not expected to change among alternatives. These impacts are localized and temporary.

CUMULATIVE EFFECTS

All areas of the White River National Forest currently meet air quality standards and all Class I wilderness areas on the forest show no degradation to visibility or other air-quality-related values. Compliance with local, state, and federal air quality regulations will ensure that future forest management activities under any of the alternatives will continue to protect air resources on the forest and not contribute to air quality degradation off the forest. However, as the population grows both locally and regionally, the potential for adverse air quality impacts will increase and may restrict forest management activities such as prescribed burning and ski area development.

Part 2, Section 4

Mineral resources

Introduction

Abstract The White River National Forest contains both leasable and locatable minerals. The Forest Service cooperates with the Bureau of Land Management to manage these resources. The Forest Plan provides the goals and objectives, and standards and guidelines for the management of these resources.

Summary The Forest Service administers its minerals program to:

- encourage and facilitate the orderly exploration, development, and production of mineral resources within National Forest System lands; and
- ensure that exploration, development, and production of mineral resources are conducted in an environmentally sound manner and that these activities are integrated with the planning and management of other national forest resources.

By virtue of their geology and geomorphology, the national forests are a principal storehouse of the nation's mineral and energy resources. The search for and development of these resources are legally mandated uses of the National Forest System, except for lands formally withdrawn by acts of Congress or by executive authority.

Two factors distinguish minerals from other forest and range resources. First, unlike other resources, most mineral deposits are nonrenewable and finite. Second, they are more difficult to inventory, explore, and develop.

Key indicators

- *Locatable minerals*—acres of land withdrawn from mineral entry
- *Leasable minerals*—acres of available and authorized lands where authorization or stipulations change
- *Salable minerals*—do not vary by alternative, therefore there is no indicator

Legal and administrative framework

- The **General Mining Law** (1872) allows prospecting and development of valuable minerals on public lands. This includes locating various types of claims, assessment work required, and patenting under specific circumstances.
- The **Mineral Leasing Act** (1920) authorizes the Secretary of the Interior to lease various minerals on lands administered by the government, including national forests and grasslands. This act also gives the conditions of leases, and the procedures under which leasing occurs.
- The **Organic Administration Act** (1897) establishes the national forests, and the specific uses thereof and the initial regulations. Mining and stone for building location and entry are specifically mentioned.
- The **Code of Federal Regulations at 36 CFR 228**, subpart A provides rules and procedures for use of National Forest System lands for locatable minerals, and at **36 CFR 228 subpart C** provides rules and procedures for use of National Forest System lands for mineral materials (sand, gravel, stone, etc.).

- The **Minerals Materials Act** (1947) gives the Secretary the authority to dispose of mineral materials by sale.
- The **Federal Onshore Oil And Gas Leasing Reform Act** (1987) authorizes the Secretary of Agriculture to (1) identify which National Forest System lands would be leased for oil and gas, and (2) identify what stipulations would be attached to those leases to protect surface resources. The Act also requires the Forest Service to review and process the Surface Use Plan of Operations before ground-disturbing activities associated with those leases are initiated.

Leasable minerals – affected environment

Federally owned leasable minerals include fossil fuels (such as coal, oil, gas, and oil shale), geothermal resources, phosphates, sulfur, and uranium. These minerals are subject to exploration and development under leases, permits, or licenses granted by the Secretary of the Interior, with Forest Service consent or consultation. At this time none of the following mineral resources are leased on the White River National Forest: coal, geothermal, phosphates, sulfur, and uranium. The only leasable minerals presently leased are oil and gas.

On a federal mineral lease, the lessee has a vested right to develop the mineral resource, subject to lease terms and any stipulations that may be attached to the lease. For oil and gas development, the Forest Service reviews, approves, and administers the Surface Use Plan of Operations, a part of the Application for Permit to Drill (APD). The Bureau of Land Management administers and approves the drilling operations.

In 1993, forest staff completed an *Oil and Gas Leasing EIS*. A Record of Decision (ROD) was approved on May 26, 1993. This is a forest-wide decision and is currently in effect. Decisions based on that analysis include (1) the designation of lands available for leasing and (2) stipulations on available lands. These decisions were presented in the ROD and on maps. These decisions are currently in effect. The 2002 Forest Plan will incorporate this decision with modifications.

This forest plan revision incorporates the Oil and Gas Leasing decision, however, a few adjustments will be made to the decisions in the *Oil and Gas Leasing EIS* as a result of Forest Plan direction. To summarize, the Oil and Gas Leasing EIS Record of Decision states:

Approximately 1,521,258 acres would be administratively available for leasing. It is my decision to apply to these lands the leasing restrictions identified in Table 2 on page 34, the mitigation measures listed in Chapter II or the FEIS and the USFWS requirements identified on page 10 (Record of Decision page 3).

Specific Lands (Authorization) Decision: The approximate acreages associated with this decision are as follows: 809,396 are not authorized for leasing at this time, 315,741 are conditionally authorized for leasing at this time and 396,124 are authorized for leasing at this time (Record of Decision Page 4).

The leasing decisions were made based on the land allocations made in the 1984 Forest Plan. The 2002 Forest Plan will make adjustments to the availability decision based on new management area allocations. The overall availability decision made in the Oil and Gas Leasing EIS was not reanalyzed, just those portions that need to be modified as a result of new land allocations.

Upon approval of the Forest Plan Record of Decision, leasing will continue, as authorized, in areas not affected by changes in availability. Leasing activities will comply with direction in the 2002 Forest Plan.

The forest has two areas in which long-term natural gas production occurs, Divide Creek Unit and Wolf Creek Unit, which are located south of Silt and west of Carbondale, respectively. The Divide Creek Unit has been producing natural gas since the early 1950s. The Wolf Creek Unit has been converted to a natural gas storage unit that provides the Roaring Fork Valley with natural gas.

**National Energy
Policy**

On July 13, 2001, the Secretary of Agriculture approved the Forest Service Energy Implementation Plan—the agency’s commitment to the National Energy Policy. The purpose of the Forest Service Energy Implementation plan is to ensure the continued sustainability of energy production on National Forest System Lands to meet the goals of the National Energy Policy (NEP). The Fossil Fuels and Geothermal Energy portion of the Forest Service Energy Implementation Plan applies directly to the White River National Forest. This section of the Plan identifies an NEP Chapter 5 recommendation:

. . . examine land status and lease stipulation impediments to federal oil and gas leasing, and review and modify those where opportunities exist (consistent with the law, good environmental practices, and balanced use of other resource). Expedite the ongoing Energy Policy and Conservation Act study of impediments to federal oil and gas exploration and development. Review public land withdrawals and lease stipulations, with full public consultation, especially with the people in the region, to consider modification where appropriate.

The White River is identified as being geographically located in one of the five “priority areas” identified by the Administration. The Energy Implementation Plan identifies several tasks to accomplish to meet the goal stated above. The White River National Forest has and will continue to provide information and inventories in response to agency requests. Upon receipt of further instructions, the White River National Forest will complete necessary reviews, and complete any adjustments to planning documents that may be deemed appropriate.

Leasable minerals - environmental consequences

GENERAL EFFECTS

The Oil and Gas EIS was designed to comply with the 1984 Forest Plan land allocations. Alternatives in the 2002 Forest Plan reallocate land resulting in changes to lands available for leasing. Additionally, new forest-wide standards and guidelines are added. All stipulations and mitigations from the Oil and Gas Leasing EIS and specified in the ROD will remain in place.

The decision made with the *1993 Oil and Gas EIS* has two components: (1) decisions on lands administratively available for leasing, and (2) leasing decisions for specific lands (the “authorization” decisions). If lands are administratively available, then an authorization decision will be made. The only decision being made as a part of the 2002 Forest Plan is to make additional lands “administratively unavailable”. Therefore, authorization of these lands is not appropriate.

The 2002 Forest Plan changes the decision made in the Oil and Gas Leasing EIS by making the following management areas not administratively available for oil and gas leasing: 1.2 (recommended wilderness), 1.5 (wild rivers), 3.4 (scenic rivers) and 4.4 (recreational rivers).

The entire Oil and Gas Leasing EIS decision will be part of the 2002 Forest Plan as updated to reflect availability decisions associated with the selected alternative. Maps were created, by alternative, that show the 1993 Oil and Gas Leasing decision and the changes to that decision by alternative. These maps are available in the administrative record in the Supervisor’s Office.

In addition, See the Alternative K map, in the map packet, for the site-specific location of these areas, and also see FEIS Volume 1, Chapter 3, Topic 4—*Roadless area management and recommended wilderness*, and Chapter 3, Topic 5, Part 4—*Wild, Scenic and Recreational Rivers* for descriptions of individual areas.

No changes are being made to leasing stipulations.

Leasable Minerals – Environmental Consequences

DIRECT AND INDIRECT EFFECTS

Effects on oil and gas leasing from Canada lynx management

The Canada lynx management direction (2002 Forest Plan Chapter 2, Section 2—*Canada Lynx*) specifically addresses oil and gas development activities. This direction is focused on road activity and site monitoring. This guidance will be followed during oil and gas exploration and development. The lynx direction does not, however, directly prohibit oil and gas activities as long as all direction can be met. The lynx direction applies to all alternatives.

Effects on oil and gas leasing from ski areas

Existing and potential ski area locations are allocated to management area 8.25. These areas, as described in the general effects section, will have a no surface occupancy (NSO) stipulation on them. Most of the 8.25 areas are in areas that are not available and authorized for oil and gas leasing. The only existing ski area that is in an area that is available and authorized for oil and gas leasing is Sunlight Ski area in Garfield County. See Topic 3, Part 2—*Ski Areas* – Consequences by County – Garfield County for acres allocated to Sunlight by alternative. Alternative B allocated the most acres to Sunlight (6,419) and Alternative K the least (2, 390). The acres allocated to Sunlight in the selected alternative will be available for oil and gas leasing with an NSO. All other ski areas are located in areas that are available and not authorized or available and conditionally authorized. Many of the ski areas are located in places where there is no known potential of oil and gas resources. Additional environmental analysis will have to be done on these areas, in the future, to make them authorized. Part of this additional environmental analysis would be to determine the appropriate stipulations.

Effects on oil and gas leasing from roadless area management and recommended wilderness

Areas allocated to management area 1.2 are recommended for wilderness. These areas, as described in the general effects section, will not be administratively available for oil and gas leasing activities. Alternative I has the most acres allocated to 1.2 (200,400), then in order of descending acres – Alternatives E, C, K, and D, with Alternative B and F having no acres of MA 1.2.

Table 35 illustrates, by alternative, the availability and authorization decision in the 1993 ROD for the Oil and Gas Leasing EIS. It also illustrates the total acreage that would be administratively unavailable for each recommended wilderness.

Table 35
Individual recommended wilderness areas unavailable for oil and gas leasing, by alternative

	93 OG EIS	93 OG EIS	93 OG EIS	93 OG EIS	93 OG EIS	2002 Forest Plan
	Acres Admn. Unavail.	Acres Available / Not Authorized (No Known Potential)	Acres Available / Not Authorized (Resource Values)	Acres Available / Conditionally Authorized	Acres Available / Authorized	Acres available in 93 OG EIS now administratively unavailable
Alternative C						
5a - Big Ridge to South Fork	600	25000	0	0	10000	35600
8a - Red Dirt	0	100	0	10100	0	10200
19 - Black Lake West	0	0	900	0	0	900
21b - Ute Pass	0	0	1800	0	0	1800
21c - Acorn Creek	0	0	700	0	0	700
28 - Freeman Creek	0	0	0	1000	0	1000
29a - Spraddle Creek	0	900	0	0	0	900
53b - Red Table	0	0	0	38900	0	38900
77 - North Independence A	0	2500	0	0	0	2500
84 - Treasure Mountain	0	1500	0	0	0	1500
Alternative D						
6 - Dome Peak	0	0	0	12200	0	12200
15a - Sweetwater	0	12000	0	0	0	12000
69 - Assignment Ridge	600	0	8600	0	4000	13200
71 - North Woody	0	100	8300	0	0	8400
84 - Treasure Mountain	0	1400	0	0	0	1400
Alternative E						
44 - Hardscrabble	0	0	0	11800	0	11800
49 - Adam Mountain	0	0	0	8200	0	8200
53b - Red Table/Gypsum Creek/Basalt Mtn	0	0	0	66700	0	66700
61 - Sloan Peak	0	800	3500	15600	0	19900

Table 35, continued

	93 OG EIS	93 OG EIS	93 OG EIS	93 OG EIS	93 OG EIS	2002 Forest Plan
	Acres Admn. Unavail.	Acres Available / Not Authorized (No Known Potential)	Acres Available / Not Authorized (Resource Values)	Acres Available / Conditionally Authorized	Acres Available / Authorized	Acres available in 93 OG EIS now administratively unavailable
Alternative I						
4 - Ripple Creek Pass	0	600	0	0	0	600
5a - Big Ridge to South Fork	500	25000	0	0	9600	35100
6 - Dome Peak	0	0	0	12500	0	12500
8a - Red Dirt	0	100	0	10300	0	10400
12 - Lower Piney	0	0	0	14100	0	14100
19 - Black Lake West	0	0	900	0	0	900
20 - Black Lake East	0	0	800	0	0	800
21b - Ute Pass	0	0	1800	0	0	1800
21c - Acorn Creek	0	0	900	0	0	900
28 - Freeman Creek	0	0	0	1000	0	1000
29a - Spraddle Creek	0	500	0	0	0	500
40a - Meadow Mountain A	0	1500	600	0	0	2100
40b - Meadow Mountain B	0	3100	0	0	0	3100
50 - Tigiwon	0	1900	0	0	0	1900
52 - Woods Lake	1900	7100	0	500	0	9500
53b - Red Table/Gypsum Creek/Basalt Mtn	0	0	0	67100	0	67100
54 - Homestake	0	4200	0	0	0	4200
57 - No Name	0	3600	0	0	0	3600
61 - Sloan Peak	0	800	3600	15800	0	20200
64 - Mormon Creek	0	3100	0	0	0	3100
77 - North Independence/Hunter	0	5600	0	0	0	5600
84 - Treasure Mountain	0	1500	0	0	0	1500

Table 35, continued

	93 OG EIS	93 OG EIS	93 OG EIS	93 OG EIS	93 OG EIS	2002 Forest Plan
	Acres Admn. Unavail.	Acres Available / Not Authorized (No Known Potential)	Acres Available / Not Authorized (Resource Values)	Acres Available / Conditionally Authorized	Acres Available / Authorized	Acres available in 93 OG EIS now administratively unavailable
Alternative K						
4 - Ripple Creek Pass	0	1000	0	0	0	1000
6 - Dome Peak	0	0	0	600	0	600
8a - Red Dirt	0	100	0	0	0	100
15a - Sweetwater A	0	800	0	0	0	800
21b - Ute Pass	0	0	2000	0	0	2000
21c - Acorn Creek	0	0	900	0	0	900
28 - Freeman Creek	0	0	0	300	0	300
29a - Spraddle Creek	0	900	0	0	0	900
52 - Woods Lake	600	4200	0	0	0	4800
53b - Red Table/Gypsum Creek	0	0	0	49800	0	49800
64 - Mormon Creek	0	3000	0	0	0	3000
69 - Assignment	600	0	8500	0	2700	11800
75 - Hunter	0	1100	0	0	0	1100
77 - North Independence A	0	3000	0	0	0	3000
84 - Treasure Mountain	0	1500	0	0	0	1500

Table 36A

Summary of recommended wilderness area oil and gas availability by alternative

	93 OG EIS	93 OG EIS	93 OG EIS	93 OG EIS	93 OG EIS	2002 Forest Plan
	Acres Admn. Unavail.	Acres Available / Not Authorized (No Known Potential)	Acres Available / Not Authorized (Resource Values)	Acres Available / Conditionally Authorized	Acres Available / Authorized	Acres available in 93 OG EIS now administratively unavailable
Alternative C	600	30000	3400	50000	10000	94000
Alternative D	600	13500	16900	12200	4000	47200
Alternative E	0	800	3500	102300	0	106600
Alternative I	2400	58600	8600	121300	9600	200500
Alternative K	1200	15600	11400	50700	2700	81600

Tables 35 and 36A show that almost all recommended wilderness areas were available for oil and gas leasing with various authorizations. Most recommended wilderness areas were not authorized, however. The only two recommended wilderness areas that had portions that were available and authorized are Big Ridge to South Fork and Assignment Ridge (see Alternative C, D, I and K in **Table 35** for details).

Alternatives B and F are not included in the table as they do not include any recommended wilderness.

Effects on Oil and Gas leasing from Wild, Scenic, and Recreation Rivers

Acres allocated to management area 1.5, 3.4, and 4.4 have been found suitable for wild, scenic, or recreational river designation respectively. These areas, as described in the general effects section, will not be administratively available for oil and gas leasing activities. All of the action alternatives recommend the same rivers for wild, scenic, and recreational designation—see FEIS Volume 4, Appendix F for a description of these rivers and Table 15 (FEIS Chapter 2) for acre allocations. Alternative B, however, recommends those rivers identified in the 1984 Forest Plan. Alternative B has less acres allocated to management areas 1.5, 3.4 and 4.4, therefore it would have less impact on leasable minerals.

Table 36B shows, for each river segment, the availability and authorization decisions made in the ROD for the 1993 Oil and Gas leasing EIS.

Table 36B
Changes in Oil and Gas Availability for Wild, Scenic and Recreational River Segments

	93 OG EIS	93 OG EIS	93 OG EIS	93 OG EIS	93 OG EIS	93 OG EIS	2002 Forest Plan
	Acres Admn. Unavail.	Acres Available / Not Authorized (No Known Potential)	Acres Available / Not Authorized (Resource Values)	Acres Available / Conditionally Authorized	Acres Available / Authorized	Acres Legally Withdrawn from Leasing	Acres available in 93 OG EIS now administratively unavailable
Rivers							
<i>South Fork of the White</i>	300	600	0	0	0	13,300	900
<i>Crystal</i>	4000	100	900	0	0	2,100	5000
<i>Deep Creek</i>	3300	1800	0	0	0		5100
<i>Colorado River</i>	100	6500	0	0	0		6600
<i>Cross Creek</i>	0	0	0	0	0	4,000	0
Totals	7700	9000	900	0	0	19,400	17600

All 5 rivers listed are recommended for designation as wild, scenic, or recreational in Alternatives C, D, E, F, I, and K. Since all 3 designations do not allow oil and gas leasing, the rivers were examined in their entirety, even if one river segment has more than one river designation.

Alternative B only recommends the South Fork of the White River and the Crystal River. As the table illustrates, Cross Creek, the South Fork of the White River, and a portion of the Crystal River were designated “Legally Withdrawn” in the decision for the 1993 Oil and Gas Leasing EIS. This decision was made because there are sections of these rivers in designated wilderness areas which are legally withdrawn from oil and gas leasing. This will not change in the 2002 Forest Plan. Areas outside of wilderness, however, will become administratively unavailable.

Table 36B shows that no area around any of the rivers was available and authorized by the 1993 Oil and Gas Leasing decision. The majority of the Crystal River and Deep Creek were made administratively unavailable in the 1993 Oil and Gas decision due to their potential for wild, scenic or recreational river designation. Additional acreages around these rivers is proposed due to changes in management area boundaries.

Future Trends Because of the demand for clean-burning fuels, an increase in both leasing and development of oil and gas resources can be expected (see Appendix C of the Oil and Gas Leasing EIS). The Reasonable Foreseeable Development Scenario from this EIS remains accurate for the life of the 2002 Forest Plan, approximately 10 to 15 years.

A part of the Oil and Gas Leasing EIS was to develop a reasonably foreseeable development scenario (RDF) which is an estimate of the number of wells and associated disturbance that can be anticipated from future oil and gas exploration, development, production, abandonment, and reclamation over a designated period of time. The Record of Decision for the 1993 Oil and Gas Leasing Environmental Impact Statement for the White River National Forest states: The RFD forecasts three exploratory oil wells, eight exploratory gas wells, and 12 development gas wells (ROD page 10). These figures remain a valid estimate over the life of the 2002 Forest Plan. Since approval of the Oil and Gas EIS, there have been no exploratory oil wells approved, one exploratory gas well approved, and no development gas wells approved.

Resource Mitigation Measures The mitigation measures for effects from exploration and production activities in the Oil and Gas Leasing EIS as specified in associated ROD continue to be valid. These directions are found in the Oil and Gas Leasing FEIS, pages II-11 to II-24 as “Conditions of Approval” of a Surface Use Plan of Operation as part of the Application for Permit to Drill. In addition, the Oryx EIS was completed pertaining to oil and gas development and production in the Divide Creek area. The ROD for the Oryx EIS approved 20 wells for coalbed methane production. None of these wells have been drilled, however the mitigation measures identified in this EIS will apply if any proposals are made to implement this decision.

All forest-wide standards and guidelines will have to be followed in implementing oil and gas leasing decisions made in the 2002 Forest Plan.

Locatable minerals – affected environment

Locatable minerals are those valuable deposits subject to exploration and development under the General Mining Law of 1872 and its amendments. These resources commonly are referred to as “hardrock” minerals, and include gold, silver, molybdenum, iron, copper, zinc, lead, and alabaster.

Lands open to operations under the General Mining Law include all areas of the national forests except those formally withdrawn from mineral entry either by Congress or the Secretary of the Interior or otherwise exempted. On the White River National Forest, approximately 80% (750,000 acres) of the existing withdrawals are wilderness. The remainder is associated with developed recreation and administrative sites. The Forest Service requests withdrawals through the Department of Interior BLM when necessary to protect capital investments, unique natural features or management options.

Many areas in or near the forest have a long history of locatable mineral development, as do many other sites in the mountains of Colorado. The towns of Aspen, Breckenridge, Gilman, Marble, and Montezuma all originated in mining booms, although little of this heritage survived past the 1920s (except in Gilman, where zinc mining continued until 1981). The only ongoing operation on the forest is an alabaster and marble mine near Redstone. Each year, the forest authorizes six to eight small short-term operations for various mineral resources.

Locatable mineral potential does exist on the forest; assessment of its potential can be found in the following documents: *Mineral Resource Potential and Geology of the White River National Forest and the Dillon Ranger District of the Arapaho National Forest, Colorado*, U.S. Geological Survey Bulletin 2035(1993) and *Regional Mineral Appraisal of the Leadville 2 Degree Quadrangle, Colorado*, USDI Bureau of Mines Mineral Land Assessment Open File Report 20-93, 1993. These reports identify levels of high, moderate and low potential for locatable, leasable, and salable (other than building stone) minerals on the Forest. Maps showing locations of this potential can be found in bulletin 2035 and MLA 20-93. These resources are available for review in the Supervisor’s Office in Glenwood Springs, Colorado.

Locatable minerals – environmental consequences

GENERAL EFFECTS

The 2002 Forest Plan does not affect the quantity or quality of locatable minerals, but it affects the number of acres where mineral exploration and development are allowed. When a ROD is issued for the selected alternative, the Forest Service will request that the BLM withdraw the following management areas from mineral entry: 1.2, 1.5, 2.2, 3.4, 4.4, 8.21, and 8.25 (see **Table 36C**). In addition to protect the values for which special interest areas were proposed, the need for mineral withdrawals will be analyzed for those 2.1 and 3.1 areas allocated in the selected alternative.

Table 36C
Recommendation to withdraw management areas from locatable mineral entry

Management Area	Withdrawn from Locatable Mineral Entry	Available for Locatable Mineral Entry
1.11 Pristine Wilderness	X	
1.12 Primitive Wilderness	X	
1.13 Semi-primitive wilderness	X	
1.2 Proposed Wilderness	X	
1.13 Backcountry Recreation – non-motorized		X
1.32 Backcountry Recreation – limited winter motorized		X
1.41 Core Area		X
1.5 Wild Rivers – designated and Eligible	X	
2.1 Special Interest Areas	Dead Horse Creek, Mitchell Creek, Main Elk, Sterry Lake, Taylor Pass	Coal Basin, Upper Gypsum Creek, Leeman, Jakemann-East, Quaker Mesa,
2.2 Research Natural Areas	X	
3.1 Special Interest Areas	Withdraw all or part of all sites depending upon the values (the whole site will be used for comparative analysis)	
3.21 Limited Use Areas		X
3.31 Backcountry recreation – year round motorized		X
3.32 Backcountry recreation – non-motorized with winter motorized		X
3.4 Scenic Rivers – Designated and Eligible	X	
3.55 Corridors Connecting Core Areas		X
4.2 Scenery		X
4.23 Scenic Byways, scenic areas, vistas or corridors		X
4.3 Dispersed Recreation		X
4.32 Dispersed Recreation – high use		X
4.4 Recreation rivers – designated and eligible	X	
5.12 General Forest and Rangelands – range vegetation emphasis		X
5.13 Resource Production – timber emphasis		X
5.4 Forested Flora and Fauna Habitats		X
5.41 Deer and Elk Winter Range		X
5.42 Bighorn Sheep Habitat		X
5.43 Elk Habitat		X
5.45 Forest Carnivores		X
7.1 Intermix		X
8.25 Ski-based Resorts – Existing and Potential	X	
8.21 Developed Recreation Complexes	X	
8.31 Aerial Transportation Corridors		X
8.32 Designated Utility Corridors – existing and potential		X

Management areas will either be available for mineral entry or not available for entry based on **Table 36C**. Special interest areas (2.1 and 3.1) will be available or not available based on the resource values for which they are proposed. In many of the 3.1 areas, specific areas (townsites, historic sites, plant locations, etc.) may need to be withdrawn instead of the entire area. This will be examined when specific documents are prepared for completing the withdrawal process. For this FEIS, the entire 3.1 management area was used in the comparative analysis for the environmental consequences.

Table 36D
Acres withdrawn by alternative

	ALTERNATIVE						
	B	C	D	E	F	I	K
Total acres of management areas withdrawn	859,100	969,200	919,900	1,019,500	866,100	1,068,300	955,200

Locatable minerals – environmental consequences

DIRECT AND INDIRECT EFFECTS

Effects on locatable minerals from ski areas

Management Area 8.25 is assigned to Ski Resorts—Designated and Potential in the 2002 Forest Plan. These areas, as described in the general effects section, will be withdrawn from locatable mineral entry. Alternative B has the most acres allocated to 8.25 (92,970), then in order of descending acres Alternatives E, F, C, K, I, and D. See FEIS Chapter 3, Topic 3, Part 2—*Ski areas* for more information regarding the allocation of 8.25 areas by alternative. By removing these areas from the locatable mineral base some potentially valuable mineral resources will not be able to be developed.

Effects on locatable minerals from recommended wilderness

Areas allocated to Management Area 1.2 are recommended for wilderness allocation in the final forest plan. These areas, as described in the general effects section, will be withdrawn from locatable mineral entry. Alternative I has the most acres allocated to 1.2 (200,400), then in order of descending acres—Alternatives E, C, K, and D, with alternative B and F having no acres of 1.2. See Chapter 2, **Table 15** for details. By removing these areas from the locatable mineral base some potentially valuable mineral will not be able to be developed.

Effects on locatable minerals from research natural areas

Areas allocated to Management Area 2.2 are designated as Research Natural Areas in the final forest plan. These areas, as described in the general effects section, will be withdrawn from locatable mineral entry. Alternative I has the most acres allocated to 2.2 (129,300), then in order of descending acres Alternatives D, C, F, E, and K, with Alternative B having no acres of 2.2. See FEIS Chapter 3, Topic 5, Part 2—*Research Natural Areas* for a list of individual areas allocated to Management Area 2.2 by alternative. By removing these areas from the locatable mineral base some potentially valuable mineral will not be able to be developed.

Effects on locatable minerals from wild, scenic, and recreation rivers

Acres allocated to Management Area 1.5, 3.4, and 4.4 have been found suitable for wild, scenic, or recreational river designation respectively. These areas, as described in the general effects section, will be withdrawn from locatable mineral entry. All of the action alternatives recommend the same rivers for wild, scenic, and recreational designation—see FEIS Volume 3, Appendix F for a description of these rivers and **Table 15** (FEIS Volume 1, Chapter 2) for acreage allocations. Alternative B, however, recommends those rivers identified in the 1984 Forest Plan. Alternative B has fewer acres allocated to management areas 1.5, 3.4 and 4.4, therefore it would have less impact on locatable minerals. By removing these areas from the locatable mineral base some potentially valuable mineral will not be able to be developed.

Effects on locatable minerals from special interest areas

There are two management areas for special interest areas—2.1 (minimal use and interpretation) and 3.1 (emphasis on use and interpretation). In the final analysis and determination for the need for a formal locatable mineral withdrawal, alternative protection opportunities will be considered as directed by FSM 2761.4. For more detailed information on each special interest area including the values for which it was established, see FEIS Volume 4, Appendix H.

Alternative D has the most acres allocated to Management Area 2.1, special areas managed for minimal use and interpretation. It is the alternative, therefore that could have the most acres of 2.1 withdrawn from locatable mineral entry. In order of descending acres of 2.1 are alternatives D, K, I, C, E, F, and alternative B with zero acres of 2.1.

Alternative D also has the most acres allocated to Management Area 3.1, special areas managed to emphasize recreation use and interpretation. It is the alternative, therefore that could have the most acres of 3.1 withdrawn from locatable mineral entry. In order of descending acres of 2.1 are Alternatives D, K, C, E, I, F, and Alternative B with zero acres of 2.1. By removing these areas from the locatable mineral base some potentially valuable mineral will not be able to be developed.

When application is made to the BLM to have these areas withdrawn, maps will be prepared following the direction in the table above. Areas allocated in the selected alternative may be withdrawn. In the final analysis and determination for the need for a formal locatable mineral withdrawal, alternative protection opportunities will be considered as directed by FSM 2761.4.

Future Trends	Locatable mineral uses on the forest are expected remain at current levels, unless world prices for valuable minerals show a dramatic increase. Generally, exploration and development will be associated with a dramatic increase in price. However, because of the potential reserves yet to be developed on the forest, we can expect development to occur in those areas of moderate to high potential eventually.
Resource Mitigation Measures	Guidance for implementing locatable mineral activities, and how to address resource concerns is found in 36 CFR 228.8 (requirements for environmental protection). These directions will be followed, in addition to forest-wide standards and guidelines, to ensure that resource values are protected and addressed in an appropriate manner.

Salable minerals - affected environment and environmental consequences

Salable minerals, or common varieties, generally are found as deposits of sand, clay, gravel, and stone that provide materials for construction and road surfacing. Disposal of these minerals is by mineral material permit or contract at the discretion of the Forest Service. Decisions to issue permits for salable mineral will be made on a case-by-case basis. There is no measurable difference in effects from the alternatives on salable minerals.

Future Trends	The public demand for sand and gravel can and will be met primarily on private lands. Sand and gravel deposits on the forest will primarily used by the Forest Service and their contractors for surfacing National Forest System transportation routes and recreation areas. Public demand for building stone from the White River National Forest is high, and demand for topsoil is low to moderate.

Paleontological resources – affected environment and environmental consequences

Paleontological resources are not minerals, but generally are managed via the same administrative procedures and can be collected in a manner similar to minerals. “Excavating, damaging, or removing any vertebrate fossil or removing any paleontological resource for commercial purposes without a special-use authorization” is prohibited by 36 CFR 261.9(i). In addition, there are forest-wide standards and guidelines for management and protection of the paleontological resource found in the 2002 Forest Plan, Chapter 2, Section 1—*Physical Resources – Paleontological Resources*.

CUMULATIVE EFFECTS FOR LEASABLE, LOCATABLE, AND SALABLE MINERAL RESOURCES

Energy and mineral resources have been numerous and accessible enough to provide a viable industry with opportunities for development for over 100 years. Present reserves will continue to provide opportunities well beyond the next planning cycle. Since mineral and energy resources are fixed both geographically and geologically impacts are associated with management prescriptions and standards that prohibit development. The

more acres removed (leasable—administratively unavailable, locatable—withdrawn) from mineral development, the more long-term impacts on the mineral resources.

The primary impact on the mineral resources comes from withdrawals associated with management prescription areas 8.25 and 2.1. These are the areas that coincide with the medium to high mineral potential areas. As minerals become scarce their value goes up, therefore we can anticipate that sometime in the future significant impacts on the mineral resources will occur because they will not be available for development. The locatable mineral resources are significant and that sometime in the future when the withdrawals come up for renewal, competing resource allocations will be revisited.

Leasable minerals are also finite. As technology improves, leasable minerals become more available economically and thus more recoverable. Natural gas in the Piceance Basin is an example. Despite knowing that a huge reservoir of gas existed there for several decades, the technology and knowledge to develop the resource was not available. Over the last 5-10 years the knowledge and technology have developed to a level that this huge reserve is and will be developed over time. The alternatives propose to remove a portion of this basin by making specific lands administratively unavailable for leasing. This represents a relatively small portion (<3%) of the basin on the forest. The portion of the total Piceance Basin that is made administratively unavailable by the White River Forest Plan is less than 1%, and is insignificant at the basin scale.

Other leasable minerals, such as coal and geothermal, have a much more significant role locally and in Colorado. Coal reserves on the forest are significant within the state of Colorado. However, in comparison to reserves in the Rocky Mountain Region, the Powder River Basin and others dwarf the reserves on the forest. There is a small impact from White River National Forest withdrawals on coal resources locally but an insignificant impact from a bigger picture.

Geothermal resources could be significant in this area. Development of these resources has been limited to the Hot Springs Pool and other small geothermal pools adjacent to the forest. It can be anticipated that at some future date there will be development of these resources. Because of the low level of interest in developing these resources, it is difficult at best to speculate what level of impacts on this resource is associated with management prescriptions and standards associated with them.

For salable minerals such as sand, clay, gravel, and stone, demand can be met on private lands in the vicinity of the forest. The primary supply of decorative rock, however, is on public lands—National Forest System lands and lands administered by the Bureau of Land Management. Over the life of the plan, there is an expectation that demand for this rock from public lands will increase and the forest will have to re-evaluate this program.

The standards and guidelines generally do not prevent development of the mineral resources. However, they do raise the cost of development. Therefore, essentially the greatest impact of the standards and guidelines is to raise the cost of development. It is hard to say that one standard raises the cost more than another, because it all depends on the specific project and its specific location. We can say that generally the costs are raised substantially, and in some cases the costs would be high enough to prevent development at this time. However, over time, as prices increase due to scarcity and the cost factor can usually be overcome.

Part 2

Biological diversity

Part 2, Section 1

Historic range of variability

Introduction

Abstract

By assessing the history of disturbance regimes on the White River National Forest, we can speculate about ecological conditions in the region of the forest before European settlement began about 1870. We also can record how these conditions have changed as a result of natural and human influences in the 130 years since the settlement period began. A more detailed summary of the Historic Range of Variability (HRV) Report that was prepared for the forest plan revision can be found in FEIS Volume 3 Appendix D. A description of the analytical process is located in FEIS Volume 3 Appendix B. The following section discusses key finding from that report and considers the effects of the alternatives on the historic range of variability.

Summary

We can use the concept of historic range of variability as a baseline of comparison for assessing current natural resource conditions on the White River National Forest.

Some resource conditions will essentially be unchanged while others will have departed significantly from earlier norms. Some conditions that have changed will have done so because such variability is natural; many ecosystems have evolved on the basis of these fluctuations. These conditions can be said to be within their historic range of variability. Other conditions will have changed because of post-settlement intervention to a point that is not within the range of natural long-term fluctuation (over the 200–400 year period prior to settlement). These then are considered to be outside their HRV. For more information about the analysis process used to determine HRV, see Appendix B.

Resource managers can use historic range of variability analysis to help determine desired future conditions and management direction at the forest plan level. In most cases, managing within HRV conditions requires less expenditure of energy and money than managing outside of HRV.

Key indicators

- Predicted trend of biological and physical elements relative to their historic range of variability

Legal and administrative framework

- The **National Forest Management Act** (1976) states that forest plans must “provide for the diversity of plant and animal communities based on the suitability and capability of the specific land area.”
- In 1992, the Chief of the Forest Service issued a statement committing the Forest Service to the practice of **ecosystem management**, which is an ecological approach to managing national forests and grasslands for multiple uses.

Affected environment

Introduction An HRV assessment was completed to provide baseline information to managers in order to apply adaptive management principles for informed management decisions. The main conclusions that can be drawn from the HRV report are as follows:

Human uses

- Modern settlement of the area, which began around 1870, significantly changed many White River National Forest ecosystems; before this date, human impacts on ecosystems are considered to be relatively limited.
- Mining, farming, logging, grazing, and intentional fires all changed vegetation patterns during the late 1800s. Fire suppression during the later half of the 20th century has also begun to affect some ecosystems.

Forest vegetation

- Forest composition is within HRV except within localized, heavily managed areas such as ski areas. Much of the current 90-130 year old lodgepole pine and aspen stands may have existed as spruce-fir communities prior to the disturbances associated with the period of early European settlement. However, there are no indications that this is outside the HRV for these cover types on the White River National Forest.
- The current distribution and coverage of ponderosa pine on the White River National Forest may be on the low end of its HRV.
- Analysis of existing average patch sizes does not reveal major differences between reference areas compared to areas with recent timber management activities. This is due in part to the existing high variability in patch sizes across the forest, and the relatively small acreage of forested lands that have been actively managed for timber production on the forest.
- Aspen, Douglas fir, and lodgepole pine are relatively homogeneous in age, due to the large acreage of timber removal and subsequent regeneration during the 40-year period of early European settlement.
- Forest-wide, spruce-fir structure is within its HRV.
- In areas of the forest that have been intensively managed for timber, the number of snags and the amount of dead and down material has been reduced. This has occurred over a relatively small portion of the forest.

Non-forested vegetation The current composition of non-forested vegetation is within the HRV except for the approximately 90,000 acres of the forest that have been invaded by noxious weeds and in areas that were reseeded with introduced exotic plant species, most notably Kentucky bluegrass.

- Unregulated domestic livestock grazing from 1870-1920 led to significant overuse and abuse of many areas of the forest. Quantity and quality of the forage and deterioration of the soil resource was documented in heavily-used areas. Under improved management, many of these areas have either recovered or are recovering.
- There currently are fewer acres of shrub and sedge riparian vegetation than pre-settlement.
- Upland shrublands have increased in acreage and density as a result of fire suppression.

- Sagebrush has declined on and adjacent to the forest, due to the development of private lands and the invasion of sagebrush by other shrub species and pinyon and juniper woodlands.
- Shrubland ecosystems have more homogeneous understories than were historically present due to the establishment of bluegrass and other exotic plant species and the overall older age of the sagebrush stands.
- Fire intensity and return intervals have likely changed in grass/forb and shrublands due to fire exclusion, grazing by domestic livestock, and the introduction of exotic plant species.

Air resources

- The concentration of smoke in White River National Forest airsheds is lower than the HRV because of fire suppression.
- The forest is outside of HRV in terms of modern emissions from fossil-fuel extraction and burning, solvents, and aerosol propellants. These emissions did not exist prior to the settlement period.

Climate

Fire

- Precipitation, snowfall accumulation, and temperatures are all within HRV.
- Lodgepole pine, aspen, oakbrush, and sagebrush are still within the HRV for fire cycles, but are trending out as fire suppression has limited the number and severity of fires in these ecosystems.
- The frequency of low-intensity fires is within the HRV; the frequency and extent of high-intensity fires is outside of HRV due to fire suppression efforts controlling many of the fires which would have burned more acreage without human intervention.
- In many forest stands, the accumulation of litter, standing dead trees, and downed material is out of HRV on the high side.

Insects and Disease

- Armillaria root disease and dwarf mistletoe are trending out of the HRV on the high side due to past timber harvests and fire suppression.
- Aspen insects and diseases are trending out of the HRV on the high side due to the high ratio of mature aspen from the disturbances associated with the early settlement period.

Wildlife

- Wolves, grizzly bears, mountain bison, river otters, Columbian sharp-tailed grouse, and harlequin ducks have been extirpated from the White River National Forest. North American wolverine and Canada lynx have been greatly reduced or extirpated.
- Mountain goats, starlings, and rock doves have all been introduced to the forest or adjacent lands and now use National Forest System lands.
- Moose, from transplants in adjacent areas, are increasing in population and may soon be out of HRV on the high side.
- Sage grouse populations are out of HRV on the low side.
- Bighorn sheep populations are on the low end of the HRV.
- Elk and deer distributions and populations are within the HRV.
- Species dependent upon mature conifer habitats are on the high end of the HRV.

- Sagebrush-dependent species and species dependent upon early successional stages of forest vegetation may be at the low end of their HRV.

Aquatic Resources

- The Colorado River ecosystem and its native fish community are outside the HRV on the low end.
- Distribution and population levels of Colorado River cutthroat trout are outside the HRV on the low end.
- Distribution of boreal western toad and northern leopard frog are outside of HRV on the low end.
- Streamflows in some drainages in the Colorado River Basin are outside the HRV on the low end due to water diversions and impoundments.

Historic range of variability – environmental consequences

GENERAL EFFECTS

Although the HRV assessment examined a wide range of resources, including climate, air, and human activities, many of these are outside the scope of the decisions made in the forest plan and therefore are not included in the following discussions.

More than two-thirds of the White River National Forest is either designated wilderness or included in management areas that limit active timber management. Most changes to vegetation in these areas will result from natural disturbances alone which generally will result in maintaining HRV conditions. On portions of the forest where active timber management is allowed, changes in vegetation will occur. However, given that harvest may be scheduled for a variety of reasons, projects may not re-establish historic range of variability patterns. Alternative I stresses allowing natural processes over active management over the broadest area of the forest. Alternatives D, K, and C stress the need for maintaining biological diversity through vegetation treatments to maintain or re-establish conditions within HRV parameters. Alternative E provides for maintaining ecological conditions at a low level with less consideration of HRV parameters. Vegetation management and other human uses under Alternative F are constrained by ecological conditions only when species viability concerns have been identified. Alternative F generally will not use HRV goals as a guideline during project development. Alternative B does not incorporate the need for managing within HRV parameters into its theme.

DIRECT AND INDIRECT EFFECTS

The following discussion focuses on the effects of management activities on the historic range of variability for vegetation components.

Effects on the HRV from mineral exploration and extraction (locatable)

Development of access roads and ground-disturbing mineral exploration may affect some forest stands. The potential for intensive development of locatable minerals is considered to be low for all alternatives. In Alternative B, 859,100 acres are withdrawn from

locatable mineral entry in order to match management area prescription objectives. Alternative F has 866,100 acres withdrawn, Alternative D has 919,900 acres withdrawn, Alternative K has 955,200 acres withdrawn, Alternative C has 969,200 acres withdrawn, Alternative E has 1,019,500, and Alternative I has 1,068,300 acres withdrawn. No significant changes to HRV characteristics are expected in any alternative.

Effects on the HRV from mineral exploration and extraction (leasable)

Impacts to vegetation will result from the construction and maintenance of roads and well pads during development and extraction. No new lands will be made available or be authorized for leasing under any alternative. In Alternative B, 823,700 acres are administratively unavailable for leasable mineral entry in order to match management area prescription objectives. Alternative F has 827,000 acres unavailable, Alternative D has 874,200 acres unavailable, Alternative K has 908,600 acres, Alternative C has 921,000 acres, Alternative E has 933,600 acres, and Alternative I has 1,027,500 acres administrative unavailable.

The cumulative impacts of these increases in protection on lands made administratively unavailable are not expected to result in significant differences in HRV conditions for vegetation forest-wide.

Effects on the HRV from noxious weeds

Controlling noxious weeds in infested areas will help move those areas back toward HRV conditions. The most active management of noxious weeds will occur in Alternatives F, D, I, and K. Alternative E prescribes the least amount of weed control. None of the alternatives will provide adequate control to halt or reverse the spread of noxious weeds on the forest, although some may slow their rate of spread. Weed infestations are expected to increase across the forest in all alternatives.

Effects on the HRV from fire management

Prescribed fire will be used to achieve fuels management goals across the forest in all alternatives. The majority of these treatments will be in non-forested cover types. Fuels treatments in forested areas generally are accomplished through timber harvest activities. The least amount of fuel treatment is in Alternative F (3,800 acres per year), next are Alternatives I, and E, then B, D, and the highest is in Alternative K (6,200 acres per year). Fire suppression efforts will be similar in each management areas in all alternatives and will concentrate on protection of private lands and high-value natural resources. (See **Table 74**). The acreage allocated to specific management areas varies by alternative and suppression efforts will reflect those allocations. Impacts to HRV conditions from fire suppression are expected to most influence ecosystems that have evolved with frequent, low-intensity fires such as grasslands and shrublands and forest cover types that are fire-initiated (lodgepole pine and aspen). Spruce-fir HRV conditions are not expected to be affected significantly from fire suppression over the life of the plan in any alternative.

Wildland fire will play a role in shaping ecological conditions on the forest, especially in those management areas with low risk to moderate resource values (**Table 74**). The overall impacts from wildland fire to ecological condition will relate to the amount of land allocated to management areas where fire is allowed to play a more natural role on

the landscape. Alternatives F, I, E, and K will have the most land allocated to prescriptions that result in more constraints in selection of the appropriate management response, while Alternatives B, C, and D would allow more flexibility in the application of the appropriate response resulting in the potential for more opportunities to manage wildland fire for resource benefits. In general, wildland fire is considered to be a natural part of most forested ecosystems on the White River National Forest, and increased fire activity would be beneficial to maintaining HRV conditions.

Effects on the HRV from travel management

Impacts to vegetation from travel management will result from alterations during the construction, reconstruction, decommissioning, and closure of roads to meet travel objectives. Activities planned under Alternatives F and B are expected to result in the most miles of annual road construction, followed by Alternatives K, D, and E, while Alternatives I and C will result in the fewest new miles. Conversely, activities expected under Alternatives C and I result in the most miles of annual road closures and decommissioning, followed by Alternatives D, K, E, and B, while Alternative F would close the fewest miles annually. The overall impacts to forest-wide HRV conditions will be hard to measure for all alternatives due to the small acreage involved, but some localized impacts would be expected from road construction and decommissioning.

Effects on the HRV from ski areas

Vegetation treatment for ski area maintenance and development will affect some stands. Existing vegetation will be removed to construct ski trails, lift lines and towers, roads, buildings, and to bury utilities. With all alternatives, these activities are confined to 8.25 management areas, and not all acres within management area boundaries will be modified. Effects to vegetation from ski area development are less when development occurs above treeline; in non-forested areas, including many back bowls and avalanche paths; and between rock outcroppings. Approximately 45% of the permit area for existing ski areas has been currently developed for facilities and downhill skiing opportunities. Impacts to vegetation and landscape character are expected to continue to some degree within all these ski areas. The most significant new impacts would be expected to occur within areas proposed for future expansion, as these areas do not currently have intensive management activities. Future lift developments, ski runs, facilities and infrastructure would be expected to occur on lands allocated to expansion. Potential impacts are closely related to the number of acres of potential expansion for each alternative. Alternative D has the least potential for significant new impacts with no acres allocated for potential expansion, Alternative I has 300 acres of potential expansion, K has 8,600 acres, C has 14,700 acres, F has 25,300 acres, E has 40,800 acres and B has 50,000 acres. Based on existing developments on ski areas on the White River National Forest, approximately 45% of the acres proposed for potential expansion would be developed for downhill skiing in each alternative. Although impacts to areas within permit boundaries may be significant, the forest-wide impact to HRV conditions will be difficult to measure due to the relatively small acreage within the management area prescription.

Effects on the HRV from aerial transportation corridors

There will be impacts to cover types, structural stages, and landscape patterns that move those characteristics out of HRV in developed areas. Alternatives B, D, K, and I have no land allocated to this use, Alternative C has 400 acres, Alternative F has 1,300 acres, and Alternative E has the most, 2,600 acres (<1 percent of the forest). Although impacts to areas within the actual development corridor may be significant, the forest-wide impacts will be difficult to measure due to the relatively few acres allocated to this prescription.

Effects on the HRV from recommended wilderness, research natural areas, special interest areas (minimal use), or wild rivers

Vegetation characteristics in these areas will be shaped primarily through the forces of natural disturbance activities, such as fire, insects and disease, and windstorms. This will result in maintaining vegetation composition and structure within HRV. Active management to manage stands to move them towards HRV conditions will be minimal in all the areas listed. The least amount of land allocated to these management prescriptions is in Alternative B, 300 acres (0.01 percent of the forest). More acres are allocated in E, followed by F, D, K (128,000 acres), C, and I, 253,000 acres (10 percent of the forest, primarily as recommended wilderness). Changes in vegetation HRV conditions will depend upon the intensity, location, and amount of disturbance which occurs on these areas. It is impossible to predict the amount of change that will occur due to natural events, but it is anticipated that levels of change will correspond to the acreage allocated.

Effects on the HRV from special interest areas (use or interpretation) or scenic and recreational rivers

These designations are not expected to cause significant changes to HRV conditions for any alternative. Natural disturbance events will continue to be the most significant change agent in these areas, but active management to limit the impacts of these disturbances, such as fire suppression, may play a major role in specific areas to meet the area objectives. Alternative B has the least acreage allocated to these prescriptions, 5,300 acres. Alternatives C, D, E, and F, I, and K all have between 12,000 to 16,000 acres.

Effects on the HRV from timber management

The major impacts to structural stage ratios and in landscape patterns will occur during even-aged management treatments, creating more early seral vegetation which will maintain or improve HRV conditions for lodgepole pine and aspen. Uneven-age silvicultural treatments will not significantly affect overall structural stage ratios or landscape patterns. Alternatives F, B, K, and D promote the highest levels of even-aged silviculture. Alternative F would result in 1,100 acres of annual even-aged aspen and lodgepole pine management (less than 0.1 percent of the forest-wide aspen and lodgepole pine, and less than 0.2 percent of the suitable base aspen and lodgepole pine in that alternative). Alternative B has 700 acres, Alternative K has 600 acres and Alternative D has 500 acres, while Alternative C has the least, 300 annual acres (less than 0.02 percent of the forest-wide aspen and lodgepole pine, and less than 0.2 percent of the suitable base aspen and lodgepole pine in that alternative). Spruce-fir will continue to be managed mainly under the preparatory cuts of shelterwood silvicultural systems and the impacts to landscape conditions are expected to be minor in all alternatives. Alternatives D, C, K,

and I all stress the need for maintaining or enhancing conditions within or towards HRV during timber management projects. For these alternatives, silvicultural prescriptions will incorporate cutting stipulation to mimic HRV patterns. Alternatives F, E, and B all have less emphasis on mimicking HRV conditions through management.

CUMULATIVE EFFECTS

The literature review conducted for the HRV assessment indicates that the spatial scale of analysis varies by resource area. In general, the areas assessed were much larger than the boundary of the White River National Forest. This cumulative assessment area includes all the activities on lands within the forest boundary as well as the private and other public lands between the two major divisions of the forest.

Over the past 100 years, more significant impacts to HRV conditions have occurred on private lands adjacent to the White River National Forest than on the forest itself. These impacts have been associated with the settlement and consequent development of these private lands into communities, ranches, and homesites.

The majority of National Forest System and the adjacent Bureau of Land Management lands have been historically shaped primarily through natural disturbance processes and this is expected to continue throughout the life of the 2002 Forest Plan. These natural disturbance forces will keep National Forest Systems lands closer to approximate HRV vegetation conditions than on most private lands. Past, current and expected future fire suppression within some ecosystems will be the major activity that may result in moving vegetation conditions (seral stage composition and fuels accumulation) away from HRV on federal public lands.

Effects to HRV conditions from forest management activities are expected to be similar under all alternatives. Active vegetation management on National Forest System lands will continue to occur in specific areas. The relatively low acreage involved and the low level of impacts from these actions are not expected to result in significant changes to forest-level composition or structure. Developments on private lands have significantly altered many biological resources that are currently outside their HRV. Private land developments that convert native vegetation to homesites and businesses significantly affect HRV conditions for many biological components. Rapid and intensive development of private lands adjacent to the White River National Forest are expected to continue through the life of the 2002 Forest Plan and will result in significant changes to landscape structure and patterns as these areas are converted from native ecosystems to homes, businesses, golf courses and other developments. These changes will be much more significant to changing HRV conditions than the cumulative management activities occurring on the White River National Forest.

Part 2, Section 2

Ecosystem-level assessment

Introduction

Abstract The ecosystem-level approach to forest management is a strategy for maintaining the population viability of most of the species present on the White River National Forest by maintaining the components of forest composition and structure that are essential to their habitat needs. The Nature Conservancy has estimated that 85 percent to 90 percent of species will be protected under this approach. The underlying concept is that a representative array of vegetation cover types will include the appropriate vegetation mosaics that will accommodate most species. We examine two key components of ecosystem-level analysis, habitat fragmentation and perforation. The *Forested Vegetation* section, Topic 1, Part 3, Section 3, contains further discussion concerning ecosystem-level assessment on the White River National Forest.

Summary A common misperception is that the White River National Forest was a vast expanse of unbroken forest prior to European settlement. Actually, forests in Colorado have a high degree of natural patchiness. Large-scale disturbance events such as windstorms, insect epidemics, and fires are part of the area's natural history. Coupled with slope, aspect, soil, and elevational differences, these factors are responsible for a diverse array of forested and non-forested landscape patterns over time. Human activities and forest management also cause alterations to habitat patch characteristics and patterns.

Fragmentation Fragmentation is defined as the breaking up of contiguous blocks of habitat into progressively smaller patches that are increasingly isolated from one another. It also may be viewed as the process of interspersing blocks of suitable habitat with areas that are hostile to plant or animal life, such as highways or urban development. Fragmentation should be viewed in the concept of changes from a baseline condition. Some landscapes are naturally patchy while others are relatively uniform. Fragmentation factors would affect these two landscapes and the species that use them in different manners.

The definition of fragmentation does not address the question of how long these isolations last. Much of the research on fragmentation has focused on changes from agriculture or urban development, which are long-term or permanent in nature. By contrast, most habitat alterations from timber harvests or other forest management activities are relatively temporary.

An important consideration is how fragmentation affects different species. Not all species of animals or plants are affected the same way. A major highway corridor that bisects the habitat of small mammals may have little impact on birds that can readily fly over it. For plant species, fragmentation can result in slow species migration across the landscape in response to habitat disturbance regimes, problems with genetic isolation, or connectivity issues for the plants' pollinators. Impacts of proposed forest management to wildlife species is further addressed in the *Terrestrial Wildlife* section, Topic 1, Part 3, Section 1.

Perforation

Perforation refers to holes within otherwise contiguous blocks of habitat. An example could be a clearcut (or group of clearcuts) surrounded by late-successional forest. These cutting units may or may not mimic natural conditions, depending upon tree species, size and shape of cut, the number of snags and the amount of dead and downed materials left on site after the timber harvest, and many other factors. Many of the changes associated with management of National Forest System lands represent perforation rather than fragmentation of suitable habitats. They generally are not considered to be fragmentation factors in the traditional sense, and their effects on habitat capabilities for wildlife or plant species varies by species, cover type, and other site-specific factors.

Key indicators

- **Historic range of variability**, vegetation components only—see Topic 1, Part 2, Section 1 for more information
- **Fragmentation and perforation**
 - 1) patch isolation/connectivity
 - 2) patch size
 - 3) amount of edge
- **Landscape pattern**—see *Forested Vegetation* section, Topic 1, Part 3, Section 3
- **Non-forested vegetation**—discussion of this resource is found in Part 3, Section 4
- **Wildlife**—discussion of this resource is found in Part 3, Section 1

Legal and Administrative Framework

- The **National Forest Management Act** (1976) states that forest plans must “provide for the diversity of plant and animal communities based on the suitability and capability of the specific land area.”
- In 1992, the Chief of the Forest Service issued a statement committing the Forest Service to the practice of ecosystem management, which is an ecological approach to managing national forests and grasslands for multiple uses.
- The **Endangered Species Act** (1973) governs protection of specified species and the ecosystems upon which they depend.
- **36 CFR 219.27(g)** states that management prescriptions, where appropriate and to the extent practicable, shall preserve and enhance the diversity of plant and animal communities.

Fragmentation and perforation—affected environment

During the forest plan revision process, we have examined the elements of fragmentation and perforation listed below. These factors are being assessed as part of the landscape pattern analysis, and more discussion is found in the forested vegetation section.

- **Patch isolation/connectivity.** The creation of numerous small patches heightens the risk that suitable habitats will become isolated from each other. This problem worsens if the area between patches becomes inhospitable to species movement. Barriers to the movement of species from one suitable habitat patch to another reduces the connectivity of these habitats. When suitable vegetation types and cover conditions are present between patches, species can move between them. Major sources of long-term patch isolation that reduce connectivity include highways, construction projects on private land near the forest, and the

development of ski areas on the forest. Additional analysis and discussion of connectivity is found in the wildlife section.

- **Patch size.** Many interior-forest species seek out conditions that are beyond the influence of edges, and as such they require minimum sizes of habitat. As patches become smaller, they may not meet the needs of these species.
- **Edge effects.** As patches become smaller, the result is an increase in the amount of edge habitat. This increase can be beneficial to some species while being a detriment to others. A result could be increased competition and predation from species that are adapted to edge habitats. Forest vegetation management and road developments are primary factors responsible for increasing the amount of edge within the forest.

Among the key sources of fragmentation in the area are the following:

- **Interstate 70** from the Eisenhower Tunnel to Rifle, and the private land developments along it, are a major impediment to wildlife movement for approximately 125 linear miles. Along undeveloped stretches, animals are affected by high-volume, high-speed traffic, mowing, concrete barriers, and eight-foot-high fences they cannot cross. In other areas, the increasing spread of commercial structures and residential communities along the highway has extensively modified the migration corridors and valley bottoms important to some wildlife species, whose movement patterns have been disrupted or blocked entirely. Interstate 70 also interferes with the movement of many small mammals, amphibians, and reptiles as well as possibly the dispersal of seeds for many plant species. In summary, the highway corridor has increased patch isolation and the amount of edge and has decreased the connectivity of suitable habitats located on both sides of the corridor.
- The **Colorado State Highway 82 corridor** between Glenwood Springs and Aspen generates impacts similar to those of Interstate 70. The road and the urban developments along it are a significant barrier to the traditional movement of some species. The consistently heavy traffic on this highway makes it nearly impossible for large and small mammals, reptiles or amphibians to cross successfully. Most of the recent population growth of the Roaring Fork Valley is concentrated along Highway 82, significantly affecting habitat values and use patterns for a wide range of species.
- **Private land development** along the Blue River in Summit County has changed much of the character of this river valley to the point that it no longer meets the needs of local wildlife. Historic big game winter range has been transformed into condominiums, second homes, and commercial properties. This development has affected patch isolation and size, amount of edge, and connectivity of habitats.
- **Active timber harvest** toward the allowable sale quantity (ASQ) or for recreational development is allowed on about one-third of the White River National Forest. These projects result in habitat perforation or fragmentation, depending upon the scale of the development and the species involved. Some timber management activities, such as clearcuts, result in perforations of habitats. On the White River National Forest, however, these activities have occurred on a limited scale and adjacent habitats to which species can move are generally readily available. Patch sizes may be smaller and edge amounts may have

increased as compared to pre-settlement conditions, but for the most part connectivity has not been impaired. These activities generally result in relatively short term impacts, as these vegetation management treatments are designed to regenerate back to forested stands. In developed recreation areas such as within ski areas, patch sizes and connectivity have decreased, edge has increased, and localized areas of patch isolation have occurred. These developments generally change habitats for long periods of time and are considered permanent.

Fragmentation and perforation – environmental consequences

GENERAL EFFECTS

In general, the more human activities that occur in an area, the greater the likelihood that habitats will become fragmented or perforated. Timber management, road and trail construction and reconstruction, mineral exploration and extraction, ski area development, development of utility corridors, and developed recreation sites all have the potential to increase fragmentation and perforation.

More than two-thirds of the White River National Forest is either designated as wilderness or is included in management areas that focus on limited active management. Most changes to vegetation in these areas will result from natural disturbances alone. On those portions of the forest some level of natural fragmentation, including perforations, may result depending upon the type and extent of disturbance, the amount of adjacent suitable habitat remaining after the disturbance, and the species involved.

On the remaining third of the forest, impacts to patch isolation, patch size, and edges will continue in those areas where management activities occur. Vegetation management activities may produce temporary perforations of habitat that will last from a few years to a few decades until regeneration of stands meets identified habitat needs. In developed recreation sites, such as ski areas, fragmentation will result in a number of permanent changes to the landscape, including vegetation type conversions from forests to grasslands.

DIRECT AND INDIRECT EFFECTS

Effects on fragmentation and perforation from mineral exploration and extraction (leasable)

Impacts will result from the construction and maintenance of roads and well pads during development and extraction. This development will perforate habitats for more species during the development phase when activity levels on the roads are high than during extraction phases when less activity is necessary and many roads have been closed to motorized public use. This development will result in smaller patch sizes and more edge in the developed areas, which may perforate some habitats for non-mobile species. These areas are expected to be restricted in size and location on the forest. No new lands will be made authorized or available for leasing under any alternative. In Alternative B, 823,700 acres are administratively unavailable for leasable mineral entry in order to match

management area prescription objectives. Alternative F has 827,000 acres unavailable, Alternative D has 874,200 acres unavailable, Alternative K has 908,600 acres, Alternative C has 921,000 acres, Alternative E has 933,600 acres, and Alternative I has 1,027,500 acres administrative unavailable.

Effects on fragmentation and perforation from mineral exploration and extraction (locatable)

Development of access roads and ground-disturbing mineral exploration may affect some forest stands. The potential of intensive development of locatable minerals is considered to be low in all alternatives. In Alternative B, 859,100 acres are withdrawn from locatable mineral entry in order to match management area prescription objectives. Alternative F has 866,100 acres withdrawn, Alternative D has 919,900 acres withdrawn, Alternative K has 955,200 acres withdrawn, Alternative C has 969,200 acres withdrawn, Alternative E has 1,019,500, and Alternative I has 1,068,300 acres withdrawn.. No significant changes to forest-wide fragmentation or perforation are expected in any alternative.

Effects on fragmentation and perforation from wildlife management

The primary tools used to enhance wildlife habitat which have the potential to impact fragmentation and perforation are prescribed fire and road closures. The effects of prescribed fire treatments should be similar to those described in the *Fire Management* section of this topic (Part 3, Section 7). Over time, road closures will revegetate which will reduce existing fragmentation or perforation for most species. Site-specific road closures are not available for this analysis. Prescribed fire is expected to occur on the most acres under Alternative D, while the least amount of projected acreage is found in Alternative F.

Effects on fragmentation and perforation from management of TES species

The major tools identified for active TES management are timber management in aspen and lodgepole pine and prescribed fire to enhance lynx habitat. The effects of these activities will be similar to those described under timber management and fire management, above.

Land allocated to forested landscape linkages (management area 5.5) will be managed to provide secure travel habitats including low road densities and high levels of late successional conifer forests. Some timber harvest of lodgepole pine and aspen will occur in these areas, which may increase perforation locally. Other management of these areas will result in maintaining low levels of fragmentation and perforation in those areas of the forest. Alternative K has the most acres allocated to landscape linkages (84,000 acres, 4 percent of the forest), followed by Alternatives D, I, F, and C. Alternative B has the least acres allocated to landscape linkages (5,000 acres).

Effects on fragmentation and perforation from fire management

Fire has always been a natural part of the White River National Forest landscape, and many habitat types are fire dependent or fire-initiated. The use of prescribed fire to treat fuels or enhance wildlife habitats will result in early seral vegetation, usually in a mosaic of vegetation designed to resemble natural patterns. Some animals may find these

treatment areas to be perforations, but due to the relatively small size of treatment areas, the similarity of the impacts to natural disturbance events, and the resultant mosaic pattern, they normally will be able to move through or around the treatment areas to suitable adjacent habitats. Prescribed fire treatments will not serve as fragmentation barriers to any identified species in all alternatives. The least amount of fuel treatment is in Alternative F (3,800 acres per year), next are Alternatives I and E, then B, and D, and the highest is in Alternatives C and K (6,200 acres per year).

Effects on fragmentation and perforation from travel management

The construction and reconstruction of roads and trails to meet travel management goals will result in a variety of potential impacts. Two aspects of these activities have the potential to affect wildlife species. First, the actual construction of the road will result in direct changes to vegetation and resultant habitats. Second, there are indirect impacts associated with the human use of the roads and trails after they are built. These impacts often are more significant in the long term. Restricting or prohibiting motorized use on roads can often greatly reduce the effects of the road to most wildlife species. Some animals may be positively affected by roads, but many wildlife species show some level of aversion to roads open to motorized use. No species on the White River National Forest has been identified for which roads would serve as a total movement barrier, but many species seek habitats away from actively used roads.

Total mileage of open system roads are expected to be reduced in all alternatives over the current conditions. The total miles of open roads and trails are the best measure to the effects of travel management on fragmentation/perforation. However, figures for actual miles of roads open for motorized use will be determined in the travel management plan revision process, which has been separated from the forest plan decision. Comparing the acreage of the forest allocated to non-motorized vs. motorized categories provides an approximation of the impacts of travel management. Approximately one-third of the White River National Forest is designated wilderness and additional areas on the forest are allocated to management prescriptions that are managed for non-motorized activities through management prescription standards and guidelines or Recreation Opportunity Spectrum (ROS) classifications. Alternative F has the least total acreage devoted to these non-motorized classifications (1,018,200 acres, 46 percent of the forest). This is followed by Alternatives E, D, B, and C. Alternative K has 1,490,000 acres (65 percent of the forest) allocated to non-motorized classes and Alternative I has the most of all alternatives with over 1.6 million acres (71 percent of the forest) of non-motorized classifications.

Effects on fragmentation and perforation from utility corridors

The extent of utility corridor development is expected to be similar in all alternatives. These linear developments are narrow bands of activities that generally are managed to maintain early seral vegetation. These corridors may affect movement of some animals. They may also make some species more vulnerable to predation as the animal moves from one side of the corridor to the other.

Effects on fragmentation and perforation from recreation management

The construction and reconstruction of recreation developments to meet recreation goals may affect habitat perforation or fragmentation in some areas. The level of impacts are proportional to the amount of recreation development that occurs for each alternative. This development will include trails, trailheads, campground, and day use facilities. Due to the scale of these developments, the majority of these impacts will result in perforations rather than fragmentation for most species. Alternatives D, K, and I all promote the concentration of new developments around existing sites. This would result in less activity across the forest and impacts will be confined to already developed areas. The highest level of development of new sites occurs in Alternative E with four new sites planned. Alternative I has the least with no new sites planned for development.

Effects on fragmentation and perforation from ski areas

Timber removal for skiing will affect some areas. Existing vegetation will be removed to construct ski trails, lift lines and towers, roads, buildings, and to bury utilities. The modified areas will be managed long-term as non-forested areas, which will permanently change these cover types. In all alternatives, these activities are confined to the areas allocated to the 8.25 management category, and not all acres within a given management area boundary will be modified. Currently, approximately 45% of the land within the permit boundaries for ski areas has been developed for downhill skiing. Vegetation manipulation associated with ski area development has the potential to both fragment and perforate habitats for a variety of species. Forest-dependent, non-mobile species with small home ranges may be unable to successfully move across ski runs between forested patches. For these species, the effects would be considered to be fragmentation, while for more mobile species these same activities might serve as a perforation. Since a large proportion of the land within the existing ski area permit boundary has been already modified, the most significant impacts are expected to occur within lands allocated for future expansion.

The higher the acreage of allocation for expansion, the more potential exists for developments leading to localized fragmentation or perforation. Alternative D has the least potential for significant impacts with no acres allocated for potential expansion, Alternative I has 300 acres of potential expansion, K has 8,600 acres, C has 14,700 acres, F has 25,300 acres, E has 40,800 acres and B has 50,000 acres. Based on existing developments on ski areas on the White River National Forest, approximately 45% of the acres proposed for potential expansion would be developed for downhill skiing in each alternative. Areas of the forest in which this allocation is concentrated, i.e., Summit County and the Upper Roaring Fork Valley, have the highest potential for fragmentation and isolation of some populations of non-mobile species. Where these allocations are applied in widely separated areas, the activities would serve more as a perforation with most species able to move around the entire management area to suitable habitats in adjacent areas.

Effects on fragmentation and perforation from aerial transportation corridors

Effects from this activity will be similar to the development of utility corridors; however, aerial transportation corridors would require a higher level of maintenance and more frequent visitation. Ground-disturbing activities, including trampling with foot or vehicle traffic, would be higher than for utility corridors. Alternatives B, D, K, and I have no land allocated to this management use; Alternative C has 400 acres; Alternative F has 1,300; and Alternative E has the most, 2,600 acres. Species that avoid or are more vulnerable in open habitats may find these areas function to fragment their habitats, while they will serve as perforations for most species because they will be able to move across or around them.

Effects on fragmentation and perforation from wilderness, RNAs, SIAs (minimal use) or eligible rivers

Vegetation patterns in the southern Rockies are naturally patchy as a result of natural topography, weather, landforms, and disturbance events. Landscapes within these allocations will be shaped primarily by natural disturbance forces, therefore resulting in natural vegetation patterns. These landscapes would not be fragmented or perforated by human activities under any alternative. The least potential for additional human-induced fragmentation and perforation would occur in alternatives that have the most acres allocated to these management areas. The most acres allocated to these management areas occurs in Alternative I, 1,002,000 acres (44 percent of the forest), followed by C, E, K, D, and F. Alternative B has the least acres allocated to these management areas, 749,700 (33 percent of the forest).

Effects on fragmentation and perforation from scenic byways or SIAs (use or interpretation)

Activities within these areas will emphasize public use and interpretation. This emphasis will increase human use over time. Some areas will be maintained in early seral vegetation to provide viewing areas or developed sites. Most of these activities will be localized to small areas and should result in habitat perforation rather than fragmentation for most species. It is not possible to predict the total amount of vegetation treatment which will occur under any alternative, but it is expected that impacts will correspond to the amount of land in the allocations. The least amount of land allocated to these special areas is in Alternative B, 0 acres. Alternatives D, K, F, C, and E, all have between 10,800 and 24,200 acres; and Alternative I has 32,600 acres (1 percent of the forest).

Effects on fragmentation and perforation from timber management

The fragmentation and perforation effects from timber management in forested ecosystems are discussed in more depth in the forested vegetation section, Topic 1, Part 3, Section 3. Timber management and associated facilities such as roads may perforate habitats for some species. These effects may be positive, in the case of early seral-associated species, or negative, in the case of species dependent upon late successional forests. These impacts are relatively short term and habitats will change as the harvested stands age and progress through natural succession. In the majority of cases, most species

are able to negotiate around or through the actual cutting units to suitable adjacent habitats; therefore these impacts would be perforations rather than fragmentation. The structural stage changes associated with even-aged timber management results in the most potential of perforating habitats. Alternatives that stress management toward historic range of variability (HRV) conditions (Alternatives D, K, I, and C) will mitigate fragmentation and perforation impacts more than alternatives that do not stress HRV as a goal of management. Alternative F results in 1,100 acres of annual even-aged aspen and lodgepole pine management (less than 0.1 percent of the forest-wide aspen and lodgepole pine, and less than 0.2 percent of the suitable base aspen and lodgepole pine). Alternative B harvests 700 acres annually, Alternative K treats 600 acres, Alternative D harvests 500 acres, and Alternative C harvests the least, 270 acres (less than 0.02 percent of the forest-wide aspen and lodgepole pine, and less than 0.2 percent of the suitable aspen and lodgepole pine). Spruce-fir will continue to be managed mainly under the preparatory cuts of shelterwood silvicultural systems and the impacts to fragmentation and perforation are expected to be minor in all alternatives. Significant forest-wide impacts to perforation or fragmentation are not expected to result from uneven-aged management activities under any alternative.

CUMULATIVE EFFECTS

This cumulative assessment area includes all the activities on lands within the forest boundary as well as the private and other public lands between the two major divisions of the Forest. The cumulative impacts are similar in all alternatives. Many of the activities with the potential to negatively affect fragmentation and perforation at the ecological section level are beyond the scope of the forest plan and outside of White River National Forest management's control.

The most significant effects to fragmentation and perforation have occurred on the private lands adjacent to the forest. As these private lands have been developed into communities, ranches, homes and transportation systems, such as Interstate 70 and State Highways 9 and 82, these valley bottoms and the natural habitats they support have been highly fragmented. This fragmentation is expected to continue throughout the life of the Plan as these private lands continue to be developed. Human population increases of approximately 3 percent annually are expected for the next 20 years in the seven-county area around the forest. The continued development of private lands adjacent to the forest in the Interstate 70 and Highway 82 corridors will continue to fragment the valleys in which they occur. Animals will have an increasingly difficult time moving through these areas between blocks of the forest. Major changes to native cover types will continue to occur as these areas are developed into homes, businesses, and golf courses. Increased development of transportation systems will continue to impact native ecosystems and lead to increased fragmentation and perforation.

Most of the historic management actions on the forest have resulted in perforation effects rather than fragmentation. Continued forest management activities through the life of the Plan will continue to create some perforations. These perforations result from activities such as timber harvest and the majority result in short-term effects, until the forested stands regenerate.

On the forest, the most significant level of fragmentation of natural habitats has occurred in the portions of the forest most heavily developed for ski-based resorts, such as in Summit, Eagle, and Pitkin counties. Although the majority of these areas have been developed, these impacts are expected to continue to a lesser degree as the existing ski-based resorts expand throughout the life of the forest plan.

At the landscape level, the increases to fragmentation from the relatively small amount of active management that will occur on the forest for all alternatives is considered to be minor in comparison to the activities that are expected to occur on adjacent private lands. Forest management activities will result in localized areas of perforation. These will generally be short term and will regenerate over time to habitats similar to those prior to harvest. Exceptions to this are where activities are managed to maintain the permanent changes such as ski runs within forested habitats.

RESOURCE PROTECTION MEASURES

Goal 1 and most of the resource protection measures in Chapter 2, Sections 1 and 2 of the 2002 Forest Plan provide the necessary protection measures to protect landscape scale ecological values on the White River National Forest.

Part 2, Section 3

Species-level assessment

Abstract

A **viable population** is one that has the estimated numbers and distribution of reproductive individuals to ensure its continued existence is well distributed in the planning area. We conducted a species-level viability assessment to identify the species of plants and animals for which there is a viability concern on the White River National Forest. Approximately 350 species of plants and animals were initially included in the assessment. The screening process resulted in the identification of 11 plant species, 4 bird species, 4 mammal species, 6 fish species, and 2 amphibian species with viability concerns. Risk factors affecting viability for each species were identified and management direction have been developed to address them.

Summary

The **species-level** approach can be seen as a kind of safety net that catches species missed by the **ecosystem-level** assessment that may not adequately consider their specialized habitat needs. Many of these species are federally listed as threatened or endangered. Others are designated as sensitive species by Region 2 of the Forest Service or are species of viability concern for the White River National Forest. Such species include habitat specialists such as the peregrine falcon, which requires high, sheer cliffs for nesting, and the boreal toad, which requires specific wetland areas for breeding and early life stages. Among other species covered by a species-level approach are bats that need caves for nocturnal roosts and Hapemann's coolwort that grows in limestone seeps.

Under the species-level assessment, these specialized habitat components are identified and management strategies are adopted to ensure that they are adequately protected. The species-level analysis for federally listed, sensitive species, and species of viability concern is described in detail in the Biological Assessment and Biological Evaluation, Appendix N, and in the Viability Assessment, Appendix B.

Biological assessments (BAs) are required by the Endangered Species Act to assess the impacts of proposed federal actions to federally listed proposed, threatened, or endangered species. Biological evaluations (BEs) are documents required by regional Forest Service policy. They are similar to BAs, but they assess impacts to Forest Service-listed sensitive species. BAs and BEs are completed both at the programmatic level during forest plan revisions and at the project level. Site-specific mitigation measures that provide for long-term species viability are an integral part of these assessments. Forest-wide standards and guidelines provide mitigation measures that apply to federally listed species as well as Forest Service-listed sensitive species.

The White River National Forest completed a viability assessment to identify plant and animal species for which there is a concern about continued viability on the forest. This assessment identified species of concern and recommended management direction to address the risk factors for those species. This direction was incorporated into the 2001 forest plan as management strategies, standards, and guidelines.

Key indicators

Legal and administrative framework

- Predicted effects of alternatives on maintaining high likelihood of maintaining species viability
- The **Endangered Species Act** (1973) governs protection of specified species and the ecosystems upon which they depend.
- **36 CFR 219.27(g)** states that management prescriptions, where appropriate and to the extent practicable, shall preserve and enhance the diversity of plant and animal communities.
- **36 CFR 219.19** requires the Forest Service to identify and prevent the destruction or adverse modification of habitat determined to be critical for threatened and endangered species. It states that fish and wildlife habitat will be managed to maintain viable populations of existing native and desired non-native vertebrate species. Viable populations are defined as those with sufficient numbers and distribution of reproductive individuals to ensure their continued existence in the planning area.
- **36 CFR 219.19 (a)** also directs the Forest Service to:
 - (1) select management indicator species to estimate the effect each alternative has on fish and wildlife habitat and its subsequent effect on wildlife populations, vegetation communities, and other ecological components
 - (2) consult with biologists from other agencies
 - (3) consider access and dispersal problems of hunting, fishing, and other uses
 - (4) evaluate the effects of pest and fire management and the population trends of selected management indicator species.
- The **Forest Service Manual Directive 2672** requires the Regional Forester to identify sensitive species occurring within the region.
- The **Forest Service Manual Directive 2600-94-2** lists the designated sensitive species of the Rocky Mountain Region.
- The **Forest Service Manual Directive 2672.4** requires that a biological evaluation (BE) be prepared for all Forest Service activities to address impacts to Forest Service sensitive species.
- The 1982 **National Forest Management Act** (NFMA) implementing regulations at **36 CFR 219.19** state that:

Fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species in the planning areas. For planning purposes, a viable population shall be regarded as one which has the estimated numbers and distribution of reproductive individuals to insure its continued existence is well distributed in the planning area. In order to insure that viable populations will be maintained, habitat must be provided to support, at least, a minimum number of reproductive individuals and that habitat must be well distributed so that those individuals can interact with others in the planning area.”
- The 1983 **USDA Department Regulation 9500-4** provides further direction to the Forest Service, expanding the viability requirements to include plant species: Habitats for all existing native and desired non-native plants, fish, and wildlife species will be managed to maintain at least viable populations of such species. In achieving this objective, habitat must

be provided for the number and distribution of reproductive individuals to ensure the continued existence of a species throughout its geographic range Monitoring activities will be conducted to determine results in meeting population and habitat goals.

- Specific FSM direction, from 1986, concerning viability of plant and animal species includes:

Management of habitat provides for the maintenance of viable populations of existing native and desired non-native wildlife, fish, and plant species, generally well-distributed throughout their current geographic range.” (FSM 2622.01(2))

Maintain viable populations of all native and desired non-native wildlife, fish, and plant species in habitats distributed throughout their geographic range on National Forest System lands. (FSM 2670.22(2))

Viability assessment

Maintenance of the viability of native and desired non-native plant and animal species is a management priority on National Forest System lands. The Forest Service Manual (FSM 2670.32(3) and FSM 2670.5[19]) directs the Regional Forester to identify species of regional viability concern as **sensitive**. Some species identified as sensitive at the regional level do not necessarily have viability concerns on the White River National Forest, and conversely, some species with viability concerns on the forest may not be listed as R2 sensitive species. Our viability assessment identified and documented those differences, and resulted in the list of species of viability concern (2002 Forest Plan, Appendix EE).

The majority of the White River National Forest will continue to be managed through natural disturbance events. Approximately one-third of the forest is wilderness and an additional one-third is allocated to prescriptions that restrict active management activities. On the remaining one third of the forest, management activities will remain secondary to natural disturbances due to the relatively small scale of planned activities. Incorporation of the recommended management direction into the plan for all alternatives insures that forest management will maintain a high likelihood of maintaining or contributing to the maintenance of species viability for these species on the forest regardless of the alternative selected.

Some aspects of viability maintenance are outside the management responsibility or capability of the Forest Service:

- Management of vertebrate populations is the responsibility of the State of Colorado. Hunting seasons may affect overall populations for species such as sage grouse.
- Populations and habitat for some species are limited, either spatially (fringed myotis and pygmy nuthatch) or temporally on the forest, and forest management may have little or no effect on overall population levels.

- For some species the risks affecting populations are found off-forest, such as impacts to wintering areas for neo-tropical migratory birds.

For these species, we identified the risk factors affecting viability and identified the potential management actions the forest can take to insure that our management actions do not further decrease continued viability on National Forest System lands, and, if possible, take proactive measures to contribute to maintaining viable populations.

Some species of viability concern are found largely on National Forest System lands (Colorado River cutthroat trout, lynx, wolverine, and Barrow's goldeneye) and forest management activities have the potential to significantly affect overall populations. Forest activities must be designed to insure a high likelihood of maintaining or contributing to the maintenance of species viability for these species on the forest.

Many of the plant species identified as species of viability concern have very restricted distributions due to natural topographic or other site-specific environmental conditions. Direction developed through this assessment focuses on assuring that forest management activities maintain or enhance suitable habitat conditions for these species on the White River National Forest, regardless of outside impacts.

We developed a viability assessment process modeled after work done on the Chugach National Forest and the Black Hills National Forest. A detailed description of this assessment process is found in Appendix B. Briefly, the assessment:

- Developed a list of species to be screened for viability concerns
- Screened the list of species using established criteria and rankings
- Developed determinations for each screened species:
 - A. Species for which there is a viability concern on the White River National Forest
 - B. Species needing more baseline inventory and evaluation to determine status
 - C. Species for which there is currently no concern for species viability on the forest.
- Developed a report for each species of viability concern identifying risks to continued viability
- Incorporated recommended management actions in the forest plan to address risk factors; and
- Analyzed all alternatives against viability requirements.

We then conducted a viability assessment on approximately 350 species of plants and animals. Animal species considered included resident and migratory land birds, mammals, reptiles, amphibians, fish and invertebrates. This assessment identified a viability concern on the forest for 11 species of plants and 17 species of animals. Additionally, 42 plants, 2 vertebrate and 6 invertebrate species have been identified as species that need additional baseline information and evaluation to determine their status. For all the remaining species, the assessment resulted in a determination of no current viability concern on the forest.

A. SPECIES FOR WHICH THERE IS A VIABILITY CONCERN ON THE WHITE RIVER NATIONAL FOREST

The viability assessment resulted in the following species identified as species of viability concern on the White River National Forest. Additional information detailing risk factors, resource protection measures, alternative analysis, and estimated habitat and population trend information about each of these species is found in the individual species narratives located later in this section of the document.

MAMMALS

Canada lynx, Townsend's big-eared bat, fringed myotis, wolverine

BIRDS

Sage grouse, pygmy nuthatch, Barrow's goldeneye, and Brewer's sparrow

FISH

Colorado River cutthroat trout, roundtail chub, Colorado pikeminnow, bonytail, razorback sucker, and humpback chub

AMPHIBIANS

Boreal toad and leopard frog

PLANTS

Sea pink, Leadville milkvetch, rockcress draba, Altai cottongrass, Kotzebue grass-of-Parnassus, Harrington beardtongue, De Beque phacelia, Porter feathergrass, tundra buttercup, sun-loving meadowrue, and Colorado tansy-aster

For each of the species of viability concern, we determined the potential impact of implementing each alternative. This assessment resulted in the assignment of one of the following outcomes to each alternative for each species (The results of this assessment are documented in the table accompanying each species narrative):

- **Outcome I** – The alternative results in habitat of sufficient quality, distribution and abundance to allow the species to maintain well distributed, breeding populations within the historic distribution on the forest. The concept of well distributed must be based on knowledge of the species' distributional range and life history.
- **Outcome II** – The alternative results in habitat of sufficient quality, distribution and abundance to allow the species to maintain breeding populations distributed within the historic distribution on the forest. However, some local populations or sub-populations are more ephemeral because of reduced population levels and increased susceptibility to environmental extremes and stochastic events associated with reduced habitat abundance and distribution. Vacated habitats have the potential to be recolonized in the future.

- **Outcome III** The alternative results in habitat of sufficient quality, distribution and abundance to allow the species to maintain some breeding populations, but with significant gaps in the historic distribution on the forest. These gaps are likely permanent and will result in some limitation of interactions among local populations. The significance of gaps must be judged relative to the species distributional range and life history.
- **Outcome IV** The alternative results in habitat that only allows species existence in refugia within the historic distribution on the forest with strong limitations on interactions among local populations. The significance of extirpations across landscapes must be evaluated relative to the species distribution, range and life history.
- **Outcome V** The alternative results in long-term habitat conditions that result in species extirpation from the forest.

B. SPECIES NEEDING MORE BASELINE INVENTORY AND EVALUATION TO DETERMINE STATUS

The list of species that were determined to need more baseline inventory and evaluation prior to determining their viability status is included in Appendix EE (2002 Forest Plan).

For the species requiring additional information and evaluation to determine status, forest plan direction assures adequate protection for these species until the final determination is made. This direction includes:

Objective 1b of the plan states, “Provide ecological conditions to sustain viable populations of native and desired non-native species and to achieve objectives for Management Indicator Species.”

Strategy 1C3 states, “Identify and collect the missing or incomplete information necessary to make a final determination of species viability for all species documented as ‘species that need more baseline inventory and evaluation to determine status.’ Complete reports for five species or groups of species per year.”

Most of the standards and guidelines included in Sections 1, 2, and 3 of Chapter 2 are designed to protect the physical and biological elements on the White River National Forest. These include soil, water, and air, alpine, forested, and non-forested ecosystems, controls on resource extraction uses, protection of threatened, endangered, sensitive species, species of viability concern, and management of disturbance processes. These standards and guidelines will directly or indirectly protect ecological conditions important to species for which we have not made a final viability determination.

Plants – the following standards and guidelines provide protection for the plant species in this category:

- Management direction that restricts activities in the alpine zone in order to maintain ecological conditions important to the maintenance of native ecosystems. (Chapter 2, Section 2, Alpine Standards 1 and 2 and Alpine Guidelines 1-3).

- Management direction that restricts activities in the riparian and wetland areas of the forest in order to maintain ecological conditions important to the maintenance of native ecosystems. (Chapter 2, Section 1, Soil Standard 3 and -Water and Riparian Standards 1-13 and Guidelines 1-4).
- Rangeland Ecosystem Management standards and guidelines assure proper management of the non-forested vegetation resources. (Chapter 2, Section 2, Rangeland Ecosystem Management, Standards 1-2, Guidelines 1-3).
- Management direction that restricts all non-snow motorized and mechanized uses to designated travelways. (Chapter 2, Section 5, Standard 4).

Terrestrial Species – the following standards and guidelines provide protection for the terrestrial wildlife species in this category:

- Management direction that maintains habitat and restricts activities at black swift colonies (Chapter 2, Section 2, Species Requiring More Baseline Inventory and Evaluation To Determine Status, Standards 1, 2 and 3).
- Management direction that requires surveys and restricts actions for butterfly species needing more baseline information (Chapter 2, Section 2, Species Requiring More Baseline Inventory and Evaluation To Determine Status, Standard 4).
- Management direction that limits activities near spotted bat maternity roosts and hibernacula (Chapter 2, Section 2, Species Requiring More Baseline Inventory and Evaluation To Determine Status, Guideline 1).

Aquatic Species – the following standards and guidelines provide protection for the aquatic (stream and pond dwelling) species in this category:

- Management direction that protects physical stream habitat (pools, banks, large wood, riparian vegetation) (Water and Riparian Resources Standards 4, 5, and 7, and Guidelines 1 and 2, Rangeland Ecosystem Management Standard 2 and Guidelines 2 and 3, Wildlife General Standard 6, Colorado River Cutthroat Trout Standard 1 and Guidelines 4 and 5, General Recreation Standard 1, and Wilderness Resources Guideline 1)
- Management direction that protects stream flow (Water and Riparian Resources Standards 1 and 9, and Guidelines 3 and 4, and General Recreation Standard 3)
- Management direction that minimizes erosion and sedimentation from disturbances (Soils Standards 1-7 and Guidelines 1 and 4, Water and Riparian Resources Standards 2, 3, and 10, and Colorado River Cutthroat Trout Standard 2 and Guidelines 1-3)
- Management direction that protects streams and other water bodies from chemical contaminants (Soils Guideline 2, Water and Riparian Resources Standards 11, 12, and 13)

C. SPECIES FOR WHICH THERE IS CURRENTLY NO CONCERN FOR SPECIES VIABILITY ON THE FOREST

The majority of the species screened in the viability process were determined to have no major viability concerns on the forest. The list of these species can be found in the administrative record on file at the Supervisor's Office in Glenwood Springs.

Management Indicator Species Assessment

Management indicator species were identified to provide a means to monitor selected issues on the forest as required by regulation. These species or groups will be monitored during the life of the Plan in order to assess whether the proposed actions are achieving the desired conditions of the MIS. The selection process loosely followed the process to select MIS as presented in *Region 2 Management Indicator Species Selection Process and Criteria, Regional Desk Guide, Chapter G, Revision Analysis Requirements for Planning Documents*, pages G.27 to G.38, June 5, 2001. The major discussions dealt with the development of management questions based on the management issues in which the use of management indicator species may be appropriate. Initially, only those issues that were identified as management concerns in documents related to the draft Forest and Land Management Plan were considered. These documents were:

White River National Forest—Analysis of the Management Situation, July 1997

Proposed Revised Land and Resource Management Plan—White River National Forest, 2000

Draft Environmental Impact Statement—White River National Forest, October 2000 (DEIS)

USDA Forest Service Strategic Plan, 2000 Revision

Additional issues and questions were also developed based on staff specialist concerns that may not have been emphasized in the listed documents. After each monitoring question was developed, we considered possible methods to answer it. We designating a management indicator species or community only for those management issues or questions best answered by this method. Other monitoring issues and questions in the 2002 Forest Plan do not warrant the use of MIS because this is not the most efficient or appropriate method to answer them.

The emphasis in the selection of MIS was for those species or groups of species in which the monitoring of one or more of the population parameters would indicate the effects of management activities on the MIS and other species. Threatened, endangered, and sensitive species, game species, and special interest species were also considered as inclusion for use and as management indicators as appropriate. Specific species of viability concern and our management indicator species are described in more detail in the following section.

Part 2, Section 4

Species of viability concern and management indicator species

Introduction

This section summarizes the current scientific understanding about the population status of individual species of viability concern on the White River National Forest. It also includes an analysis of the environmental consequences of forest plan implementation by alternative. Species are grouped into *Terrestrial Wildlife*, *Aquatic Wildlife*, and *Plants* subsections. More detailed information can be found in FEIS Volume 4, Appendix N, *Biological Evaluation*.

TERRESTRIAL WILDLIFE

Cave Bat

- Classification** • Management Indicator Species (bat cave management)

Affected Environment

**Monitoring Question/
Reasons for Selection as MIS**

All species of cave bats were selected for monitoring to answer the question, “Are caves being managed so that bat species will continue to use the caves, and maintain populations in the areas adjacent to the caves?” This management indicator species (MIS) is specific to a group of bats that utilize caves for winter and/or maternity roosts. Some of these species may also use other substrates for winter or maternity roosts, but their population levels may only be maintained when caves with specific characteristics are available at the appropriate season. Cave bats include the Townsend’s big-eared bat and the fringed myotis, two species of viability concern on the forest (for further information, see analysis presented later in this section, Appendix N (for Townsend’s big-eared bat) and the Species Viability Reports in the White River National Forest administrative files at the Supervisor’s Office in Glenwood Springs, CO). Other species that are associated with caves include western small-footed myotis, long-legged myotis, long-eared myotis, California myotis, and big brown bat. The presence of bats at some caves on the forest will be monitored.

Habitat Description

Each species uses caves with specific microenvironment characteristics for either winter hibernation and/or raising young, and also require adequate food sources near the caves at the appropriate times of the year. These micro-environmental characteristics vary by species, so that not all caves have the necessary characteristics for all species. These cave characteristics include air temperature, movement, and moisture. Locations of roosting sites are also important in relation to possible natural and man-made disturbances. Caves are found throughout each of the cave species range, but may be concentrated in certain areas because of geological features. The

White River National Forest has the largest concentration of known caves in Colorado. Potential cave habitat occurs in five of seven ranger districts on the White River National Forest (estimated to be approximately 35,000 acres), but is mostly concentrated in the karst areas of Deep Creek and Glenwood Canyon areas. The White River National Forest also has multiple mining districts within and on the boundary of the forest. Food sources for these species generally are not limiting factors throughout most of their ranges, but areas likely exist within their ranges that have restricted forage either temporally or spatially. Food source quality and quantity is not known on the forest, but is likely adequate in most of the areas.

Cave habitat quality trends for these species is generally decreasing, mainly due to increased recreational use of caves (though restrictions for some caves that have or had large hibernaculum or maternity roosts have maintained or increased use). Cave habitat quality trends for the forest is unknown, but likely decreasing due to the increased recreational use of caves. The trend for cave habitat quantity is stable.

**Population
Description**

Many bat species that require caves for part of their life history have declined in the past, and some are, or maybe are, presently declining throughout their range. This group includes Townsend's big-eared bat and fringed myotis—two species that have been shown to be dependent on cave environments. Other species may not be as dependent on caves in all areas of their range, but require caves to maintain higher reproductive and winter survival levels in those areas of their range that include cave habitat. Some of the cave bats are considered common throughout their range and on the White River National Forest (such as little brown myotis).

Population trends for some of these species throughout their range are declining (such as Townsend's big-eared bat), and some are stable or possibly increasing. Overall, cave bat populations in general are likely stable, but may be decreasing in cave areas that are experiencing increasing recreational use. These same trends are expected on the forest.

**General
Risk Factors**

The greatest risk factor (limiting factor) for cave bats is human activities, mainly through recreational use of caves, which may disturb bats, possibly sufficiently to decrease survival or reproduction. Other risks include the use of pesticides that may decrease forage availability and increase exposure of cave bats to chemicals.

Environmental Consequences

Risk Factors

The identified general risk factor of human recreational use of caves is the main risk factor for the populations that occur on the White River National Forest. The use of pesticides on the Forest is very limited, but may impact forage or bats at a site-specific level.

**Resource
Protection
Measures**

The 2002 Forest Plan establishes key decisions for long-term direction, including forest-wide goals and objectives, forest-wide standards and guidelines, direction applying to future activities within management areas, determining suitability and capability of lands, and establishing monitoring and evaluation requirements.

The resource protection measures applicable to management of cave bats include:

Forest-wide Goals, Objectives, and Strategies, 2002 Forest Plan, Chapter 1:

- Strategies that direct us to manage for management indicator species, sensitive species and species of viability concern (Objective 1b, Strategies 1b.3 and 1b.4, Objective 1c, Strategy 1c.1).
- Strategies that direct us to manage for bat caves and mines (Objectives 1b.5 and 1b.6).
- Strategies that direct us to specifically manage for fringed myotis and Townsend's big-eared bat habitat.

Forest-wide Standards and Guidelines, 2002 Forest Plan, Chapter 2:

- Guidelines to protect cave resources (Caves, Guidelines 1, 2 and 3).
- Standards and guidelines to restrict disturbances to bat caves and mines (Wildlife, General, Standards 1, 2 and 3, Guideline 2).
- Standards and guidelines to protect bat cave and mine habitat characteristics (Wildlife, General, Standard 2).
- Standards and guidelines to protect other habitat for cave bats (Wildlife, General, Standard 4, Guidelines 3 and 4).
- Standards and guidelines to specifically protect and manage habitat and disturbances to fringed myotis and Townsend's big-eared bats (Species of Viability Concern, Terrestrial, Fringed Myotis and Townsend's Big-Eared Bat, Standards and Guidelines).

DIRECT AND INDIRECT EFFECTS

Effects on Habitat

The greatest threat to cave bats is the use of caves by recreationists. Cave exploration has been responsible for the mortality of hibernating and juvenile bats in some caves, and has resulted in reducing or eliminating bat use of some caves. Various activities, in addition to recreational cave use, occur and will occur in and near these caves that may impact the habitat or the behavior of cave bats, but the plan direction provides prohibitions, restrictions and limits on these activities. This direction would apply to all alternatives so that caves will be managed in all alternatives to maintain or improve the habitat for all cave bats.

The trend for cave habitat quantity on the White River National Forest will be stable under all alternatives. Cave bat habitat quality trend would be stable or increase under all alternatives because of implementing the strategies, standards and guidelines. No measurable difference in cave bat habitat quality between alternatives is expected since most of the cave areas (such as Glenwood Canyon and Deep Creek) are inaccessible to motorized vehicles, and forest plan direction applies to all alternatives.

Effects on Populations

Populations of cave bats are expected to be maintained throughout the areas that they currently exist. Population trends on the White River National Forest for all cave bats will likely be stable, possibly increasing, under all alternatives, since habitat quality is expected to be stable or increasing.

Table V-1

Cave bats – Estimated potential changes during the life of the 2002 Forest Plan

Cave Bats	Existing Condition	ALTERNATIVE						
		<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
Habitat Quantity	S	S	S	S	S	S	S	S
Habitat Quality	D	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN
Population Trend	S/ D	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN

CUMULATIVE EFFECTS

Actions that are occurring throughout the cave bat species ranges, including adjacent to the White River National Forest, are those risk factors already discussed, mainly disturbance from recreational use. Also, some mines in some areas may be closed without consideration of bat use or needs. All of these factors may impact the populations of cave bats. It is expected that cave bat populations will remain stable in these areas, but some species may decrease because specific roost needs may be eliminated from some caves or mines. All species are expected to maintain their presence throughout their ranges so that any changes in populations on the White River National Forest is unlikely to impact the populations on the forest.

Fringed Myotis

- Classification**
- Management Indicator Species (in the group Cave Bats, bat cave management)
 - Species of Viability Concern (refer to the Viability Report)
- Note: Caves include mines in the following discussion.

Affected Environment

Monitoring Question/	See the discussion of cave bats regarding reasons for MIS selection.
Reasons for Selection as MIS	
Reasons for Viability Concern	There is a viability concern for this species on the forest because: • The populations are few or unknown on the forest, • The habitat on the forest is vulnerable to disturbance actions that may result in negative impacts to survival or reproduction, and • The population trends throughout its range, Colorado and (likely) on the forest is unknown, but thought to be declining.
Habitat Description	Fringed myotis is a bat of mainly dry habitats. In Colorado it is found in Douglas fir, Ponderosa pine woodlands, greasewood, oak brush, and salt brush scrublands at elevations to 7,500 feet (Fitzgerald et al. 1999). Caves, mines, and sometimes buildings are used for nursery roosts. Caves and mines have been found to be used as hibernacula sites but very little is known of winter habits. No hibernacula have been found in Colorado, although it is expected that the animals hibernate in the state (Armstrong et al. 1994). Localized migrations are thought to occur but firm information is lacking (Fitzgerald et al. 1994). Fringed myotis is a colonial-roosting species with large colonies being extremely rare. Maternity and night roosts are found in caves, mines, rock crevices, buildings, bridges, and other protected sites (Western Bat Working Group (WBWG) 1998). Tree roosting and maternity sites have been documented in large conifer snags (WBWG 1998). Maternity roosts are found in sites that are generally cooler and wetter than those used by related species (WBWG 1998). Hibernacula have only been documented in buildings and underground mines (WBWG 1998, Fitzgerald et al. 1994). The White River National Forest has the largest concentration of known caves in Colorado. Potential cave habitat occurs in five of seven ranger districts on the White River National Forest (estimated to be approximately 35,000 acres), but is mostly concentrated in the karst areas of Deep Creek and Glenwood Canyon areas. The White River National Forest also has multiple mining districts within and on the boundary of the forest. No roosts for this species are documented on the forest, though they are expected. Cave habitat quality trends for this species is generally decreasing, mainly due to increased recreational use of caves (though implementing restrictions for some caves that have or had large hibernaculum or maternity roosts have maintained or increased use). Cave habitat quality trends for the White River National Forest is unknown, but is likely

decreasing due to the anticipated increase in recreational use of caves on the forest. The trend for cave habitat quantity is stable.

**Population
Description**

Fringed myotis occupies an extensive range in western North America from south-central British Colombia to Veracruz and Chiapas, Mexico, with a disjunct population in the Black Hills of Wyoming and South Dakota (Balcombe 1988). One subspecies occurs in Colorado, *Myotis thysanodes thysanodes* (Fitzgerald et al. 1994). The fringed myotis might be uncommon to rare throughout the bulk of its range, not merely at the periphery (NatureServe 2001). It is estimated that there is approximately 6-20 occurrences in Colorado (NatureServe 2001). Populations have shown fluctuations over a ten-year period (NatureServe 2001). The species is found in Colorado in the conifer woodlands and scrublands at elevations to 7,500 feet (Fitzgerald et al. 1994). It has been documented near the White River National Forest in Rio Blanco County and near the town of New Castle in Garfield County (Armstrong et al. 1994), and is believed to occur on the White River National Forest. There has been very limited inventory of this species on the White River National Forest.

Population information trend data is not available and can be only estimated at this time. For the most part the populations are estimated as declining, stable, or unknown (NatureServe 2001). The Colorado Natural Heritage Program rates this species in Colorado as S3, vulnerable in the state.

**General
Risk Factors**

The species' main risk factor is disturbance of individuals at roost sites. Another factor is activities that alter the temperature and other characteristics of roost sites.

Environmental Consequences

Risk Factors

The identified general risk factors are all risk factors for the populations that occur on the forest, mainly disturbance of roosting bats, but also the possibility of altering roost characteristics, especially at mines.

**Resource
Protection
Measures**

The 2002 Forest Plan establishes key decisions for long-term direction, including forest-wide goals and objectives, forest-wide standards and guidelines, direction applying to future activities within management areas, determining suitability and capability of lands, and establishing monitoring and evaluation requirements. The resource protection measures applicable to management of the fringed myotis that are common to all alternatives include:

Forest-wide Goals, Objectives, and Strategies, 2002 Forest Plan, Chapter 1:

- Strategies that direct us to manage for Management Indicator Species and species of viability concern (Objective 1b, Strategy 1b.4; Objective 1c, Strategy 1c.1).
- Strategies that direct us to manage for bat caves and mines (Objectives 1b.5 and 1b.6).
- Strategies that direct us to specifically manage for fringed myotis and Townsend's big-eared bat habitat (Strategy 1c.17).

Forest-wide Standards and Guidelines, 2002 Forest Plan, Chapter 2:

- Guidelines to protect cave resources (Caves, Guidelines).
- Standards and guidelines to restrict disturbances to bat caves and mines (Wildlife, Standards 1 – 3, Guideline 2).
- Standards and guidelines to protect bat cave and mine habitat (Wildlife, Standard 2).
- Standards and guidelines to protect other habitat for cave bats (Wildlife, Standard 4, Guidelines 3 and 4).
- Standards and guidelines to specifically protect and manage habitat and disturbances to fringed myotis and Townsend's big-eared bats (Fringed Myotis and Townsend's Big-Eared Bat, Standards and Guidelines).

DIRECT AND INDIRECT EFFECTS

Effects on Habitat

The greatest threat to all cave bats is the use of caves by recreationists. Cave exploration has been responsible for the mortality of hibernating and juvenile cave bats in some caves, and has resulted in reducing or eliminating bat use of some caves. Various activities, in addition to recreational cave use, occur and will occur in and near these caves that may impact the habitat or the behavior of fringed myotis, but the plan direction provides prohibitions, restrictions, and limits on these activities. This direction would apply to all alternatives, so that caves will be managed in all alternatives to maintain or improve the habitat for fringed myotis.

The trend for fringed myotis habitat quantity on the White River National Forest will be stable under all alternatives. Fringed myotis habitat quality trend would be stable or increase under all alternatives because of implementing the strategies, standards and guidelines. No measurable difference in fringed myotis habitat quality between alternatives is expected since most of the cave areas (such as Glenwood Canyon and Deep Creek) are inaccessible to motorized vehicles, and forest plan direction applies to all alternatives.

Effects on Populations

Populations of fringed myotis are expected to be maintained throughout the areas in which they currently exist. Population trends on the forest for this species will likely be stable or increasing since habitat quality is expected to be stable or increasing.

Table V-2
Fringed Myotis – Estimated potential changes during the life of the 2002 Forest Plan

<i>Fringed Myotis</i>	<i>Existing Condition</i>	ALTERNATIVE						
		<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
<i>Habitat Quantity</i>	S	S	S	S	S	S	S	S
<i>Habitat Quality</i>	D	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN
<i>Population Trend</i>	U	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN
<i>Viability Outcome</i>	II	II	II	II	II	II	II	II

CUMULATIVE EFFECTS

Actions that are occurring throughout the species' range, including adjacent to the White River National Forest, are those risk factors already discussed, mainly disturbance from recreational use. Also, some mines in some areas may be closed without consideration of bat use or needs. All of these factors may impact the populations of fringed myotis. It is expected that populations will remain stable in these areas, but some sites may decrease because specific roost needs may be eliminated from some caves or mines. Fringed myotis populations are expected to maintain their presence throughout their ranges so that any changes in populations on the forest is unlikely to impact the populations on the forest. Under all alternatives, implementing 2002 Forest Plan direction will result in ensuring a high likelihood of maintaining the presence and viability of the species on the forest.

Townsend's Big-eared Bat

- Classification**
- Management Indicator Species (in the group Cave Bats, bat cave management)
 - Species of Viability Concern (also refer to the Viability Report)
 - Sensitive Species (refer to the Biological Evaluation in Appendix N)

Note: Caves includes mines in this discussion.

Affected Environment

Monitoring Question/ See the discussion of cave bats.

Reasons for Selection as MIS

Reasons for Viability Concern/

There is a viability concern for this species on the forest because:

- The populations are rare on the White River National Forest,
- The habitat on the White River National Forest is vulnerable to disturbance actions that may result in negative impacts to survival or reproduction, and
- The population trends throughout its range, Colorado and (likely) on the White River National Forest is decreasing.

Habitat Description

Townsend's occurs in semi-desert scrublands, pinyon-juniper woodlands and open montane forests. It is recorded to the edge of spruce-fir forests in Colorado (NatureServe 2000). This species is associated with caves and abandoned mines for day roosts and hibernacula, but will also use abandoned buildings and crevices on rock cliffs for refuge (Fitzgerald et al. 1994). The distribution is strongly correlated with availability of cave or cave-like roosting habitat. Population concentrations occur in areas of rock formations, which contain substantial surface exposures of cavity forming rock, and old mining districts (Pierson et al. 1999). There are also other summer roosts that are occupied by males and non-reproductive females, not usually containing more than a few individuals at a site (Pierson et al. 1999). The hibernacula and maternity roosts have very specific requirements.

Hibernacula are relatively cold, often near the entrances and in well-ventilated areas (NatureServe 2000, Pierson et al. 1999). Hibernacula with the appropriate stable temperature and humidity appear to be a limiting resource for this bat (Fitzgerald et al. 1994).

Townsend's females gather in small nursery colonies in the warm parts of caves or mines and sometimes in buildings in the western United States. Individuals generally return to the same maternity roost in successive years (NatureServe 2000). Some factors have been identified in selection of maternity roost sites, including roost temperature, roost dimension, light quality, and air flow. Roost temperature appears to be critical (Pierson et al. 1999).

The White River National Forest has the largest concentration of known caves in Colorado. Potential cave habitat occurs in five of seven ranger districts on the White

River National Forest (estimated to be approximately 35,000 acres), but is mostly concentrated in the karst areas of Deep Creek and Glenwood Canyon areas. The White River National Forest also has multiple mining districts within and on the boundary of the forest. There are known occupied hibernacula on the White River National Forest, and likely there are other hibernacula and maternity roosts.

Cave habitat quality trends for this species is generally decreasing, mainly due to increased recreational use of caves (though restrictions for some caves that have or had large hibernaculum or maternity roosts have maintained or increased use). Cave habitat quality trends for the White River National Forest is unknown, but is likely decreasing due to the anticipated increase in recreational use of caves on the White River National Forest. The trend for cave habitat quantity is stable.

**Population
Description**

The species is rare throughout its range, with concentrations in appropriate roosting habitat. Townsend's occurs throughout much of western North America, from British Columbia to Mexico, and eastward to Texas, with isolated populations farther east. Distribution of this species seems to be determined primarily by roost site temperatures. Townsend's hibernate singly, or in clusters in some areas, from early fall to early spring. No long-distance migrations have been reported.

Many westslope Colorado counties have noted the presence of this species (Colorado Division of Wildlife (CDOW) 1984). Records of this species from Colorado only number about 350 individuals and of those individuals, about 250 are from 1990 or later. Since 1990, approximately 170 mine roosts have been documented, all but one having less than 30 animals. There are 15 cave roosts known, with all populations believed to be less than 25 individuals (Pierson et al. 1999). Thirty hibernacula have been documented in Colorado. Most of the documented hibernacula sites are small, consisting of only a few individuals per site (Pierson et al. 1999). Little historical colony size information is available for Colorado, but if they were typical to those found in other portions of its range, then dramatic declines have occurred. All known inhabited caves in Colorado have had heavy visitation with one exception, which supports the largest number of bats. In Colorado, only 11 maternity roosts have been identified.

There are two historical hibernacula sites on the White River National Forest; both are in natural caves of the Leadville limestone geological formation. One of these sites was found to have an estimate of 500 hibernating Townsend's in 1968 (Pierson et al. 1999). This cave has high recreational visitation in the summer, but winter use is limited due to limited access. This cave may still be used as a hibernaculum (a survey in 1994 indicated a there was at least some use of this particular cave). Other winter records exist, but there is a lack of specific information (Pierson et al. 1999). No maternity roosts have been documented at this time on the White River National Forest. Because there has been a lack of cave and mine inventories conducted on the White River National Forest, there is a high likelihood that there are maternity roosts on the White River National Forest.

Population trends throughout the species range are generally decreasing, including in Colorado and likely on the White River National Forest. The Colorado Natural Heritage Program rates this species in Colorado as S2, imperiled in state because of rarity and/or vulnerability.

**General
Risk Factors**

The species' main risk factor is disturbance of individuals at roost sites. Because of their roosting characteristic, they are extremely vulnerable to disturbance. In addition, because of their late flights, their seclusive habits, and the capability of these bats to avoid mist nets, these bats often go undetected unless their roost sites are known (Fitzgerald et al. 1994). Another factor is activities that alter the temperature and other characteristics of roost sites.

Environmental Consequences

Risk Factors

The identified general risk factors are all risk factors for the populations that occur on the White River National Forest, mainly disturbance of roosting bats, but also the possibility of altering roost characteristics, especially at mines.

**Resource
Protection
Measures**

The 2002 Forest Plan establishes key decisions for long-term direction, including forest-wide goals and objectives, forest-wide standards and guidelines, direction applying to future activities within management areas, determining suitability and capability of lands, and establishing monitoring and evaluation requirements. The resource protection measures applicable to management of Townsend's big-eared bat that are common to all alternatives include:

Forest-wide Goals, Objectives, and Strategies, 2002 Forest Plan, Chapter 1:

- Strategies that direct the forest to manage for Management Indicator Species, Species of Viability Concern and Sensitive Species (Objective 1b, Strategies 1b.3 and 1b.4, Objective 1c, Strategy 1c.1).
- Strategies that direct us to manage for bat caves and mines (Objectives 1b.5 and 1b.6).
- Strategies that direct us to specifically manage for fringed myotis and Townsend's big-eared bat habitat (Strategy 1c.17).

Forest-wide Standards and Guidelines, 2002 Forest Plan, Chapter 2:

- Guidelines to protect cave resources (Caves, Guidelines).
- Standards and guidelines to restrict disturbances to bat caves and mines (Wildlife, Standards 1, 2 and 3, Guideline 2).
- Standards and guidelines to protect bat cave and mine habitat (Wildlife, Standard 2).
- Standards and guidelines to protect other habitat for cave bats (Wildlife, Standard 4, Guidelines 3 and 4).
- Standards and guidelines to specifically protect and manage habitat and disturbances to fringed myotis and Townsend's big-eared bats (Fringed Myotis and Townsend's Big-Eared Bat, Standards and Guidelines).

DIRECT AND INDIRECT EFFECTS

Effects on Habitat

The greatest threat to Townsend's big-eared bat is the use of caves by recreationists. Cave exploration has been responsible for the mortality of hibernating and juvenile bats in some caves, and has resulted in reducing or eliminating bat use of some caves. Various activities, in addition to recreational cave use, occur and will occur in and near these

caves that may impact the habitat or the behavior of Townsend's, but the plan direction provides prohibitions, restrictions and limits on these activities. This direction would apply to all alternatives, so that caves will be managed in all alternatives to maintain or improve the habitat for all Townsend's.

The trend for cave habitat quantity on the White River National Forest will be stable under all alternatives. Townsend's habitat quality trend would be stable or increase under all alternatives because of implementing the strategies, standards and guidelines. No measurable difference in Townsend's habitat quality between alternatives is expected since most of the cave areas (such as Glenwood Canyon and Deep Creek) are inaccessible to motorized vehicles, and 2002 Forest Plan direction applies to all alternatives.

Effects on Populations

Populations of Townsend's are expected to be maintained throughout the areas in which they currently exist. Population trends on the White River National Forest for Townsend's will likely be stable or increasing since habitat quality is expected to be stable or increasing.

Table V-3
Townsend's Big-eared Bat – Estimated potential changes during the life of the 2002 Forest Plan

<i>Townsend's Big-eared bat</i>	<i>Existing Condition</i>	ALTERNATIVE						
		<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
<i>Habitat Quantity</i>	S	S	S	S	S	S	S	S
<i>Habitat Quality</i>	D	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN
<i>Population Trend</i>	D	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN
<i>Viability Outcome</i>	II	II	II	II	II	II	II	II

Key: D – Decreasing; S – Stable; IN – Increasing

CUMULATIVE EFFECTS

Actions that are occurring throughout the species ranges, including adjacent to the White River National Forest, are those risk factors already discussed, mainly disturbance from recreational use. Also, some mines in some areas may be closed without consideration of bat use or needs. All of these factors may impact the populations of Townsend's. It is expected that populations will remain stable in these areas, but some sites may decrease because specific roost needs may be eliminated from some caves or mines. The species is expected to maintain its presence throughout its range so that any changes in populations off the White River National Forest is unlikely to impact the populations on the White River National Forest. Under all alternatives, implementing 2002 Forest Plan direction will result in ensuring a high likelihood of maintaining the presence and viability of the species on the White River National Forest.

Elk

- Classification**
- Management Indicator Species (motorized/non-motorized travel and recreation management)

Affected Environment

Reasons for Selection as MIS

This species was selected for monitoring to answer the question “Does Forest motorized and non-motorized travel and recreation management result in effective use of habitat by large ungulates?” Since recreation is the predominant use of the White River National Forest (Recreation Management), the effectiveness, quality and quantity of habitat will be impacted for some wildlife species (Terrestrial Wildlife). These actions would mostly impact those species that require seclusion and/or large landscapes, such as wolverine, lynx, elk, and deer. Elk occur throughout the White River National Forest, and use all of the major vegetated cover types at certain times of the year. Calving and winter use are critical periods for elk, which travel and recreation management could impact. The White River National Forest will coordinate with the Colorado Division of Wildlife in monitoring elk dispersal, and the specific actions that impact dispersal, on the White River National Forest.

Habitat Description

The habitat for this species occurs throughout the mountainous regions of western North America. The habitat on the White River National Forest includes all the major vegetation types, and most of the minor types. The White River National Forest provides most of the summer range for the herds in general area. Certain areas in the extreme lower elevations of the White River National Forest are used as winter or transitional range, but the vast majority of the winter range occurs off the White River National Forest.

Generally, the current trend for habitat quality and quantity throughout the species range and on the White River National Forest is likely stable or increasing due to improvements in ungulate and vegetation management that maintain or improve elk habitat. Specifically, the trend for winter habitat quality and quantity adjacent to the White River National Forest (and in some portions of its range) is decreasing because of development and conversion of habitat.

Population Description

This species occurs throughout the mountainous regions of the western United States and Canada. The populations throughout its range were very low in the early 1900's. Existing levels throughout its range are at or above historic levels because of reintroductions and population management. Current elk populations throughout most of the White River National Forest are above desired levels (as determined by the Colorado Division of Wildlife).

Population trends throughout the species range are generally increasing. The trend throughout most of the White River National Forest is increasing, but some areas are stable or decreasing due to population control through hunting (e.g., DAU E-13, Andy Holland, pers. comm.).

General Risk Factors	The main risk factors (limiting factors) for effective use of habitat throughout the species range are the reduction of forage and cover habitat (primary concern is winter range) and disturbance from human uses, especially in calving and wintering areas. Actions that impact the quality and quantity of forage and cover include residential and commercial development, conversion of grasslands and shrublands for agricultural use, and suppression of low-intensity fires. Human uses that impact elk use of habitat include motorized and non-motorized recreational, administrative and commercial use on and off roads and trails.

Environmental Consequences

Risk Factors	The main risk factor on the White River National Forest is the reduction of habitat quality through disturbance to elk from motorized and non-motorized recreational use on and off roads/trails. The 2002 Forest Plan provides varying intensities and seasons of use of recreational activities such as off-road vehicles, hiking, skiing, and bicycling. These activities would mainly impact the effective use and dispersal of elk throughout the landscape. The more effective use of the habitat, the more likely there would be fewer resource conflicts with other resource uses on and off the White River National Forest. Another risk factor, and associated with disturbance, is the quality of habitat on the White River National Forest, especially winter habitat. The higher the quality of habitat, including both for forage and cover, the less likely there would be conflicts with other forest uses, and the more likely elk would stay on the White River National Forest longer into the winter

Resource Protection Measures	The 2002 Forest Plan establishes key decisions for long-term direction, including forest-wide goals and objectives, forest-wide standards and guidelines, direction applying to future activities within management areas, determining suitability and capability of lands, and establishing monitoring and evaluation requirements. The Resource Protection Measures applicable to management of elk that are common to all alternatives include:

Forest-wide Goals, Objectives, and Strategies, 2002 Forest Plan, Chapter 1:

- Strategies that direct us to manage for Management Indicator Species (Objective 1b, Strategy 1b.4).

Forest-wide Standards and Guidelines, 2002 Forest Plan, Chapter 2:

- Restrictions on activities that may disturb elk (Wildlife, Standard 1).
- Vegetation and travel management restrictions to provide minimum elk habitat effectiveness (Wildlife Standard 7).
- Direction for designing structures considering elk movement (Wildlife Guideline 1).
- Direction to manage livestock to achieve desired conditions with consideration of wildlife use (Rangeland Ecosystem Management Standards and Guidelines).
- Direction on the size and location of openings created through vegetation management (Silviculture Standards 5, 6, 8, 11).
- Direction on the use of fire to manage for resource objectives (Fire Guidelines).
- Travel management direction to consider other resources (Travel System Infrastructure Standards 2 through 6, Guidelines 1, 4, 5).

Management Area Direction (2002 Forest Plan, Chapter 3 – Management Area Direction)

- Direction to specifically management for deer and elk winter range (MA 5.41, Deer and Elk Winter Range).
- Direction to specifically manage for elk calving, migration, summer and incidental winter range (MA 5.43, Elk Habitat).

DIRECT AND INDIRECT EFFECTS

Effects on Habitat

The major impacts to elk habitat and use are travel/recreation and vegetation management. Alternatives vary in travel and recreation management through the direction of MA allocations and recreation opportunity spectrum (ROS) designations. Alternatives differ in areas that allow motorized and non-motorized use on and off established routes during snow periods (winter) and snow-free periods (summer). Generally, alternatives with the most acres of motorized use will result in more disturbances to wildlife as compared with alternatives with fewer acres of motorized use, with acres of off-route motorized use having the greatest impact on elk use (for more detailed analysis, see the General Wildlife analysis for travel and recreation management on wildlife in the Terrestrial Wildlife section). Since many of these disturbances will be mitigated by 2002 Forest Plan direction (i.e., such as seasonal and permanent restrictions, road closures and obliterations and other direction), differences between alternatives likely are not reflected by differences in acres of motorized and non-motorized use. Of the vegetation management activities, timber and fire/fuels management will have the major impacts on habitat quality and quantity. The expected outcome for the ten years following implementation of the 2002 Forest Plan (under the experienced budget level) for acres harvested, thinned or burned ranges from 48,000 acres in Alternative I to 80,000 acres in Alternative K (for more detailed analysis, see the General Wildlife analysis for timber management and fire management on wildlife in the Terrestrial Wildlife section). These actions could increase or decrease the elk habitat quality depending on the prescriptions implemented.

A more appropriate analysis to measure differences between alternatives is by analyzing the differences in allocations specifically for elk management (this is presented in more detail in the Terrestrial Wildlife section, Elk Habitat Management). These management areas will be specifically managed for effective elk habitat and utilization, including vegetation management activities and travel/recreation management. These areas are fairly well dispersed across the White River National Forest in all alternatives in the mid to lower elevations. In summary, the more allocations in management areas (MAs) 5.41 and 5.43, the more effectively disturbance and forage and cover habitat will be managed to disperse elk throughout the White River National Forest and maintain them on forest lands longer during the winter. Based on these management allocations, Alternatives D and K (with 389,000 acres in these MAs) are more likely to result in greater effective elk habitat use than Alternative F (with 217,000 acres) (Table 3-50, Acres dedicated for elk management on the White River National Forest).

During the life of the 2002 Forest Plan, it is difficult to predict the habitat trend since events such as catastrophic fire and insect epidemics are unknown. In the absence of these events, the trend for habitat quality from implementation of the 2002 Forest Plan is

likely to remain stable or improve in all alternatives forest-wide. There may be small differences between alternatives based on the acres allocated to MAs 5.41 and 5.43, assuming pro-active management (such as vegetation management and road closures) are implemented (the more acres in these MAs, the more likely habitat quality will improve) (Table V-4, Elk). The trend for the quantity of habitat is not expected to change under any alternative since 2002 Forest Plan direction will not convert elk habitat to types that are not elk habitat.

Effects on Populations

Elk populations are not only influenced by the quality and quantity of habitat, but also by predation and hunting (see cumulative effects). Because of the unknown cumulative effects, it is unknown if elk populations on the White River National Forest will remain stable, increase or decrease during the life of the 2002 Forest Plan.

Table V-4

Elk – Estimated potential changes and alternative comparisons of elk habitat and populations during the life of the 2002 Forest Plan

Elk	Existing Condition	ALTERNATIVE						
		B	C	D	E	F	I	K
Habitat Quantity	S (most of the forest)	S	S	S	S	S	S	S
Habitat Quality	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN
Population Trend	IN	U	U	U	U	U	U	U

Key: D – Decreasing; S – Stable; IN – Increasing; U – Unknown

Note: Habitat quality comparison between alternatives is a relative comparison computed by dividing the acres allocated to MAs 5.41 and 5.43 in each alternative divided by the maximum allocated (389,000 acres in Alternatives D and K). The higher the number, the more effective management may be in dispersing elk across the Forest and maintaining elk on the White River National Forest.

CUMULATIVE EFFECTS

Other actions are occurring off the White River National Forest that influence elk populations. Commercial and residential development adjacent to the White River National Forest has occurred in the past and is expected to continue to occur during the life of the 2002 Forest Plan. Many of the developments have and are occurring on winter range, generally with the effect of eliminating most of the winter use in these areas. Lands adjacent to the White River National Forest, especially private lands, generally have a higher road density and more use than on the adjacent White River National Forest lands. Both development and higher use on adjacent land to the White River National Forest is resulting in ineffective use of winter range in some areas off the White River National Forest, and possibly will result in increased use of winter range on the White River National Forest. There may be increased use of elk in the winter ranges on

the White River National Forest that may impact quality, but specific management in these areas will likely maintain or improve the habitat quality. The impacts on winter habitat quality on the White River National Forest from implementing the 2002 Forest Plan and considering all impacts will likely to be stable. Considering implementing the 2002 Forest Plan and all the impacts, both on and off Forest, the habitat quality trend on the White River National Forest (including winter, summer, migratory and calving habitat) is likely to be stable or increasing (Table V-4, Elk). Populations are dependent on a variety of factors including habitat quantity and quality, predation, weather and hunting. Because of the unknowns from hunting and weather, it is unknown if elk populations will remain stable, increase or decrease during the life of the 2002 Forest Plan (Table V-4, Elk). Considering all possible impacts, the effective use of habitat on the White River National Forest by elk will vary by alternative by the acres allocated in MAs 5.41 and 5.43. The more acres allocated in these MAs, the higher effective use of habitat by elk (this is presented in more detail in Terrestrial Wildlife section, Elk Habitat Management) (Table V-4, Elk).

Barrow's Goldeneye

- Classification**
- Species of Viability Concern (also refer to the Viability Report)

Affected Environment

Reasons for Viability Concern

There is a viability concern for this species on the forest because:

- The population on the White River National Forest is the only known population in Colorado,
- The population is small and the population trend is unknown, and
- The known breeding habitat is limited to one area on the White River National Forest.

Habitat Description

This species usually nests in the cavities of large snags. Soft snags, broken top snags, woodpecker cavities and natural cavities are especially important since they are secondary cavity nesters. Females return year after year to the same nest cavity if it remains suitable (Bellrose 1976). Tree species documented as being used for nesting cavities include Douglas-fir, aspen, cottonwood, ponderosa pine, and Engelmann spruce (Palmer 1976). Most cavity nest sites described are either in trees standing in water or within 30.5 meters (100 feet) of its edge, but have been reported as far as 1.3 miles away depending on nest site availability (Savard et al. 1991). In some areas of their range, they have been reported to nest in ground cavities (British Columbia), holes in basalt cliffs (eastern Washington), rock crevices (Alaska), and on the ground (common in Iceland) (Palmer 1976). In Colorado, nest site descriptions are limited in number, but all are described as tree cavities (Kingery and Kingery 1989, Chuck Reichert pers. comm.).

Palmer (1976) states that in western North America moderately alkaline lakes of small to medium size in parkland areas support the highest concentrations of brood-rearing goldeneyes, with the highest use of lakes that are 1.5 to 4.6 meters (5 to 15 feet) deep and have a dense growth of submerged aquatic vegetation. The species uses more fishless lakes than lakes with fish, because a lack of fish results in an increase in the abundance of macro invertebrates (Poysa et al 1994). Adult females breeding on small lakes move to larger but nearby water areas for the molt, whereas those on larger lakes usually remain there (Bellrose 1976). Molting post breeders prefer larger water bodies (Palmer 1976). Molting sites are important as they concentrate and support most of the males of the population at a vulnerable time during the flight period (Savard and Dupuis 1999). After molting there is a local elevation migration among these ducks as they move from the freezing waters of the high sub alpine and parkland lakes to the lower valleys where open waters persist throughout the winter (Bellrose 1976, Bent 1925, del Hoyo et al. 1992). They prefer larger lakes and reservoirs at the lower elevations, moving to rivers and other smaller open water sources only when ice forces them to move. In Colorado, this species remains on waters kept open by springs, diversion systems, and dams, as well as on portions of rapid rivers that do freeze (Palmer 1976, Reeser 1969).

Habitat for this species (based mainly on existing populations) occurs primarily in northwestern North America, with isolated populations in Iceland and eastern North America. The only known occupied habitat in Colorado is on the White River National

Forest. Current occupied habitat is on the Flat Tops, but areas with goldeneye breeding habitat characteristics occur throughout the Flat Tops and in the Battlement Mesa area. Most of the known occupied breeding habitat is within wilderness.

Current habitat trends throughout the species range are not known (reports of both increasing or decreasing, depending on area), but the trend on the White River National Forest (Colorado) is likely stable since few management actions occur in habitat near the breeding ponds (most of the occupied nesting habitat is in wilderness areas).

**Population
Description**

The breeding range of the common goldeneye is largely restricted to northwestern North America. More than seventy percent of the population breeds and winters west of the Rocky Mountains (over 100,000 birds). Two eastern populations occur in Iceland (600-1200 birds) and in eastern North America (2000-4000 birds) (Savard and Dupuis 1999). The entire world population is probably in the region of 200,000 breeding birds (del Hoyo et al. 1992). In Colorado, Barrow's goldeneye is endemic to the Flat Tops of the White River National Forest and this contingent probably does not exceed 100 pairs (Potter 1998). Although early breeding records came from several locations in the state (Cooke 1897), there are no records from the 19th century (Kingery and Kingery 1989) and recent records are known only from the White River National Forest (Kingery and Kingery 1989, Massey 1993, Potter 1998).

Population trends throughout the species range are generally unknown (some areas may be decreasing, some stable, some increasing), but the trend on the White River National Forest during the breeding season is likely stable since few actions occur in wilderness where most of the occupied nesting habitat is located. The Colorado Natural Heritage Program rates this species as S2, imperiled in the state because of rarity or vulnerability.

**General
Risk Factors**

The major risk factors (limiting factors) throughout the species range are the reduction of nesting cavity substrates through vegetation management and reduction of food sources through livestock management, non-native aquatic introductions, and pesticide use. Timber, fuelwood, and fire management have the possibility of reducing the nest cavity snags. Livestock concentrations around water may effect water quality and plant composition at small lakes, which may alter the quality or quantity of invertebrate forage species. Fish enhancement or introductions may decrease the availability of invertebrate forage species through predation or competition. Pesticides that transfer to small lakes may directly kill forage species, or indirectly alter habitat that reduces forage availability.

Environmental Consequences

Risk Factors

The identified general risk factors are all risk factors for the populations that may occur on the White River National Forest.

**Resource
Protection
Measures**

The 2002 Forest Plan establishes key decisions for long-term direction, including forest-wide goals and objectives, forest-wide standards and guidelines, direction applying to future activities within management areas, determining suitability and capability of lands, and establishing monitoring and evaluation requirements.

The resource protection measures applicable to management of the Barrow's goldeneye that are common to all alternatives include:

Forest-wide Goals, Objectives, and Strategies, 2002 Forest Plan, Chapter 1:

- Strategies that direct us to manage for Species of Viability Concern (Objective 1c, Strategy 1c.1).
- Strategies that direct us to manage for Barrow's goldeneye nesting and foraging habitat (Strategies 1c.18 and 1c.19).

Forest-wide Standards and Guidelines, 2002 Forest Plan, Chapter 2:

- Standards and guidelines that maintain water and riparian resource healthy conditions (Water and Riparian Resources, Standards and Guidelines).
- Standards that direct the Forest to maintain and manage for at least a minimum number of snags and large snags dispersed throughout the landscape (Biodiversity Standards 2 and 3).
- Guideline directing to favor native and desirable non-native species over undesirable non-native species (Biological, Biodiversity, Guideline 1).
- Standards and guidelines to manage livestock to achieve or maintain the desired conditions (Biological, Rangeland Ecosystem Management, Standard 2, Guidelines—all).
- Standards restricting disturbances (Biological, Wildlife, Standard 1; Barrow's Goldeneye Guideline 2).
- Specific direction for Barrow's goldeneye that directs the Forest to: Manage and maintain current and future goldeneye cavity trees and snags, and foraging habitat, in occupied, suspected and potential habitat (Biological, Barrow's Goldeneye Standards 1-4, Guidelines 1 and 2).

DIRECT AND INDIRECT EFFECTS

Effects on Habitat

The major impacts to goldeneye nesting habitat substrates are vegetation management. Of the vegetation management activities, timber management and prescribed fire will have the major impacts on habitat quality and quantity. The expected outcome for the ten years following implementation of the 2002 Forest Plan (under the experienced budget level) for acres harvested, thinned or prescribed burned ranges from 48,000 acres in Alternative I to 80,000 acres in Alternative K (for more detailed analysis, see the General Wildlife analysis for timber management and fire management on wildlife in the Terrestrial Wildlife section). These actions could result in removal of snags and trees that may provide existing or future adequate nesting cavities for goldeneyes. This impact to possible nest sites may vary between alternatives, but considering that most of the known (and likely potential) habitat is within wilderness areas, and that 2002 Forest Plan direction requires adequate nesting snags within goldeneye habitat under all alternatives, these differences would be small, and likely not measurable.

Livestock management, fisheries management, and pesticide use may impact the forage quality and quantity of goldeneye habitat. The 2002 Forest Plan directs that these activities be managed so that forage quality and quantity will be maintained, and that the

survival and reproduction of goldeneyes will be maintained. This direction applies to all alternatives, so that no difference between alternatives is expected.

During the life of the 2002 Forest Plan, it is difficult to predict the habitat trend since events such as catastrophic fire and insect epidemics are unknown. In the absence of these events, the trend for habitat quality from implementation of the 2002 Forest Plan is likely to remain stable in all alternatives forest-wide (Table V-5, Barrow's Goldeneye). There may be small differences between alternatives at the site-specific level, but these differences will likely not be measurable forest-wide. The trend for the quantity of habitat is not expected to change under any alternative since 2002 Forest Plan direction applies to all alternatives.

Effects on Populations

Since habitat in occupied and potential goldeneye habitat will likely remain stable over time, the likelihood of Forest management activities impacting Barrow's goldeneye populations on the White River National Forest is low for all alternatives. With the habitat quality and quantity expected to remain stable, and assuming the continued genetic exchange with populations off the White River National Forest (see Cumulative Effects), the goldeneye populations on the White River National Forest are expected to show a stable trend for all alternatives (Table V-5, Barrow's Goldeneye).

Table V-5
Barrow's Goldeneye – Estimated potential changes during the life of the 2002 Forest Plan

<i>Barrow's Goldeneye</i>	<i>Existing Condition</i>	ALTERNATIVE						
		<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
<i>Habitat Quantity</i>	S	S	S	S	S	S	S	S
<i>Habitat Quality</i>	S	S	S	S	S	S	S	S
<i>Population Trend</i>	S	S	S	S	S	S	S	S
<i>Viability Outcome</i>	II	II	II	II	II	II	II	II

Key: D – Decreasing; S – Stable; IN – Increasing; U – Unknown

CUMULATIVE EFFECTS

Actions are occurring in goldeneye habitat off the White River National Forest in some parts of its range. Timber harvest and fire (both prescribed and uncontrolled) impact the nesting substrates and water quality of habitat. Other actions may impact the forage for this species, but specific impacted areas are not known. It is unknown specifically what the trend for habitat quality or quantity is throughout its range, but populations may have been increasing in much of western North America for the last 30 years. Assuming that genetic interchange of the White River National Forest's population with populations outside the White River National Forest, the population on the White River National Forest should remain stable (Table V-5, Barrow's Goldeneye). Under all alternatives, implementing 2002 Forest Plan direction will result in ensuring a high likelihood of maintaining the presence and viability of the species on the White River National Forest.

Northern Sage Grouse and Brewer's Sparrow

- Classification**
- Management Indicator Species (sagebrush management)
 - Species of Viability Concern (also refer to the Viability Reports for each species)

Affected Environment

**Monitoring Question/
Reasons for Selection as MIS**

These species were selected for monitoring to answer the question, "Is sagebrush habitat being managed adequately to provide the quality and quantity of habitat for species dependent or strongly associated with sagebrush?" Both of these species are sagebrush obligates, and both have experienced population declines as the sagebrush cover type throughout their ranges has decreased. Most other species associated with sagebrush (such as sage sparrow) have experienced population declines in the past, though most not as significant as sage grouse and Brewer's sparrow. The populations and habitat of both species will be monitored on the White River National Forest in each species appropriate habitats.

Reasons for Viability Concern

There is a viability concern for this species on the forest because:

- The habitat and populations are limited on the forest,
- The habitat on the forest is vulnerable to vegetation management that may result in negative impacts to sagebrush habitat quality and quantity, and
- The species population trends in Colorado and throughout their ranges have been decreasing for an extended period of time.

Habitat Description

Both of these species are sagebrush obligates, requiring the sagebrush cover type to reproduce. Sage grouse also winter in the sagebrush cover type. Brewer's sparrows usually nest in large sagebrush plants, generally within sagebrush stands that are 5 acres in size or greater. Sage grouse require large expanses of sagebrush for winter habitat since they feed mainly on sagebrush during the winter, but breeding habitat is characterized by a mix of open and closed canopy sagebrush. Grouse also prefer the more wet or mesic areas since these areas tend to produce more forage for the young during the summer. More detailed discussion of the habitat needs and concerns for these species can be found in their individual Species Viability Reports (White River National Forest files).

Generally, the current trend for habitat throughout the species' range is likely decreasing because of continued conversion of sagebrush to other vegetation types and residential and commercial development. The sagebrush community comprises about 43,000 acres across the forest. While it is likely that some of the sagebrush cover type has decreased due to type conversions (mainly to grassland, but also includes losses from creation of reservoirs), the current trend in habitat quantity on the White River National Forest is now likely stable (no cover type conversions). Sagebrush habitat quality is likely decreasing on the forest due to very little natural disturbance of the cover type that would produce greater diversity in composition and structure.

Population Description

The historic distribution of these species generally coincides with the sagebrush cover type throughout western North America. Brewer's sparrows likely still occur in varying densities throughout the sagebrush cover type in the west. Sage grouse

populations have been extirpated from parts of its range (such as New Mexico and parts of Oregon and Washington). On the White River National Forest, Brewer's sparrow is still found throughout much of the sagebrush cover type, but sage grouse are limited to lower elevation sagebrush that is adjacent to or near sagebrush on private and BLM lands (such as along the Blue River and north of Eagle).

Population trends for both species are decreasing throughout their ranges, including Colorado. The trends on the White River National Forest for sage grouse are likely to be decreasing also. The trends on the forest for Brewer's sparrow are unknown since this species is not monitored well on or adjacent to the forest. The Colorado Natural Heritage Program rates the northern sage grouse as S3/S4 (Watchlisted) and the Brewer's sparrow as S4 (apparently secure).

**General
Risk Factors**

The main risk factor (limiting factor) throughout these species' ranges is the conversion of the sagebrush cover type to other cover types, including through agriculture and residential/commercial development. Another risk factor is the continued decrease of herbaceous growth for cover and forage, including through livestock management practices that decrease the herbaceous density and through suppression of low and moderate intensity fires that moderated shrub canopy cover and regeneration. Other risk factors for sage grouse are the reduction of wet and mesic areas for brood rearing. Other risk factors for Brewer's sparrow are nest parasitism from cowbirds that may be associated with livestock management. Further discussion of the habitat needs and concerns for these species can be found in the individual Species Viability Report (WRNF files).

Environmental Consequences

Risk Factors

The identified general risk factors are all risk factors for the populations that occur on the White River National Forest, including the decrease of herbaceous cover and forage and impacts to wet and mesic areas. Conversion of the sagebrush cover type has likely occurred in the past, but current management emphases are not likely to result in any widespread conversions.

**Resource
Protection
Measures**

The 2002 Forest Plan establishes key decisions for long-term direction, including forest-wide goals and objectives, forest-wide standards and guidelines, direction applying to future activities within management areas, determining suitability and capability of lands, and establishing monitoring and evaluation requirements. The resource protection measures applicable to management of northern sage grouse and Brewer's sparrow that are common to all alternatives include:

Forest-wide Goals, Objectives, and Strategies, 2002 Forest Plan, Chapter 1:

- Strategies that direct us to manage for Management Indicator Species and Species of Viability Concern (Objective 1b, Strategies 1b.4, Objective 1c, Strategy 1c.1).
- Strategies that direct us to manage for northern sage grouse and Brewer's sparrow sagebrush habitat (Strategies 1c.20, 1c.21 and 1c.22).

Forest-wide Standards and Guidelines, 2002 Forest Plan, Chapter 2:

- Direction to manage and maintain the ecological function of riparian and wetland areas (Water and Riparian Resources, Standards 5 and 8, Guidelines 2, 3, and 4; Wildlife, Standard 6; Sage Grouse and Brewer's Sparrow, Guideline 7).
- Direction to manage livestock to manage for or maintain the desired conditions (Rangeland Ecosystem Management, Standards and Guidelines).
- Specific direction for northern sage grouse and Brewer's sparrow that directs the Forest to: maintain and enhance sagebrush habitat, including breeding and foraging habitat (Sage Grouse and Brewer's Sparrow, Standards 1, 2, and 3, Guidelines 1-4); restrict activities that may negatively impact the survival or reproduction of sage grouse and Brewer's sparrow (Sage Grouse and Brewer's Sparrow, Standard 4, Guidelines 5 and 6).

DIRECT AND INDIRECT EFFECTS

Effects on Habitat

Various activities occur and will occur in sagebrush habitat that may impact the habitat or the behavior of sage grouse and Brewer's sparrow, but the 2002 Forest Plan direction provides prohibitions, restrictions, and limits on these activities, which include livestock management, fire management, recreation use, road management, and structure installation. This direction would apply to all alternatives, so that sagebrush habitat will be managed in all alternatives to maintain or improve the habitat for sage grouse and Brewer's sparrow. There may be measurable impacts of these activities at the site-specific level, but there would be no measurable differences between alternatives at the Forest level on the sage grouse and Brewer's sparrow populations.

Considering that the Plan directs that sagebrush habitat be actively managed, the trend for both habitat quality and quantity is expected to increase during the life of the 2002 Forest Plan, though this increase may be very small and difficult to measure (Tables V-6, Northern Sage Grouse, and V-7, Brewer's Sparrow).

Effects on Populations

Since sagebrush habitat is expected to improve, populations of Brewer's sparrows are expected to remain stable or increase during the life of the 2002 Forest Plan. The trend for sage grouse populations is strongly dependent on the status of habitat outside of the White River National Forest, so the trend, based only on forest actions, is unknown (see Cumulative Effects).

Table V-6
Northern Sage Grouse—Estimated potential changes during the life of the 2002 Forest Plan

Northern Sage Grouse	Existing Condition	ALTERNATIVE						
		<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
Habitat Quantity	Approx. 43,000 acres	IN	IN	IN	IN	IN	IN	IN
Habitat Quality	D	IN	IN	IN	IN	IN	IN	IN
Population Trend	D	IN	IN	IN	IN	IN	IN	IN
Viability Outcome	III	II	II	II	II	II	II	II

Key: D – Decreasing; S – Stable; IN – Increasing; U – Unknown

Table V-7
Brewer's Sparrow – Estimated potential changes during the life of the 2002 Forest Plan

Brewer's Sparrow	Existing Condition	ALTERNATIVE						
		<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
Habitat Quantity	Approx. 43,000 acres	IN	IN	IN	IN	IN	IN	IN
Habitat Quality	D	IN	IN	IN	IN	IN	IN	IN
Population Trend	U	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN
Viability Outcome	II	II	II	II	II	II	II	II

Key: D – Decreasing; S – Stable; IN – Increasing; U – Unknown

CUMULATIVE EFFECTS

Actions are occurring off the White River National Forest that is impacting the quantity and quality of sagebrush habitat. The conversion of the sagebrush cover type to other cover types, such as agricultural and residential/commercial development, is continuing adjacent to the White River National Forest as communities continue to grow. Livestock grazing continues in the sagebrush areas, though this management may be changing to allow more herbaceous growth and protection of springs and other wet areas that provide forage for sage grouse. Actions throughout the range of these species will likely result in localized decreases in habitat and subsequent populations.

Broad-scale management plans specifically for sage grouse and sagebrush management are being developed for some sage grouse populations. For example, this includes the Middle Park sage grouse population—part of their range being on the forest near the Blue River. These plans are likely to result in improvements for sagebrush habitats adjacent to the forest. If plans for the other sage grouse populations are developed, and the plans are

implemented, we anticipate that these populations that also use portions of the forest during all or some seasons should increase (**Table V-6**, Northern Sage Grouse).

Trends for Brewer's sparrow adjacent to the White River National Forest are anticipated to remain stable or increase based on implementing the current and possible future plans for sage grouse. The populations on the White River National Forest are anticipated to remain stable or increase also since habitat on the forest will improve, and genetic exchange with sparrows off the Forest will continue (**Table V-7**, Brewer's Sparrow).

Snowshoe Hare

- Classification**
- Management Indicator Species (early seral lodgepole pine and spruce-fir management)

Affected Environment

Monitoring Question/ Reasons for Selection as MIS	This species was selected for monitoring to answer the question, “Does forest management maintain populations of species strongly associated with early seral lodgepole pine and spruce-fir habitat?” Snowshoe hare is very responsive to vegetation treatments, so population numbers in a project area may fluctuate as habitat characteristics change. Early seral conditions provided near spruce-fir habitat capable of supporting snowshoe hares may provide habitat conditions that result in population increases in some years. This is not only important for species like lynx, but also for other predators that prey on hares and other prey species that use early seral habitats. Selected areas of early seral lodgepole pine and spruce-fir snowshoe hare habitat and populations will be monitored on the White River National Forest.
Habitat Description	Snowshoe hare habitat is found in the montane, sub-boreal and boreal forests of northern North America, including Alaska. On the White River National Forest, snowshoe populations are generally dependent on late-successional forests, especially spruce-fir, but will also use early seral habitat. Generally, this early seral habitat would be considered summer forage, as opposed to winter forage areas that can be used throughout the year. There are currently about 40,000 acres of early seral conifer stands on the forest that may be hare summer foraging habitat. The trend for the summer habitat quality is likely stable (very little change recently). There currently are over 800,000 acres of winter and/or summer foraging habitat on the forest.
Population Description	Throughout most of the species range, wide fluctuations in population occur, generally on ten-year cycles. These cycles generally are not as evident in the southern portions of the range. Because of the stability and naturally fragmented nature of many spruce-fir stands on the forest, hare populations remain at a low and fairly constant population levels (Dolbeer and Clark 1975). The population trend in Colorado is thought to be relatively stable, which is likely the trend on the forest also.
General Risk Factors	The main risk factor (limiting factor) is vegetation management actions, such as timber management, that may decrease the density and cover of winter habitat that is necessary for hare survival.

Environmental Consequences

Risk Factors	The identified general risk factors are the main risk factor for the populations that occur on the White River National Forest, including the use of timber management and other actions to alter winter habitat.
Resource Protection Measures	The 2002 Forest Plan establishes key decisions for long-term direction, including forest-wide goals and objectives, forest-wide standards and guidelines, direction applying to future activities within management areas, determining suitability and capability of lands, and establishing monitoring and evaluation requirements. The resource protection measures applicable to management of snowshoe hare includes:

Forest-wide Goals, Objectives, and Strategies, 2002 Forest Plan, Chapter 1:

- Strategies that direct us to manage for Management Indicator Species (Objective 1b, Strategies 1b.4, Objective 1c, Strategy 1c.1 (as prey for lynx)).
- Strategies that direct us to manage for snowshoe hare as a prey species for lynx (Objective 1b, Strategy 1b.1, Objective 1c, Strategies 1c.1, 1c.2, 1c.5, and 1c.6).

Forest-wide Standards and Guidelines, 2002 Forest Plan, Chapter 2:

- Standards and guidelines to manage for hares as a prey source for lynx (Proposed, Threatened, Endangered and Sensitive Species, Canada Lynx, Standards 1, 3, 5, 6, 7, and 8, Guidelines 2, 4, 5, 12, and 13).

DIRECT AND INDIRECT EFFECTS

Effects on Habitat

The main activity that would provide early seral habitat for hare is timber management. Alternative F provides the greatest level of timber harvest that may result in more young seral stands than any other alternative (see the discussion of timber management impacts on wildlife in the Terrestrial Wildlife section). In the first decade, approximately 19,000 acres may be treated. If all the treatments resulted in early seral habitat (which is unlikely), a total of 59,000 acres of young seral stands may be available for summer forage at the end of the decade. If these acres were next to late-successional forests, they may provide additional summer forage habitat, which could increase the populations in the short-term. Young seral snowshoe hare habitat may be provided during the life of the forest plan at varying levels based on activities planned for each alternative. Alternatives B (12,000 acres), K (10,000 acres), and D (9,000 acres) would also provide more early seral habitat for the hare than at present. The remaining alternatives may result in low levels of new early seral habitat (less than 6,000 acres).

Timber management may also impact winter habitat (late-successional forests). Winter habitat is necessary to maintain hare populations through the winter. It is anticipated that only a small percentage of the hare winter habitat or the dispersal of winter habitat throughout the Forest will be impacted by timber management actions (that is, future condition will be similar to existing condition).

Other actions, such as fire/fuels management and ski areas, may impact hare habitat, but these actions are expected to impact relatively few acres of hare habitat.

Plan strategies, standards, and guidelines provide direction for lynx management that will maintain the quality and quantity of lynx habitat necessary for the desired lynx population (see the discussion on lynx in this section and in Appendix N for more details). This direction includes managing habitat for the snowshoe hare, the lynx's main forage species. This direction would apply to all alternatives, so that lynx habitat will be managed in all alternatives to provide the desired habitat for snowshoe hares.

If all the timber management actions resulted in an increase in summer habitat adjacent to winter habitat, the trend for summer habitat quantity and quality would increase under all alternatives. The degree of increase may vary between alternatives based on the expected entered acres.

Effects on Populations

Based only on the increase in early seral habitat and assuming that adequate winter habitat is available to maintain populations in the winter, the trend for hares on the White River National Forest may increase under all alternatives. Since early seral habitat represents only a small portion of the hare habitat on the forest, there likely will not be measurable population differences between alternatives. There may be differences between alternatives, but since it is unknown how much actual summer or winter habitat would be impacted by the proposed actions, actual population trends on the forest are unknown. There may be changes in populations at the site-specific level dependent on prescriptions and locations of actions implemented.

Table V-8
Snowshoe Hare—Estimated potential changes during the life of the 2002 Forest Plan

Snowshoe Hare/ Early seral Habitat	Existing Condition	ALTERNATIVE						
		B	C	D	E	F	I	K
Habitat Quantity (acres)	40,000	52,000	49,000	49,000	45,000	59,000	45,000	50,000
Habitat Quality	S	IN 1.3	IN 1.1	IN 1.2	IN 1.1	IN 1.5	IN 1.1	IN 1.3
Population Trend	S	U	U	U	U	U	U	U

Key: D – Decreasing; S – Stable; IN – Increasing; U – Unknown

Note: Habitat quality comparison between alternatives is a relative comparison computed by dividing the possible total early seral habitat by the acres of existing seral habitat.

CUMULATIVE EFFECTS

Actions are occurring in hare habitat adjacent to the White River National Forest and throughout the species range. While these actions may result in increasing population numbers in some areas or decreasing population numbers in others, none of these actions are likely to result in eliminating the species from its current range. None of the actions off the forest will impact the populations on the forest.

Alpine Willow and Horned Lark

- Classification**
- Management Indicator Species (amount and distribution of alpine willow species/alpine grassland management)

Affected Environment

Monitoring Question/

The alpine willow cover type was selected for monitoring to answer the question, “Is alpine willow habitat being managed to provide habitat for white-tailed ptarmigan and other species that are dependent or strongly associated with alpine willow habitat?”

Reasons for Selection as MIS

Horned lark was selected for monitoring to answer the question, “Is the alpine grassland habitat being managed to provide habitat for those species dependent or strongly associated with alpine grassland habitat?” Alpine willow habitat is necessary for a variety of species that use alpine areas, including the white-tailed ptarmigan. The amount and distribution of alpine willow will reflect whether adequate acres and distribution of this cover type is maintained for these species. Alpine grassland is used by a variety of species, including horned lark. Population trends for this species will indicate trend for quality and quantity of habitat for other alpine grassland species (this is a species that will indicate the health of alpine grasslands by remaining stable or decreasing since it is associated with more open, disturbed sites than species that require more dense alpine grasslands).

Habitat Description

Alpine areas (above timberline) represent about ten percent of the forest. The majority of the alpine areas occur within wilderness areas. These areas include grasslands, shrublands, Krummholz spruce and fir, and areas devoid of vegetation (such as rock outcrops). Willow species include greyleaf, plainleaf, arctic, and others. Grassland species include kobresia, trisetum, sedges, bluegrasses, and others. Current activities in these areas are recreational use (mainly trail use, but also ski area activities) and livestock grazing, mainly by sheep.

Horned lark habitat is found throughout the grasslands in North America, including those in alpine areas. It prefers open grassland communities with some bare ground as opposed to dense grassland (Beason 1995). It may abandon areas where it begins nesting in early spring if vegetation grows too tall.

The trend for willow habitat and horned lark grassland habitat in the alpine areas throughout its range and on the White River National Forest is unknown, since these alpine types are not usually monitored. The trend for horned lark habitat throughout its range (which include the majority of its habitat in the lower elevations) is likely declining because of the decrease of agricultural activities that created and maintained very open grassland habitat.

Population Description

Horned larks are found throughout the grasslands in North America. It is one of most common birds in the low elevation grasslands in Colorado, and is fairly common in the high elevation grasslands. The species probably increased its numbers and range starting in the late 1800’s because of agricultural activities that resulted in more open habitat.

The species throughout its range is declining, seemingly from changes in agricultural practices and abandoned farmlands that result in denser grasslands and more forested

areas. This trend is likely also happening in Colorado, but most likely only in the lower grasslands. The population trends in the alpine grasslands throughout its range and on the White River National Forest are unknown.

**General
Risk Factors**

The main risk factor (limiting factors) for both alpine willow and horned lark (alpine grassland) habitat are recreation and livestock management in the alpine areas. These areas are very sensitive to disturbances that alter vegetation cover, since the soils are very unstable and have low fertility, and vegetation is slow growing.

Environmental Consequences

Risk Factors

The identified general risk factors are all risk factors for the populations that occur on the Forest, including livestock grazing and recreational use on and off trails and roads (ski area development and use may impact minor portions of alpine areas).

**Resource
Protection
Measures**

The 2002 Forest Plan establishes key decisions for long-term direction, including forest-wide goals and objectives, forest-wide standards and guidelines, direction applying to future activities within management areas, determining suitability and capability of lands, and establishing monitoring and evaluation requirements. The resource protection measures applicable to management of alpine willow and horned lark (alpine grassland) habitat in all alternatives include:

Forest-wide Goals, Objectives, and Strategies, 2002 Forest Plan, Chapter 1:

- Strategies that direct the White River National Forest to manage for Management Indicator Species (Objective 1b, Strategy 1b.4).

Forest-wide Standards and Guidelines, 2002 Forest Plan, Chapter 2:

- Plan direction to manage for stable and productive soil (Physical, Soils Standards and Guidelines).
- Specific direction to manage for productive alpine areas (Biological, Alpine Standards and Guidelines).
- Plan direction to manage rangeland ecosystems to maintain and improve grazed rangelands, including alpine riparian and wetland areas (Rangeland Ecosystem Management, Standard 2, all Guidelines).
- Provide suitable wildlife habitat in riparian areas (Wildlife, General, Standard 6).

DIRECT AND INDIRECT EFFECTS

Effects on Habitat

Various activities occur and will occur in alpine habitats (such as livestock grazing and recreation) that may impact the habitat for horned lark and willow associated species, but the plan direction provides restrictions and limits on these activities to varying degrees. The quality, quantity, and distribution of alpine willow habitat are expected to remain stable or increase during the life of the 2002 Forest Plan in all alternatives since the main impacts (livestock grazing and trail use/management) are expected to remain at current levels or decrease. There may be small differences of impacts between alternatives at the site-specific level, but these differences are expected to be small and unlikely to be

measurable at the forest level. Since implementation of the 2002 Forest Plan may result in maintaining or increasing grass density and cover in alpine grasslands, horned lark habitat quality and quantity is expected to remain stable or decrease, and habitat for species more associated with denser alpine grassland habitat will remain stable or increase. There may be measurable impacts of these activities at the site-specific level (such as at ski areas), but there would be no measurable differences between alternatives at the forest level on alpine willow or horned lark habitat.

Effects on Populations

Horned lark populations may slightly decrease over the life of the 2002 Forest Plan since it is expected that alpine grassland will trend towards denser characteristics. This decrease will likely not be detectable at the forest level, but may be detectable at site- or project-specific levels.

Table V-9

Alpine willow – Estimated potential changes during the life of the 2002 Forest Plan

		ALTERNATIVE						
		<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
Alpine Willow Habitat Quantity	Existing Condition U	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN
Habitat Quality	U	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN

Key: D – Decreasing; S – Stable; IN – Increasing; U – Unknown

Table V-10

Horned Lark. Estimated potential changes during the life of the 2002 Forest Plan.

		ALTERNATIVE						
		<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
Horned Lark Habitat Quantity	Existing Condition U	S/ D	S/ D	S/ D	S/ D	S/ D	S/ D	S/ D
Habitat Quality	U	S/ D	S/ D	S/ D	S/ D	S/ D	S/ D	S/ D
Population Trend	U	D	D	D	D	D	D	D

Key: D – Decreasing; S – Stable; IN – Increasing; U – Unknown

CUMULATIVE EFFECTS

Actions, as presented in the general risk factors, are occurring in alpine areas throughout the range of alpine willow and horned lark habitat (alpine grasslands). These actions may result in negative impacts to habitat depending on the action. It is not known the extent of these actions, but, considering that most of the alpine habitat in the contiguous United States is in federal ownership, similar future management of these areas will likely be similar to that directed by the 2002 Forest Plan. There may be improvement in alpine willow and grasslands off the White River National Forest, but these changes will have no impact on habitat on the White River National Forest. Since the horned lark is a common species throughout its habitat off the White River National Forest, changes in populations will not likely impact the populations on the White River National Forest.

Canada Lynx

Classification

- Species of Viability Concern (also refer to the Viability Report)
- Endangered Species (refer to the Biological Evaluation, Appendix N)

Affected Environment

Reasons for Viability Concern

There is a viability concern for this species on the forest because:

- Population structure and distribution of the species is poorly understood on the Forest,
- Populations throughout its range are generally decreasing, and
- The species is extremely rare on the Forest.

Note: Most of the information and analysis presented below is summarized from the Viability Report and the Biological Evaluation. Refer to those reports for more details on life history, habitat and analysis.

Habitat Description

Lynx are temperate forest dwelling carnivores. They are mostly dependent upon snowshoe hare for prey, but have been linked to using other species, especially during hare declines. Hares not only determine where lynx are found, but also influence how many lynx may occupy an area. In the southern Rocky Mountains, lynx are predominately found above 8,000 feet in Engelmann spruce, subalpine fir, and lodgepole pine forests. Lynx require late-successional forest that contain low but stable densities of snowshoe hare and high amounts of dead and down large woody material used as denning habitat. Lynx females seem to select dense, mature forest habitats that contain large woody debris, such as fallen trees or upturned stumps, to provide security and thermal cover for kittens (Koehler 1990, Koehler and Brittell 1990). Mid-successional stages of forested communities may serve to promote travel between early and late-successional habitats. Early successional forest stands, following fire or management activities, may promote higher hare densities than late-successional forest stands, but the effect is considered to be transient. Conifers are used more heavily in winter than hardwood due to the increase in cover, lighter snow packs and warmer temperatures. Koehler (1990) found in his study that lynx avoided large openings in the forest canopy (less than 100 meters) and normally used coniferous or deciduous vegetation less than two meters in height with a closed canopy for traveling. Roads may increase the vulnerability of lynx to hunters and trappers as well as increase the chances of road deaths. They frequently travel along roadways when adequate cover is present on both sides of the road (Koehler and Brittell 1990). This, however, has not been the case in other studies in the United States and southern Canadian Rockies. These studies have indicated the opposite so the early data is confusing the issue as to what size of opening will actually deter lynx from crossing.

There are approximately 1,456,000 acres of lynx habitat on the forest. This acreage includes winter forage (snowshoe hare habitat), denning, willow, high-elevation sagebrush, and other low quality habitat. Within these acres, actions (prescribed fire, wildfire, timber management, ski area development) have occurred within the past ten to fifty years that have impacted lynx habitat so that some suitable habitat is now unsuitable (less than 65,000 acres). These acres are inclusive since not all acres

impacted are lynx habitat (e.g., ski area development occurs in alpine areas also, which are not lynx habitat). Based on these inclusive numbers, less than five percent of the lynx habitat may currently be unsuitable on the forest. Other actions have also occurred in the past, such as recreation developments, oil and gas developments, etc., but the acreages associated with these actions are small and would not change the approximate percentage of unsuitable habitat.

Some of the key landscape linkage areas identified for lynx in the southern Rocky Mountains are located on the White River National Forest. These include areas from Vail Pass/Ten-mile drainage/Tennessee Pass areas and the Loveland Pass area.

Current habitat trends throughout the species range are generally declining, which is likely the trend in Colorado and on the White River National Forest.

Population Description

The distribution and abundance of lynx appears to be tied to that of the snowshoe hare from western Alaska to the eastern islands of Canada and in the mountains of the western United States. Lynx are a wild felid of northern temperate forests in the western mountains, where environmental conditions at high elevations support boreal forest habitats similar to those found in northern regions.

In the lower 48 states, lynx are still thought to occur in relatively high numbers in Washington, Montana, and Maine, and somewhat lower numbers in Wyoming and a few of the Great Lake States. The status in the other western states, Idaho, Colorado, and Utah is unknown but considered very low, and they are considered extirpated from Oregon. Some recent survey efforts in Oregon that found traces of lynx indicate that may not be the case. Historic records of lynx from Colorado indicate it is found only in the areas of the state which support contiguous temperate forests at elevations of approximately 7,800 feet or higher. The majority of the positive locations for lynx are from an area bounded by the towns of Silver Plume, Vail, Aspen, and Leadville. Three additional records are from the Uncompahgre Plateau, near Ouray, and near Cumbres Pass. Concentrations for positive and probable sightings are found on the Forest in an area that includes Summit, Eagle, Gunnison and Pitkin counties. Cary in 1911 reported 4 probable sightings from the Flat Tops, (White River Plateau) area and one from the Grand Mesa. No additional positive or probable sightings have been reported from the Flat Tops, 4 Mile or Battlements portions of the White River National Forest, or for any additional areas of the Grand Mesa, Uncompahgre, and Gunnison National Forests. The last confirmed record of lynx from Colorado (before the re-introductions) was at the Vail Ski Area in 1973. Several years of intensive and extensive field survey efforts have failed to document the presence of individuals or populations. Scattered reports continue to come in to the Colorado Department of Wildlife (CDOW) about tracks or sightings of lynx. These sightings have a wide variation in reliability, but enough are from knowledgeable individuals to indicate that there may be a remnant population of very few animals remaining.

Population trends throughout the species range are generally decreasing. Population trends in Colorado and on the White River National Forest currently are likely stable after a large decrease in the populations in the early to mid-1900s.

**General
Risk Factors**

Actions that may impact lynx populations and habitat include timber management, fire management, recreation, livestock grazing, utility corridors, and residential, commercial and agricultural developments, such as housing, ski areas and large resorts. These actions may impact one or more of the primary habitat needs of the species:

- Habitat, including denning, dispersal (connectivity), and foraging (mainly winter habitat for the snowshoe hare).
- Limited snow compaction—snow compaction may facilitate increased competition from other predators (mainly coyotes on the White River National Forest).
- Low disturbance—while lynx seem to be little disturbed by human activity, some activities may be significant at certain times of the year so that lynx use of habitat may be limited, especially at and near denning habitat.

Trapping has also been documented as possibly being one of the factors for the initial decline of lynx in the state of Colorado. Today, this factor is of less concern since the state of Colorado made trapping in illegal in 1997.

Environmental Consequences

Risk Factors

Most of the identified general risk factors are all risk factors for the populations that occur on the White River National Forest. Forest Service actions that may impact lynx populations include timber management, fire management, recreation, livestock grazing, developments, utility corridors, ski areas, and large resorts.

**Resource
Protection
Measures**

The 2002 Forest Plan establishes key decisions for long-term direction, including forest-wide goals and objectives, forest-wide standards and guidelines, direction applying to future activities within management areas, determining suitability and capability of lands, and establishing monitoring and evaluation requirements. The factor used in listing this species as threatened in 2000 was the inadequacy of existing regulatory mechanisms, specifically the lack of guidance for the conservation of lynx in the National Forest Land and Resource Management Plans and the BLM Land Use Plans. The Resource Protection Measures applicable to management of the Canada lynx that are common to all alternatives include:

Forest-wide Goals, Objectives, and Strategies, 2002 Forest Plan, Chapter 1:

- Strategies that direct the Forest to manage for Threatened Species and Species of Viability Concern (Objective 1b, Strategy 1b.1; Objective 1c, Strategy 1c.1).
- Strategies that direct the Forest to manage for Canada lynx foraging, denning and dispersal/connectivity habitat (Strategies 1c.5 through 1c.9).

Forest-wide Standards and Guidelines, 2002 Forest Plan, Chapter 2:

- Standards and guidelines that maintain minimum woody debris (for denning habitat) (Soils, Standard 7; Biodiversity, Standard 2; Silviculture, Guideline 5).
- Standards and guidelines to manage livestock to achieve or maintain the desired conditions (Rangeland Ecosystem Management, Standard 2, Guidelines—all).
- Standards that limit the size of forest openings (Silviculture, Standards 5 and 6, Guideline 13).
- Standards restricting disturbances (Wildlife, Standard 1).

Specific direction for the Canada lynx (in the Canada Lynx section) directs us to:

Maintain adequate habitat for lynx:

- Provide denning habitat (Standards 2 and 4, Guideline 3).
- Maintain dispersal (connectivity) habitat (Standard 10, Guidelines 1, 6, 7, 8 and 13).
- Provide foraging habitat through timber, livestock and ski area management to maintain and improve snowshoe hare habitat (Standards 1, 3, and 5 to 8, Guidelines 2, 4 and 5).

Limit snow compaction:

- Design new winter use activities to minimize the effects on lynx, including ski areas expansion (Guideline 13).
- Restrict the use of designated routes in the winter (Canada Lynx, Standards 9 and 10, Guidelines 6, 7, 8 and 10).

Limit disturbance to denning and foraging lynx:

- Design new winter use activities to minimize the effects on lynx, including ski area expansion (Guideline 13).
- Design projects to avoid impacts at times suitable sites may be occupied as natal or maternity dens (Guideline 11).
- Restrict the use and development of designated routes, closing unnecessary roads, and locating new trails and roads away from habitat (Standard 10, Guidelines 6 to 10). Maintain adequate habitat for lynx.

Management Area Direction (2002 Forest Plan, Chapter 3—*Management Area Direction*)

- Manage dispersal (connectivity) habitat (MA 5.5, Forested Landscape Linkages).
- Provide foraging habitat through ski area management to maintain and improve snowshoe hare habitat (MA 8.25, Ski Areas, Wildlife Guidelines 1 and 2).
- Designing new winter use activities to minimize the effects on lynx from ski area expansion (MA 8.25, Ski Areas, Wildlife, Standard 1).

DIRECT AND INDIRECT EFFECTS

Effects on Habitat

Various Management Actions proposed in the 2002 Forest Plan may impact some of the primary needs of Canada lynx (denning and foraging habitat, shelter, prey base, etc.) including:

Timber Management. Based on the experienced budget level, approximately 6,000 to 32,000 acres (depending on alternative) may be managed for timber within the ten-year life of the plan (Tables 3-126 and 3-133). This acreage includes proposed actions in lynx habitat and areas that are not lynx habitat. Actions include shelterwood, clearcut, seed-tree, group selection and singletree selection silvicultural systems, commercial and pre-commercial thinning, and prescribed fire to treat the slash. These treatments will have a variety of impacts on lynx habitat, some of which will improve denning, dispersal and foraging habitat, some of which will have negative short-term impacts so that suitable

habitat will become unsuitable, and some will have no impact since lynx habitat will not be entered. Much of the treatments will have short-term (20 to 100 years) impacts, but planned future timber management actions in most of these treated areas (e.g., thinning, final removal of overstory) may maintain these acres as unsuitable. Timber management activities also include the construction of roads, which may provide additional disturbance from timber management activities and possible increases in recreational activities, such as snowmobiles. Compaction of the snow may also occur, possibly increasing competition from coyotes and other competitors.

Recreation Management. Ski area development undoubtedly has had historic impacts on lynx habitat through the modification of preferred denning, foraging and dispersal habitat, and increased disturbance. In 1973, an individual who first observed the animal while riding on a ski lift took a lynx illegally from the front side of Vail Mountain. Occasional lynx reports are still received from the Vail area. Allocated ski area acres will increase approximately 0 to 50,000 acres (depending on alternative, Supplemental Table S-1) over existing permitted acres. If these allocated ski area acres were fully permitted, approximately 0 to 23,000 acres would be skiable (runs would be developed on 45 percent of the allocated acres). This expansion may change suitable habitat to unsuitable, increase the disturbance to any lynx that may have been using the areas, and decrease the available dispersal habitat in the area.

Snowmobiling, cross-country skiing, and snowshoeing on-routes and off-routes in lynx habitat provide compacted snow conditions, especially in early winter, where lynx competitors, mainly coyote, gain an advantage to scarce prey resources. Varying by alternative, the 2002 Forest Plan provides 462,000 to 1,266,000 acres of areas that allow off-route winter motorized use, resulting in a range of a decrease of 791,000 acres to an increase of 13,000 acres as compared with current management. Most of the areas outside wilderness will allow winter motorized use on established routes. The location of all roads and trails, and the eventual density of roads and trails, is not specifically known at this time (a travel management analysis and decision is planned for completion in 2002), but MAs/ROs that allow off-route winter motorized use will usually result in more disturbance and snow compaction than MAs/ROs that allow winter motorized use on established routes only.

Recreational developments, such as campgrounds, may have minor impacts on lynx habitat and habitat use. These developments are usually small in acreage, so actual impacts to habitat would be small. These developments may also result in greater disturbance to any lynx that may use the areas around the developments, but this disturbance would generally be minimal.

Livestock Management. Livestock grazing occurs in some lynx habitats, but most grazing occurs in the more open grassland and shrubland that lynx do not prefer. Livestock grazing that occurs within lynx habitat has the potential of impacting habitats utilized by snowshoe hare by possibly reducing the shrub component.

Transportation Systems. The proposed actions of the plan allocate areas for winter and summer motorized travel. Approximately 562,000 to 1,296,000 acres (depending on alternative) is allocated for winter-motorized travel on and/or off established routes. Approximately 672,000 to 1,268,000 acres is allocated for summer-motorized travel on established routes only. Information of the effects of forest roads and trails on lynx is

largely anecdotal. Although lynx have been known to travel along forest roads if adequate vegetation remains along both sides of the road, roads themselves provide increased opportunity for accidental road kills as well as increasing lynx vulnerability from hunters and trappers. Trapping of lynx is no longer legal in Colorado and they are on the Colorado Endangered Species list, however, there are rumors of lynx shot or trapped almost every year. Roads and trails also may provide travelways for competitors since there is a chance that winter motorized use will compact the snow.

Fire/fuels management. Prescribed and wild fire may continue to occur in lynx habitat. The proposed actions of the alternatives include approximately 38,000 to 62,000 acres (depending on alternative) of prescribed fire to be implemented within the ten-year life of the plan (Table 3-43). Probably most of these fires will not be in lynx habitat (likely less than ten percent will be in lynx habitat), but some acres of lynx habitat are expected to be burned for fuel reduction. Anticipated impacts on lynx habitat from prescribed fire could be reduction in denning habitat by removal of dead and down woody material, and a temporary reduction in snowshoe hare habitat. Prescribed fire in some areas may promote regeneration of snowshoe hare habitat. Since intense burns would not be implemented, some of the woody vegetation and the dead and down woody material would remain. Wildfires would have more extensive impacts to lynx habitat than prescribed fires since they would probably be stand-replacing fires, mostly in spruce-fir and lodgepole pine forests. Impacts to most lynx habitat components would result, most likely making suitable lynx habitat unsuitable, eliminating denning habitat for an extended period of time by the reduction of down and down woody material, and eliminating prey habitat (especially snowshoe hare and red squirrel) in the short to long term.

Other activities. Other proposed actions include special use permits and oil/gas lease developments. These activities may result in higher disturbance to any lynx using these areas because of the activities at the developments and associated roads to the developments. The roads also may increase snow compaction for lynx competitors to use, and increase motorized use in winter if recreationists are allowed access.

The Canada Lynx Conservation Assessment and Strategy (Ruediger et al 2000) was developed to provide direction within the lynx range, including on Forest Service lands. Recommendations from this publication were used as the basis for the development of strategies, standards and guidelines for the 2002 Forest Plan (as discussed in Resource Protection Measures), and for the continuing development of Regional direction. The 2002 Forest Plan provides direction on maintaining the quality and quantity of lynx habitat in order to contribute to the expansion, and eventually the maintenance, of a viable population of lynx in the southern Rocky Mountains.

Implementation of the 2002 Forest Plan will maintain the necessary quality and quantity of habitat for the lynx on the White River National Forest. Activities will not result in suitable habitat becoming unsuitable habitat in LAUs that have more than 30% of the lynx habitat in unsuitable (Canada Lynx, Standard 1). The existing unsuitable acres on the Forest are 65,000 acres, which represents less than 5% of the Forest lynx habitat. All LAUs are below 30% unsuitable (highest is 13%, lowest is <1%). The proposed timber, fire/fuels and ski area actions under the experienced budget level for the ten-year life of the 2002 Forest Plan ranges from 48,000 acres (Alternative I) to 100,000 acres (Alternative B). Not all actions will be implemented in lynx habitat, but to compute the highest possible impact, all actions were included in the calculations. Total possible acres

of unsuitable habitat at the end of the ten-year life of the 2002 Forest Plan (under Alternative B) equal approximately 165,000 (65,000+100,000) acres. Based on these inclusive numbers, less than 12% (165,000/1,456,000 (total acres of lynx habitat on the Forest)) of the lynx habitat may be unsuitable on the White River National Forest at the end of the ten-year life of the 2002 Forest Plan. Actual unsuitable acres will be considerably lower than 165,000 acres.

Other standards and guidelines concerning changes to lynx habitat (including denning, dispersal/connectivity and foraging habitat), limiting snow compaction and limiting disturbance to lynx are addressed so that adequate quality and quantity of habitat for lynx is provided on the White River National Forest.

During the life of the 2002 Forest Plan, it is difficult to predict the habitat trend since events such as catastrophic fire and insect epidemics are unknown. In the absence of these events, the trend for suitable habitat quantity and quality from implementation of the 2002 Forest Plan is likely to remain stable or slightly decrease, varying by acres of treatment in each alternative. Since up to 30% of the lynx habitat in each LAU is permitted to be unsuitable under 2002 Forest Plan direction, all alternatives could decrease the acres of suitable habitat. Generally, this will mostly vary by the acres that may be impacted by the expected outcomes for timber, fire/fuels and ski area management (Alternative B has the possibility of impacting suitable lynx habitat more than Alternative I) and by the specific prescriptions that are implemented (see Table V-11, Canada Lynx, for a relative comparison of alternatives). Exact acreages or percentages are unknown since timber and fire/fuels management prescriptions could increase or decrease some of the lynx habitat requirements, or not enter lynx habitat.

Table V-11
Canada lynx – Estimated potential changes during the life of the 2002 Forest Plan

Canada Lynx	Existing Condition	ALTERNATIVE						
		B	C	D	E	F	I	K
Suitable Habitat Quantity/Quality	D	S/ Slightly D 1.0	S/ Slightly D 0.7	S/ Slightly D 0.8	S/ Slightly D 0.7	S/ Slightly D 0.8	S/ Slightly D 0.5	S/ Slightly D 0.8
Population Trend	Likely S	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN
Viability Outcome	III	III	III	III	III	III	III	III

Key: D – Decreasing; S – Stable; IN – Increasing; U – Unknown

Note: Number in Suitable Habitat Quantity/Quality is a relative comparison of impacts on suitable lynx habitat computed by dividing the expected outcome acres for timber, fire/fuels and ski area management (under the experienced budget level) divided by the maximum among all alternatives (Alternative B). The higher the number, the more likely suitable lynx habitat may be impacted.

Effects on Populations

Since suitable habitat will not fall below 30% for any LAU, adequate habitat is expected to be available for an increase in population on the White River National Forest. Since lynx are wide-ranging species at low population levels naturally, this population on the White River National Forest is dependent on actions off the White River National Forest.

CUMULATIVE EFFECTS

The action area is the southern Rocky Mountain region. Other actions that may occur off the White River National Forest include most of those actions mentioned in the previous paragraphs. Additional actions that may impact lynx and lynx habitat on non-Forest Service lands include commercial and residential development that is occurring in most communities adjacent to the White River National Forest. All of the actions may result in some lynx habitat changing from suitable to unsuitable, possibly permanently, reducing dispersal (connectivity) habitat, and increasing the disturbance to any lynx that may be using the areas or adjacent areas.

While all of these cumulative actions/impacts may negatively impact lynx and lynx habitat, it is the intent of the 2002 Forest Plan to consider these possible non-Forest Service actions, and manage Forest Service lands to mitigate these impacts by implementing 2002 Forest Plan direction. Other cumulative actions are actions that occur on other forests in the southern Rocky Mountains, but the Regional direction, which will be the same or similar to what is in the 2002 Forest Plan, will provide the same lynx management on those forests as in the 2002 Forest Plan. This is expected to result in stable or increasing populations throughout the region, including on the White River National Forest.

Pygmy Nuthatch

Classification

- Management Indicator Species (ponderosa pine management)
- Species of Viability Concern (also refer to the Viability Report)
- Sensitive Species (refer to the Biological Evaluation in Appendix N)

Affected Environment

Monitoring Question/

Reasons for Selection as MIS

This species was selected for monitoring to answer the question “Is ponderosa pine habitat being managed adequately to provide the quality and quantity of habitat for species dependent or strongly associated with ponderosa pine?” The main issues are the maintenance of adequate cavity nesting substrates for primary and secondary cavity nesters, and the maintenance of the ponderosa pine cover type for those species dependent or strongly associated with ponderosa pine. Other species have been identified using the ponderosa pine cover type, including western bluebird. The habitat and populations of the pygmy nuthatch will be monitored in the major ponderosa pine areas on the forest.

Reasons for Viability Concern

There is a viability concern for this species on the forest because:

- The habitat is limited on the forest,
- The habitat on the forest is vulnerable to vegetation management that may result in negative impacts to pygmy nuthatch habitat quality and quantity, and
- The known breeding populations on the forest are small and isolated.

Habitat Description

This species is highly associated with ponderosa pine, requiring existing cavities to nest, or creating their own cavities. Throughout its range, most nests have been located in ponderosa pine. The species does not migrate, but winters in the general area where they breed. They require large cavities in large trees or snags for communal roosts in the winter. The ponderosa pine cover type on the White River National Forest mainly occurs in the Derby/Stump Park area (about 300 acres on the east edge of The Flat Tops), but other stands in the area classified as other cover types include ponderosa pine as a component. There currently is an active timber sale(s) and associated timber management treatments occurring in portions of this area to control bark beetle infestations. There are ponderosa pine areas scattered throughout the remainder of the White River National Forest and close to the forest in adjacent lower elevation valleys and slopes, but these areas are generally less than 50 acres in size or are only comprised of scattered ponderosa pine trees.

Generally, the current trend for habitat throughout the species range is likely stable because of the increased emphasis in forest management to maintain large trees, retain a minimum number of snags, and the increase in the use of prescribed fire to decrease fuel loadings. The current trend for habitat quality on the White River National Forest is unknown, but possibly decreasing since the bark beetle has been documented in the Derby/Stump Park area, and vegetation management actions are occurring that will decrease the density of trees in that area. Habitat quantity on the forest is likely stable (no recent changes in acres of ponderosa pine cover type).

Population Description

Pygmy nuthatch is common to very common throughout the ponderosa pine areas in western North America, including Colorado (Gross 1998; Towry 1983). On the White River National Forest, occurrence in ponderosa pine is mostly limited to an area on the Eagle Ranger District near the Derby/Stump Park area (Potter 1995). Nesting has also been documented in a few non-ponderosa pine areas near Dillon (Summit County), in areas of mature lodgepole pine stands, and near Breckinridge, where individuals were using artificial nest structures (Andrews and Righter 1992; Jones 1998; Potter 1995). Abundance is unknown on the White River National Forest. The Colorado Natural Heritage Program ranking for Colorado is S4, apparently secure.

Population trends throughout the species range are generally unknown, but the trend in the United States is thought to be stable. The trend on the White River National Forest is unknown.

General Risk Factors

The main risk factor (limiting factor) throughout the species range is the removal, through timber management and other management activities, of trees and snags of sufficient number, size and decay for cavities. Other risk factors include the past removal of large ponderosa pine trees that appear to offer the best foraging habitat (Ewell and Cruz 1998) and the increased likelihood of more intense fires in ponderosa pine areas due to past fire suppression. Further discussion of the habitat needs and concerns for this species can be found in the Biological Evaluation (Appendix N) and in the individual Species Viability Report (WRNF files).

Environmental Consequences

Risk Factors

The identified general risk factors are all risk factors for the populations that occur on the White River National Forest, including the removal of nest cavity substrates, removal of large trees and increased likelihood of intense fires.

Resource Protection Measures

The 2002 Forest Plan establishes key decisions for long-term direction, including forest-wide goals and objectives, forest-wide standards and guidelines, direction applying to future activities within management areas, determining suitability and capability of lands, and establishing monitoring and evaluation requirements. The resource protection measures applicable to management of pygmy nuthatch that are common to all alternatives include:

Forest-wide Goals, Objectives, and Strategies, 2002 Forest Plan, Chapter 1:

- Strategies that direct us to manage for Management Indicator Species, Species of Viability Concern, and Sensitive Species (Objective 1b, Strategies 1b.3 and 1b.4, Objective 1c, Strategy 1c.1).
- Strategies that direct us to manage for pygmy nuthatch nest and roost cavity trees and snags, and manage to maintain large ponderosa pine trees over time for foraging (Strategies 1c.23 and 1c.24).

Forest-wide Standards and Guidelines, 2002 Forest Plan, Chapter 2:

- Vegetation management direction that restricts activities in the ponderosa pine cover type to managing for two-aged or uneven-aged silvicultural systems in order to maintain of diversity of vegetative types and large ponderosa pine trees for foraging (Silviculture Standard 12).

Specific direction for the pygmy nuthatch that directs us to:

- Manage and maintain current and future pygmy nuthatch cavity trees and snags in occupied areas and potential ponderosa pine cover types (Pygmy Nuthatch Standard 1).
- Provide a diversity of foraging substrates, and emphasize the retention of ponderosa pine for cavities, perches and foraging sites (Pygmy Nuthatch Guideline 1).

Standards that direct us to maintain and manage for at least a minimum number of snags and large snags dispersed throughout the landscape (Biodiversity Standards 2 and 3).

DIRECT AND INDIRECT EFFECTS

Effects on Habitat

There is no planned harvest or treatment specifically for timber production or extraction in the ponderosa pine cover type under the experienced budget level in any alternative, but active vegetation management (e.g., prescribed fire, thinning, timber harvest) in the ponderosa pine cover type may occur during the life of the forest plan under all alternatives. Since the resource protection measures would apply to all alternatives, current and potential ponderosa pine habitat that is actively managed under any alternative will be managed to maintain or improve the habitat for pygmy nuthatch. It is unlikely that there will be any measurable differences between alternatives on pygmy nuthatch habitat at the forest or site-specific level. It is anticipated that the quantity and quality of pygmy nuthatch habitat (in the ponderosa pine cover type) will increase in the long-term (20-50 years) since pro-active management (Strategies 1c.23 and 1c.24) to improve pygmy nuthatch habitat is expected to be implemented. During the life of the forest plan, it is difficult to predict the trend since events such as catastrophic fire and insect epidemics are unknown. In the absence of these events, and assuming that current management in the Stump Park area will decrease the likelihood of epidemic bark beetle infestations, it is anticipated that the habitat quality and quantity on the Forest will increase during the ten-year life of the forest plan (Table V-12, Pygmy Nuthatch).

Effects on Populations

With the anticipated increase of pygmy nuthatch habitat quality and quantity, and assuming the continued genetic exchange with populations off the White River National Forest (see Cumulative Effects), the pygmy nuthatch populations on the forest are expected to show a stable or increasing trend over the short- and long-term for all alternatives (Table V-12, Pygmy Nuthatch).

Table V-12

Pygmy nuthatch – Estimated potential changes during the life of the 2002 Forest Plan

Pygmy Nuthatch	Existing Condition	ALTERNATIVE						
		<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
Habitat Quantity	Approx. 300 acres	IN	IN	IN	IN	IN	IN	IN
Habitat Quality	U (possible dec.)	IN	IN	IN	IN	IN	IN	IN
Population Trend	U	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN
Viability Outcome	II	II	II	II	II	II	II	II

Key: D – Decreasing; S – Stable; IN – Increasing; U – Unknown

CUMULATIVE EFFECTS

Actions are occurring in pygmy nuthatch habitat off the White River National Forest throughout its range. Increased emphasis on ponderosa pine management throughout its range on public lands has resulted in management changes that are likely to benefit nuthatch habitat and populations. The ponderosa pine habitat that exists on private lands adjacent to the White River National Forest has experienced declines since the late 1800's, and is likely to continue to decrease. Residential and commercial development will likely result in the removal of some ponderosa pine from these areas, thereby reducing available habitat for the nuthatch. It is unknown what the trend of pygmy nuthatch populations is in the general area of the forest, but continued development will likely result in decreasing trends in most areas adjacent to the forest. This should not measurably impact the populations on the forest since habitat and populations throughout the Region on public lands will be available for interactions (genetic exchange). Because of changes in timber management and the increasing fuel reductions, including actions on the forest, the trend for habitat and populations on the forest and throughout its range are likely to remain stable or increase (**Table V-12**, Pygmy Nuthatch). Under all alternatives, implementing forest plan direction will result in ensuring a high likelihood of maintaining the presence and viability of the species on the White River National Forest.

Black Swift

- Classification**
- Management Indicator Species (black swift/cliff management)
 - Sensitive Species (refer to the Biological Evaluation in Appendix N)

Affected Environment

**Monitoring Question/
Reasons for Selection as MIS**

The black swift was selected for monitoring to answer the question, “Will forest management maintain the known populations of black swifts on the forest?” This management indicator species (MIS) falls within the category, “species with special habitat needs that may be influenced significantly by planned management programs,” and is only an indicator of itself. It has been identified as a “species requiring more baseline information to determine viability status,” and it is a Forest Service sensitive species. Current activities at some of the colonies are hiking and climbing. Black swift colonies and habitat will be monitored (known colonies are currently being monitored).

Habitat Description

Black swifts nest on precipitous cliffs near or behind high waterfalls in the mountains. Foraging birds range at high elevations over most montane and adjacent lowland habitats. Black swifts are most common from 7,500 to 10,500 feet in elevation. They migrate north in May and leave the nesting areas in September. Nests are constructed from mud, mosses, or algae, and are located on ledges under overhanging rocks, often behind a waterfall, or in a cave. Approximately 50 sites (confirmed colonies) are known in Colorado, with fifteen active sites identified in 2001 on the White River National Forest. Other areas that may have the habitat characteristics for black swifts likely exist on the forest (and within Colorado). Some of these areas have been surveyed, and additional potential sites will likely be surveyed as they are identified.

Habitat trend for this species throughout its range and in Colorado was likely declining (Colorado Bird Observatory [CBO 1995] identified that a 26 percent to 50 percent loss of breeding and wintering habitat has occurred in Colorado over the past 50 years), but currently is unknown (that is, may currently be stable or increasing). Habitat trend on the White River National Forest is likely similar to the state of Colorado in general (that is, unknown, but may currently be stable or increasing).

Population Description

The global distribution of black swift is from central Mexico south to Guatemala, Honduras to Costa Rica and Antilles. In the United States, the distribution is southeast Alaska, western Canada, south to southern California, northwest Montana, Colorado, Utah, Northern New Mexico, and southeastern Arizona. Black swifts are rare to uncommon very locally in most mountain ranges in Colorado except in the San Juan Mountains, where they are locally uncommon to fairly common. They are very rare in foothills, western valleys, mountain parks, and on the eastern plains. Approximately 50 confirmed colonies are known in Colorado. Fifteen confirmed colonies were identified on the White River National Forest in 2001.

**General
Risk Factors**

The population trend throughout its range was declining for most of the 1900s, but it may be stable currently (some surveys may indicate a possible increase in populations, but this may be because of increased survey efforts for this species). The trend on the White River National Forest is unknown (annual monitoring/surveying occurs on the forest at known and potential sites, with reproductive activities varying by site and year). The Colorado Natural Heritage Program rates this species as S3, vulnerable.

The greatest risk factor (limiting factor) for black swifts is disturbance and habitat alterations from recreational use at the nesting sites. Recreational activities of rock climbing and spelunking have the potential of altering habitat characteristics associated with black swift nests. Since black swifts have a very narrow range of habitat conditions they may use, disturbances at these specific habitats can eliminate the sites from further use. These activities are expected to occur at other black swift sites in Colorado and throughout its range.

Environmental Consequences

Risk Factors

The identified general risk factor of human recreational use of cliffs is the main risk factor for the populations that occur on the forest.

**Resource
Protection
Measures**

The 2002 Forest Plan establishes key decisions for long-term direction, including forest-wide goals and objectives, forest-wide standards and guidelines, direction applying to future activities within management areas, determining suitability and capability of lands, and establishing monitoring and evaluation requirements. The resource protection measures applicable to management of the black swift includes:

Forest-wide Goals, Objectives, and Strategies, 2002 Forest Plan, Chapter 1:

- Strategies that direct us to manage for Management Indicator, Sensitive Species and species that need more baseline inventory and evaluation to determine status (Objective 1b, Strategies 1b.3 and 1b.4, Objective 1c, Strategy 1c.3).
- Strategies that direct us to manage for black swifts (Objectives 1b.25 and 1b.26).

Forest-wide Standards and Guidelines, 2002 Forest Plan, Chapter 2:

- Standards and guidelines to restrict disturbances at black swift nesting sites (Wildlife, Standard 1; Species Requiring More Baseline Inventory and Evaluation to Determine Status, Standards 2 and 3).
- Standards protecting black swift habitat (Species Requiring More Baseline Inventory and Evaluation to Determine Status, Standards 1 and 3).

DIRECT AND INDIRECT EFFECTS

Effects on Habitat

Various activities occur and will occur in, at, and near the known and unknown colonies that may impact the habitat or the behavior of black swifts; but the plan direction requires surveys before projects are implemented and provides restrictions on activities that may impact individuals or habitat, including restricting rock climbing, ice climbing, caving, and hiking. This direction would apply to all alternatives, so that known black swift areas will be managed in all alternatives to maintain the habitat for black swifts. There would be no measurable differences between alternatives at the project or forest level on known

black swift habitat. Habitat at unknown sites may be impacted by recreational activities, but, since the location of these sites is unknown, the specific impacts to black swifts and how they vary between alternatives is unknown.

The trend for habitat quantity on the White River National Forest will be stable under all alternatives. Black swift habitat quality trend at known sites (and sites identified in the future) will be stable under all alternatives because of implementing the strategies, standards, and guidelines. No measurable difference in black swift habitat quality between alternatives is expected.

Effects on Populations

Known populations of black swifts are expected to be maintained throughout the areas that they currently exist. Population trends on the White River National Forest for black swifts at known sites will likely be stable. Trends at unknown sites are not known, but the total number of known populations is expected to increase as more surveys are conducted.

Table V-13
Black Swift – Estimated potential changes during the life of the Forest Plan

<i>Black Swift</i>	<i>Existing Condition</i>	ALTERNATIVE						
		<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
<i>Habitat Quantity</i>	U	S	S	S	S	S	S	S
<i>Habitat Quality</i>	U	S	S	S	S	S	S	S
<i>Population Trend</i>	U	S	S	S	S	S	S	S

Key: D – Decreasing; S – Stable; IN – Increasing; U – Unknown

CUMULATIVE EFFECTS

Actions that are occurring throughout the black swift range, including adjacent to the White River National Forest, are those risk factors already discussed, mainly disturbance from recreational use. All of these factors may impact the habitat and populations of black swifts. It is unknown what the trends for habitat and populations for black swifts would be based on the possible impacts, but, considering that the current population trends are stable or increasing, and similar emphasis on black swift management is expected on other public lands, any changes in populations off the forest will have no or limited impact on the populations on the forest.

Juniper Titmouse

- Classification** • Management Indicator Species (pinyon-juniper management/large trees)

Affected Environment

**Monitoring
Question/
Reasons for
Selection as
MIS**

Juniper titmouse was selected for monitoring to answer the question, “Are large trees being retained in the pinyon-juniper cover type to provide adequate nesting substrates for those species that use large trees?” Pinyon-juniper woodland was selected to answer the question, “Is the pinyon-juniper cover type being managed to provide a variety of age and size classes for all species using pinyon-juniper?” Juniper titmouse populations will be monitored in appropriate habitats on the White River National Forest. Pinyon-juniper woodland age and size class distributions, including densities of large trees, will be monitored on the White River National Forest.

**Habitat
Description**

The juniper titmouse is generally only found in pinyon-juniper woodland, and uses cavities for nesting. This species is more common where large, mature trees are present that supply cavities (Cicero 2000). It may nest outside of cavities, but nests are still usually on crevices or other areas of large trees. The species seems to use a variety of stand densities and age/size classes.

The pinyon-juniper cover type has expanded throughout most of its range in the 1900’s because of the combined effects of intensive livestock grazing and fire suppression. The majority of the pinyon-juniper type throughout its range is dense mid- to old-aged stands, but many of the large trees have been removed because of past firewood harvest. The trend in quantity is now likely stable or decreasing because of increased emphasis on prescribed fire and vegetation treatments to maintain and restore other grassland/shrubland cover types. The trend in quality is likely increasing over most of its range because increased use of prescribed fire, vegetation treatments and less-intensive livestock management has resulted in decreased canopies and increased plant species diversity and composition. It is likely that large trees are still being removed for firewood throughout most of its range.

The pinyon-juniper cover type occurs on only about 15,000 acres on the White River National Forest. Most of the pinyon-juniper woodland on the forest is currently in the mid to late age/size classes with high densities of trees and high canopy closure. The stocking level and trend of large trees in these areas is not known, but it is known that some of the large trees in areas that are accessible to vehicles have been removed for firewood. Very few forest actions currently occur in the pinyon-juniper woodland. The habitat quantity and quality for the titmouse on the forest is likely stable since very few actions are occurring on the forest that would impact the acres of pinyon-juniper woodland or large trees. The age and size class distribution is likely outside of the historic range of variability (see HRV in Appendix), and the trend is likely decreasing because of the lack of disturbance.

**Population
Description**

Juniper titmouse is rare to fairly common throughout most of its range in pinyon-juniper woodlands, including in Colorado (Andrews and Righter 1972). On the Forest they are probably rare to fairly common in appropriate habitat.

Population trends throughout the species' range may be decreasing, and may also be decreasing in Colorado, though the recent split of the species plain titmouse into oak titmouse and juniper titmouse has resulted in difficult interpretation of the data (Gross 1998). The trend on the forest is unknown. The Colorado Natural Heritage Program rates this species as S4 (apparently secure).

**General
Risk Factors**

The main risk factor (limiting factor) throughout juniper titmouse and pinyon-juniper range is the continued suppression of fire so that canopy closures are dense. Another risk factor for the titmouse is the continued removal of large trees for firewood.

Environmental Consequences

Risk Factors

The identified general risk factors are all risk factors for the populations that occur on the White River National Forest, including the continued suppression of fire and the possible removal of large trees for fuelwood.

**Resource
Protection
Measures**

The 2002 Forest Plan establishes key decisions for long-term direction, including forest-wide goals and objectives, forest-wide standards and guidelines, direction applying to future activities within management areas, determining suitability and capability of lands, and establishing monitoring and evaluation requirements. The resource protection measures applicable to management of juniper titmouse and pinyon-juniper woodlands common to all alternatives include:

Forest-wide Goals, Objectives, and Strategies, 2002 Forest Plan, Chapter 1:

- Strategies that direct us to manage for Management Indicator Species (Objective 1b, Strategy 1b.4).

Forest-wide Standards and Guidelines, 2002 Forest Plan, Chapter 2:

- Standards that direct us to manage for future snags by managing for large trees dispersed throughout the landscape (Biodiversity Standard 2).
- Direction to manage fuelwood and other forest products consistent with desired conditions (Special Forest Products Guideline 1).
- Retain all snags and trees consistently used by bats (Wildlife Standard 4. This would benefit juniper titmouse since bats in pinyon-juniper areas are likely to use the largest trees and snags available).
- Implementing fire management to manage for resource management goals and objectives (Fire Guidelines).

DIRECT AND INDIRECT EFFECTS

Effects on Habitat

None of the alternatives, management area prescriptions, or plan strategies, standards, or guidelines specifically emphasizes juniper titmouse habitat or pinyon-juniper woodland management. However, activities, such as prescribed fire to improve wildlife habitat, could potentially affect minor amounts of this community. The expected outcomes (under the experience budget level) for prescribed burns to improve wildlife habitat during the ten-year life of the forest plan (see the Terrestrial Wildlife section, Effects on wildlife from fire management) range from 7,500 acres (Alternative F) to 35,000 acres (Alternative D). Very little, if any, of these burns will be implemented in the pinyon-

juniper vegetation type, but it is possible that small areas adjacent to the target types (which are mainly oak shrub) may be impacted. This may result in some increase in the age and size class diversity, but it would not or barely be measurable Forest-wide. It is unlikely that there will be any measurable changes in large tree density during the life of the Plan since: (1) most of the pinyon-juniper areas that are accessible to vehicles have had fuelwood extraction (where large trees and snags were likely emphasized for collection); (2) other pinyon-juniper areas that still have large trees and snags will have very little fuelwood collection because of topography or other factors that limit vehicle access; and (3) prescribed fires will likely maintain existing large trees (since prescriptions will only be at low to moderate intensities). There may be measurable impacts of activities at the site-specific level, but there would be no or very little measurable differences between alternatives at the forest level on the availability of large trees for juniper titmice or the age and size class diversity of pinyon-juniper woodland.

Since very little activity is anticipated in this community, habitat trends are as follows:

1. Pinyon-juniper age and size class distribution is anticipated to be stable or possibly increase, though this increase would most likely not be measurable within the life of the plan.
2. Titmouse habitat quantity and quality will likely remain stable since pinyon-juniper acres and large tree availability is not expected to measurably change over the life of the 2002 Forest Plan.

Effects on Populations

Juniper titmouse populations are not anticipated to measurably change over the life of the 2002 Forest Plan because there will be no measurable change in habitat quality or quantity.

Table V-14
Juniper titmouse – Estimated potential changes during the life of the 2002 Forest Plan

<i>Juniper Titmouse</i>	<i>Existing Condition</i>	ALTERNATIVE						
		<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
<i>Habitat Quantity</i>	15,000 acres	S	S	S	S	S	S	S
<i>Habitat Quality</i>	S	S	S	S	S	S	S	S
<i>Population Trend</i>	U	S	S	S	S	S	S	S

Key: D – Decreasing; S – Stable; IN – Increasing; U – Unknown

Table V-15

Pinyon-juniper. Estimated potential changes during the life of the 2002 Forest Plan

<i>Juniper Titmouse</i>	<i>Existing Condition</i>	ALTERNATIVE						
		<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
<i>Habitat Quantity</i>	15,000 acres	S	S	S	S	S	S	S
<i>Habitat Quality</i>	D	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN	S/ IN

Key: D – Decreasing; S – Stable; IN – Increasing; U – Unknown

CUMULATIVE EFFECTS

Actions are occurring in pinyon-juniper woodland and juniper titmouse habitat off the forest throughout its range. Residential and commercial development has and is occurring throughout the range on private land. This development is expected to continue to occur during the life of the 2002 Forest plan, reducing or eliminating habitat quality and quantity on these lands. Decreasing pinyon-juniper quality and quantity on these lands is likely to continue to result in decreases in local populations, but, considering that the titmouse will likely still be rare to fairly common in appropriate habitats throughout Colorado, this should not impact the populations on the White River National Forest. In the absence of uncontrolled wildfire, actions off the forest are not anticipated to impact the age or size classes on the forest.

MacGillivray's Warbler

Classification • Management Indicator Species (dense shrub habitat)

Affected Environment

Monitoring Question/ Reasons for Selection as MIS	This species was selected for monitoring to answer the question, “Does forest management maintain populations of species dependent on dense shrub habitat dispersed throughout the shrub cover types?” Dense shrub components provide important foraging and ground nesting habitat for this and other species. MacGillivray’s warbler habitat and populations on the White River National Forest will be monitored.
Habitat Description	MacGillivray’s warbler is found breeding from the base of the foothills to 9,000 feet in elevation. Dense shrub components provide important foraging and ground nesting habitat for this species. The species occurs in many vegetation types that include dense, low shrub understories. The shrub communities on the White River National Forest include oakbrush and other species and covers approximately 182,000. Currently, very little activity occurs in the shrub types except for prescribed fire, mainly for elk and deer habitat improvement. These impacts are usually short-term (5-20 years), since the shrub species, especially oak, grow very quickly to a dense condition. The current trend for habitat throughout its range and on the forest is unknown since these vegetation types are poorly monitored.
Population Description	MacGillivray’s warbler is common to uncommon throughout its range (DeGraaf and Rappole 1995), but is one of the most common western Colorado warblers. The species breeds throughout the western mountain states and provinces, north to extreme southeast Alaska. They winter from central Mexico and southern Baja California south to Panama. On the White River National Forest, they are probably uncommon to common in appropriate habitat (DeGraaf and Rappole 1995). Population trends for the species throughout its range is unknown, though it may be decreasing in some portions and increasing in others. The trend in Colorado may be decreasing (Gross 1998). The trend on the White River National Forest is unknown. The Colorado Natural Heritage Program rating for this species is S4, apparently secure.
General Risk Factors	The main risk factor (limiting factor) is likely management actions, such as prescribed fire, that decrease the density of shrub habitat.

Environmental Consequences

Risk Factors	The identified general risk factor is likely the main risk factor for the populations that occur on the White River National Forest, including the use of prescribed fire to open dense shrub habitat.
Resource Protection Measures	The 2002 Forest Plan establishes key decisions for long-term direction, including forest-wide goals and objectives, forest-wide standards and guidelines, direction applying to future activities within management areas, determining suitability and capability of lands, and establishing monitoring and evaluation requirements.

The resource protection measures applicable to management of MacGillivray's warbler includes:

Forest-wide Goals, Objectives, and Strategies, 2002 Forest Plan, Chapter 1:

- Strategies that direct us to manage for management indicator species (Objective 1b, Strategy 1b.4, Objective 1c, Strategy 1c.1).

DIRECT AND INDIRECT EFFECTS

Effects on Habitat

None of the alternatives, management area prescriptions, or plan strategies, standards, or guidelines specifically emphasizes MacGillivray's warbler management. For all alternatives, the main impact to habitat will likely be from the use of prescribed fire to improve elk and deer habitat. These impacts will likely be short-term (5-20 years), since shrub species, especially oak, grow very quickly to a dense condition. Actual impacts to warbler habitat may be even more short-term since the low undergrowth that the species uses will likely grow back in less than 20 years. These burns will likely result in a mosaic of different seral conditions, including maintaining vigorous stands that will likely maintain nesting habitat distributed throughout the shrub types. The expected outcomes (under the experience budget level) for prescribed burns to improve wildlife habitat during the ten-year life of the forest plan (see the Terrestrial Wildlife section, Effects on wildlife from fire management) range from 7,500 acres (Alternative F) to 35,000 acres (Alternative D) (Table S-2). Approximately twenty percent of the dense shrub habitat on the White River National Forest would be burned by prescribed fire if the outcomes of Alternative D were fully implemented in the dense shrub habitat (though it is unlikely that all of this will be in the shrub habitat). While the quantity of warbler habitat would not be impacted by the actions (no conversion of shrub habitat to other cover types is anticipated), the quality may be impacted so that nesting and foraging habitat quality may decrease. This decrease would vary by alternative so that the quality of nesting and foraging habitat may decrease more under Alternative D than under Alternative F. Considering that these impacts would likely be short-term, there will likely be only small differences between alternatives on the impacts to nesting and foraging habitat.

The trend for habitat quantity will be stable under all alternatives. Habitat quality trend would decrease under all alternatives if the expected outcome for wildlife prescribed fire were fully implemented in MacGillivray's warbler habitat. Since the growth of the shrub types will occur fairly quickly, there may be measurable impacts on nesting habitat quality for a short period at the site-specific level, but changes in warbler habitat at the forest-level will be minor or not measurable.

Effects on Populations

MacGillivray's warbler populations are expected to be dispersed throughout the shrub types similar to the existing condition. There may be fewer nesting pairs as a result of implementing wildlife prescribed burns under all alternatives. The proposed actions may result in short-term population decreases that may vary by alternative at the site-specific level, but it is unlikely that there would be any measurable differences between alternatives at the forest level.

Table V-16

MacGillivray's warbler – Estimated potential changes during the life of the 2002 Forest Plan

MacGillivray's Warbler	Existing Condition	ALTERNATIVE						
		<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
Habitat Quantity	182,000 acres	S	S	S	S	S	S	S
Habitat Quality	U	D	D	D	D	D	D	D
Population Trend	U	0.18	0.18	0.18	0.19	0.11	0.04	0.16
		D	D	D	D	D	D	D

Key: D – Decreasing; S – Stable; IN – Increasing; U – Unknown

Note: Habitat quality comparisons between alternatives is a relative comparison computed by dividing the acres of prescribed fire to improve wildlife habitat in each alternative under the experienced budget level by the total acres of shrub communities. Short-term impacts to nesting habitat quality increases as the number increases.

CUMULATIVE EFFECTS

Actions are occurring in the shrub types adjacent to the White River National Forest and throughout the species breeding range. While these actions may decrease the presence of individuals and breeding pairs, a review of the literature has not revealed any concerns that the species would be eliminated from its present range. The literature did not provide any specific concerns for the winter range. Considering that the species will likely be present on existing habitat throughout most of its breeding and winter range during the life of the forest plan, it is unlikely that changes in habitat off the forest will impact the populations on the Forest.

Wolverine

- Classification**
- Species of Viability Concern (also refer to the Viability Report)
 - Sensitive Species (refer to the Biological Evaluation, Appendix N)

Affected Environment

- Reasons for Viability Concern**
- There is a viability concern for this species on the forest because:
- Population structure and distribution of the species is poorly understood on the Forest,
 - Populations throughout its range are generally decreasing, and
 - Overall population size and range are decreasing.

Note: Most of the information and analysis presented below is summarized from the Viability Report and the Biological Evaluation. Refer to those reports for more details on life history, habitat, and analysis.

- Habitat Description**
- Banci (1994) quotes Kelsall (1981) as stating that wolverine “habitat is probably best defined in terms of adequate year-round food supplies in large, sparsely inhabited wilderness areas, rather than in terms of particular types of topography or plant associations.” Specific preferred cover types tended to be associated with areas of high prey abundance or avoidance of high temperatures and humans (studies cited in Banci 1994).

Wolverines are primarily found in boreal forests and tundra areas of the northern latitudes. They are typically associated with contiguous forested montane habitats. In the Rocky Mountains, wolverines are found in coniferous forests. Ecotones with marshes, lakes, cliffs, as well as habitat type transitions, and elevational gradients also appear to be important habitat components (Hash 1987). The preferred habitat of boreal forests in Alaska and Canada consists of pines, firs, and spruce with some deciduous species. Habitats in these northern latitudes do not have the ecological or elevational variety seen in the Colorado Rocky Mountains and are much more remote and uninfluenced by development. Wolverines are also found in tundra regions of Canada and Alaska where permafrost exists and grasses, sedges, lichen and willow (*Salix* spp.) dominate the vegetation (Hash 1987).

Hornocker and Hash (1981) reported that in Montana, 70% of all wolverine telemetry relocations were in large areas of “medium or scattered mature timber”. More specifically they were relocated most frequently in areas of subalpine fir (*Abies lasiocarpa*). Copeland (1996) reported that in Idaho, wolverines preferred rock habitats in the summer, and the montane coniferous forest types in the winter. Additionally, they preferred northerly aspects in both summer and winter. Specific habitat preferences of wolverines in Colorado are not known, however most of the sightings within the past 20 years in Colorado were located in spruce/fir and alpine habitats.

Wolverines do not tolerate disturbances by humans and thus require large tracts of remote undeveloped and isolated land. They need large contiguous areas of suitable habitats and secluded habitat for natal dens and kit rearing. Because it appears that subalpine cirque habitats are required for natal denning, security areas, and summer foraging, the montane coniferous forests that are suitable for winter foraging and

summer kit rearing must be connected to such habitats (Copeland 1996).

They also require areas that support both large ungulate and smaller prey populations (Banci 1994). Wolverines are opportunistic carnivores that also take advantage of fruits, insects, and berries when their preferred foods are not available (Hash 1987). They do well in areas where a host of other predators exist because they are successful at scavenging carcasses killed by these predators. This, along with winter kill, is likely their main source of ungulate carrion. Small mammals are important in the diet of wolverines, but wolverines are too large to survive on small mammals alone (Banci 1994). Banci (1994) reported that the availability of large mammal as prey or carrion “underlies the distribution, survival, and reproductive success of wolverines.”

No specific acreages for wolverine habitat is known since so little specific quantifiable definitions of habitat is available, but it is assumed that at least most of the alpine and subalpine areas of the White River National Forest is habitat, along with some lower elevation areas. Trends for habitat throughout the species range is not known, but is decreasing in some parts of its range due to vegetation management activities. Habitat quality and quantity trends in Colorado and on the White River National Forest is not known since little is known about wolverine habitat in the southern Rocky Mountains, and what is known hasn’t been monitored.

Population Description

Wolverines ranged from boreal and tundra areas of Alaska and Canada south to the boreal forests in the Rocky Mountains to Arizona and New Mexico. Historically they have been found as far East as New England and as far west as California (Hash 1987). They are less common in their southern distribution. Presently wolverines are found in the Northern Rockies, Washington and Oregon. The status of the wolverine varies in these locations (Ruediger 1994), but Montana has the most viable population of wolverines in the Rocky Mountains of the United States (Hash 1987). Wolverine population numbers in Colorado are not currently known. It is possible that wolverines had been extirpated from the state. Nead et al. (1995) speculate that population numbers were never very high in Colorado, and that presently a viable population does not exist in the state. Historic wolverine sightings that have been verified come from contiguous forested montane areas from Rocky Mountain National Park to Telluride. There have been five positive wolverine sightings in Colorado (Laramie, El Paso, Park, and Arapahoe counties) in the past 20 years (since 1980). Of the 23 probable sightings in Colorado in the past 20 years, only three were in the White River National Forest (two were in Eagle County and one was in Gunnison County). Some of the positive wolverine identifications are confounded by the fact that six wolverines escaped from the Cheyenne Mountain Zoo in Colorado Springs from 1966 to 1986, and two were released near Aspen in 1979 (Byrne 1995).

Population densities of wolverines are low, even in optimal habitat conditions. During pre-settlement times, wolverines were widespread but likely occurred at low densities (Banci 1994). Population trends in some parts of the species range are decreasing, but the trends in the southern Rocky Mountains and Colorado are unknown (there is possibly no reproducing population in Colorado).

**General
Risk Factors**

The major risk factors for the species have been:

- 1) Mortality through furbearer trapping;
- 2) Disturbance to individuals through human interactions; and
- 3) Fragmentation of habitat through vegetation management. Trapping may have influenced the local distribution and abundance of wolverines in certain areas of their range. Human impact at natal sites has been identified as a factor affecting the reproductive success of wolverines. Fragmentation may play a role in determining the ability of transient wolverines to colonize areas that are suitable but unoccupied. These actions impact whether populations are stable, increasing or decreasing and thereby affecting the long-term survival of this species throughout its range.

Environmental Consequences

Risk Factors

Most of the identified general risk factors are all risk factors for the populations that occur on the White River National Forest. Forest Service actions that may impact wolverine populations include timber management, fire management, recreation, developments, utility corridors, ski areas and large resorts. Today, trapping is less of a concern since the state of Colorado made trapping illegal in 1997.

**Resource
Protection
Measures**

The 2002 Forest Plan establishes key decisions for long-term direction, including forest-wide goals and objectives, forest-wide standards and guidelines, direction applying to future activities within management areas, determining suitability and capability of lands, and establishing monitoring and evaluation requirements. Because little detailed information is known about the specifics of wolverine habitat needs, habitat management prescriptions that encompass the life needs of lynx, American marten (*Martes Americana*), and fisher (*Martes pennanti*) will also benefit wolverines at the stand level (Banci 1994). The 2002 Forest Plan directs management for lynx, including maintaining denning and other habitat, and limiting or restricting actions that may result in disturbance or habitat alterations, such as ski area developments, winter recreational use, and vegetation management. While these standards and guidelines are not specifically designed for wolverine management, they will likely provide many of the habitat and solitude requirements for wolverines. See the resource protection measures for Canada lynx for a listing of these strategies, standards and guidelines.

DIRECT AND INDIRECT EFFECTS

Effects on Habitat

It is unclear how wolverines respond to vegetation management, including timber harvests (Banci 1994). Hornocker and Hash (1981) found no differences in wolverine density, habitat use, movement, and behavior between the northwest Montana boreal forest wilderness areas and nonwilderness areas, where logging occurred and recreationists frequented. However, during the summer, wolverines retreated from the nonwilderness area to “rugged, relatively inaccessible mountains” and humans rarely used the nonwilderness area in the winter. Both fire and timber harvest may increase herbivore and small mammal populations, however they may also decrease forest

structure necessary for denning and rendezvous sites. The disturbances from the management actions and increased road densities associated with timber management may have more impact on wolverines than the actual vegetation alterations.

Recreation poses a significant risk factor for wolverines especially in the late winter to early summer during denning and kit rearing seasons. Because of habitat alterations, denning female wolverines may be relegated to higher elevations where secure den sites are limited. In these cases, recreational activities, such as backcountry use, all-terrain vehicles (including snowmobiles), aircraft, horse travel may pose a threat to the success of raising a successful litter (Banci 1994) if conducted in areas where wolverines den from winter to early summer.

The factors that may be limiting for wolverines on the White River National Forest include:

1) Large refugia where wolverines and their habitat are protected. The White River National Forest includes approximately 754,000 acres of wilderness (MAs 1.11, 1.12, 1.13), about one-third of the forest. All of these eight wilderness areas include most of the alpine and subalpine areas of the forest, and represent the majority of the possible wolverine habitat on the White River National Forest. These wilderness areas allow no vegetation treatments (other than prescribed fire) or motorized recreational use. Some of these areas receive considerable hiking and horse riding use in the summer, but these activities generally only occur along established trails. Very few activities occur in these areas in the winter. The acres of wilderness areas do not change by alternative, so the impacts will generally be the same for all alternatives. Additional areas for Congress to consider wilderness designation are also allocated (MA 1.2). These areas will generally be managed as wilderness until Congressional action is taken. These areas either expand existing wilderness areas or designate new wilderness areas, and will provide additional areas of refugia with minimal impacts from use. Acres allocated in MA 1.2 vary by alternative (Chapter 2, **Table 14**). Alternative I has the most acres in MA 1.2 (200,000), with other alternatives having fewer acres (E, 107,000; C, 94,000; K, 82,000; D, 47,000), and Alternatives B and F not allocating any acres. Generally, the more acres in MA 1.2, the more opportunities for maintaining large refugia for wolverines, such that Alternative I would provide more effective wolverine habitat than Alternatives B or F.

2) Linkages and corridors between refugia/suitable habitats are maintained. Transient and dispersing wolverines may play an important role in maintaining viable wolverine populations (Banci 1994). MA 5.5 (forested landscape linkages) areas were developed to provide areas for landscape scale movement, migration and dispersal of forest carnivores and other wide-ranging wildlife species between forested landscapes across the White River National Forest. Human use and management is limited in these areas. Allocation of these areas varies by alternative with Alternative K having the most acres at 84,000 to Alternative B having the least at 5000 (Chapter 2, **Table 14**). Generally, the more acres allocated to MA 5.5, the more likely linkages and corridors will be maintained for wolverine use between the wilderness areas. For example, Alternative K will more likely be able to maintain linkages in these areas than Alternative B. Other comparisons between alternatives may be difficult just based on this relationship since other allocations (such as MA 1.2, and those allowing minimal vegetation or recreation management) may also provide some linkage opportunities.

3) Human disturbance is minimized in both linkage areas and refugia. Since wolverine refugia on the White River National Forest is mostly wilderness and recommended wilderness, activities in these areas are generally low, with minor differences between alternatives as discussed in 1. It is anticipated that most summer use by wolverines would occur mainly in the higher elevations of the wilderness areas.

One aspect of maintaining effective linkages, corridors and some habitat is whether summer or winter motorized use off established routes is permitted (outside of wilderness areas). MAs and ROS classifications that do not allow these activities may result in fewer disturbances to wolverines than allocations that allow them. These allocations vary by alternative, which range from:

Winter—Alternative I with 1,070,000 acres to Alternative F with 266,000 acres, and

Summer—Alternatives D, I and K with 1,532,000 acres to Alternative F with 486,000 acres (Chapter 2, **Tables 6** and **7**).

Generally, the more areas that do not allow motorized use off established routes, the more effective wolverine habitat will result, such that Alternative I will result in more effective habitat use by wolverines (less disturbance) in the winter and summer than Alternative B. Less disturbance will result in less likelihood that the survival or reproduction of individuals will be impacted.

4) Forest structure for denning female wolverines is maintained in forested areas. Forest habitat with structure including coarse woody debris, trees with cavities, and old beaver lodges can provide denning sites (Banci 1994). The 2002 Forest Plan identifies standards and guidelines for lynx habitat management, including maintaining and managing for down woody debris for denning habitat. This direction, while not specifically designed for wolverine, will likely provide adequate denning habitat for wolverines. The more denning habitat that is maintained, the more likely that individuals will be successful in reproduction.

5) Large ungulate populations are maintained. The White River National Forest has one of the largest populations of elk in the nation and many mule deer. MAs have been developed to specifically manage for elk and deer, including 5.4, 5.41 and 5.43. The impacts of these alternatives on deer and elk vary by alternative (see the analyses on mule deer and elk habitat in the *Terrestrial Wildlife* section for further discussion). Generally, the more acres allocated to these MAs, the more likely to disperse elk and deer throughout the landscape, maintain the populations' health, and maintain individuals on the forest during the fall and winter. For example, Alternative D with 839,000 acres allocated to these MAs, is more likely to provide effectiveness use of habitat by deer and elk than Alternative B with 301,000 acres. This difference does not indicate that deer or elk populations would increase or decrease since population numbers also are dependent on other factors, such as harvest (hunting), available high quality winter habitat off the forest and habitat improvements. Because Copeland (1996) found no association between the location of wolverines and wintering ungulates, ungulate mortalities in the fall, which are presently associated with hunters, are important to maintain. However, excessive hunter harvest may negatively impact wolverines (Copeland 1996).

During the life of the 2002 Forest Plan, it is difficult to predict the habitat trend since events such as catastrophic fire and insect epidemics are unknown, and very little is

known about the specific habitat requirements of wolverines. Since most of what is considered wolverine habitat is in wilderness areas, it is anticipated that the overall trend for habitat quality and quantity will be stable. There is the possibility that motorized use outside of wilderness could impact habitat quality (more disturbance). Winter motorized use may result in the most disturbance since wolverines may move to lower elevations in the winter (see point 3 above and **Table V-17**, Wolverine). While there are differences between alternatives on acres that do not allow off-route winter motorized use, habitat quality differences between alternatives are unlikely to be measurable on the ground.

Effects on Populations

Even though habitat quality and quantity is expected to be stable during the life of the 2002 Forest Plan, impacts to the trends of existing or future populations is not known. It is unlikely that any change in wolverine numbers on the White River National Forest will be measurable during the life of the 2002 Forest Plan since populations would be very low if any individuals were present.

Table V-17
Wolverine – Estimated potential changes during the life of the 2002 Forest Plan

Wolverine	Existing Condition	ALTERNATIVE						
		B	C	D	E	F	I	K
Habitat Quantity	U	S	S	S	S	S	S	S
Habitat Quality	U	S 0.3	S 0.6	S 0.7	S 0.6	S 0.2	S 1.0	S 0.7
Population Trend	U	U	U	U	U	U	U	U
Viability Outcome	III	III	III	III	III	III	III	III

Key: D – Decreasing; S – Stable; IN – Increasing; U – Unknown

Note: Numbers in Habitat Quality is a relative comparison of alternatives computed by dividing acres allocated that do not allow off-route winter motorized use (outside of wilderness) by the maximum (Alternative I). The higher the number, the less likely that off-route winter motorized use may disturb wolverines.

CUMULATIVE EFFECTS

Similar activities that may impact wolverines on the White River National Forest occur outside forest boundaries, with similar impacts expected. Also, continued development adjacent to the White River National Forest may limit movements and increase disturbance. Considering all the strategies, standards and guidelines for lynx and other resources and the MA allocations, most of these impacts off the White River National Forest are expected to be mitigated sufficiently to provide adequate habitat and solitude for wolverine. Some of the actions, cumulatively, may result in less effective use of the habitat, which may impact reproductive success of some individuals. Little direct mortality is expected except for possible mortalities from high-speed road use. The differences between alternatives on wolverine use or population trends are unlikely to be measurable at the forest level since most direction applies to all alternatives, and most of

the wolverine habitat is in wilderness areas, which does not vary between alternatives. It is anticipated that 2002 Forest Plan direction will result in adequate habitat for wolverines to expand their range and/or increase their populations, but it is unknown about population trend since very little is known about the populations in the Rocky Mountains and specifically in Colorado.

AQUATIC WILDLIFE

Roundtail Chub

- Classification** • Species of Viability Concern

Affected Environment**Reasons for Viability Concern**

There is a viability concern for this species on the forest because:

- The species has experienced a recent range-wide decline, and
- It is considered a species of Special Concern by the State of Colorado.

Habitat Description

Roundtail chub live in big rivers and tend to occupy slow moving waters (Woodling 1985). Murky, rather than clear, water is sought (Sigler and Sigler 1996). Water temperature in roundtail chub habitat ranged in temperature from 0 to 30 degrees C (Bezzerrides and Bestgen 2000). Laboratory studies suggest a preference for 20 to 24 degrees C water (Bezzerrides and Bestgen 2000). Groups of adults are found in eddies and pools with cover available, adjacent to strong river currents (Bestgen and Propst 1989). Young typically reside in quiet water near shore or in backwaters, usually with cover present (Sigler and Sigler 1996, Bestgen and Propst 1989, Woodling 1985). Their preferred habitat has been drastically reduced in recent times by impoundments and water diversions. Roundtail chub have been found in reservoirs shortly after impoundment, but do not persist (Bezzerrides and Bestgen 2000). Natural flow regimes and occasional flooding are believed to be important to controlling exotic predator populations in some areas (Bestgen and Propst 1989). Spawning occurs over gravel substrate (see F. Reproduction and Development).

Population Description

Roundtail chub range throughout most Colorado River Basin mainstem and tributary rivers from Fontanelle Reservoir in Wyoming south through southeastern Nevada and Arizona (Sigler and Sigler 1996, Page and Burr 1991). Roundtail continue to occupy a large portion of their historic range (Bezzerrides and Bestgen 2000). They are present in the Colorado, White, and Yampa River mainstems and in the lower reaches of major tributaries. They are found in the Colorado River below Kremmling, numerous tributaries downstream of New Castle such as Divide Creek below the Forest, and the lower stretch of the Gunnison River (Carothers and Sealing 1994). These chubs inhabit the mainstem of the White River downstream of Meeker. Roundtail decline has been observed in the White River (Bezzerrides and Bestgen 2000). To the north, roundtail chub is found in the Yampa River below Milner, Little Snake River, Milk Creek, the lower portions of Trout Creek, and the Green River. In the vicinity of the White River National Forest, roundtail chub occur downstream of the forest boundary in the Colorado and White Rivers and Colorado River tributaries such as Rifle and Divide Creeks (Woodling 1985). The only known occupied habitat on the White River National Forest is in the Colorado River through Glenwood Canyon.

Roundtail chub has historically been the most common member of the genus *Gila* in the Colorado River Basin extending up to the mountain foothills (Holden and Stalnaker 1975, Woodling 1985). Recently, roundtail chub have been declining throughout much of their native range (Sigler and Sigler 1996).

**General
Risk Factors**

The dominant risk factors contributing to the decline of roundtail chub are exotic predatory fishes, loss of suitable habitat (primarily due to impoundments and dewatering), conversion of warm-water habitat to cold-water habitat (e.g., below bottom-release reservoirs), and other alterations of the hydrologic regime. In the upper Colorado River Basin, exotic predatory fishes are not a significant concern since the most aggressive species are not currently established. Loss of habitat due to impoundments, including the impoundments themselves as well as conversion to cold-water habitat, is less of a problem in the upper Colorado since most reservoirs are high elevation and upstream of roundtail chub habitat.

Environmental Consequences

Risk Factors

White River National Forest activities have limited potential to impact spawning success and general habitat availability for roundtail chub. Spawning success can be affected by allowing activities that change the timing of spring runoff. Delaying spring runoff keeps water temperatures cooler longer which could delay spawning or reduce spawning success. Forest activities that deplete water directly reduce the volume of habitat available downstream.

**Resource
Protection
Measures**

The 2002 Forest Plan establishes key decisions for long-term direction, including forest-wide goals and objectives, forest-wide standards and guidelines, direction applying to future activities within management areas, determining suitability and capability of lands, and establishing monitoring and evaluation requirements. The resource protection measures applicable to management of roundtail chub habitat that are common to all alternatives include:

Forest-wide Goals, Objectives, and Strategies, 2002 Forest Plan, Chapter 1:

- Strategies that direct us to protect and improve watershed health and habitat for MIS and species of viability concern (Objective 1a, Objective 1b, Strategy 1b.4, Objective 1c, and Strategies 1c.1 and 1c.2).
- Strategies that direct the Forest to protect stream flow (Objective 1a and Strategy 1a.6).
- Strategies that direct the Forest to work with the State to reduce exotic introductions (Strategy 1c.4).

Forest-wide Standards and Guidelines, 2002 Forest Plan, Chapter 2:

- Protection of flow (Water and Riparian Resources Standards 1 and 9, and Guidelines 3 and 4; and General Recreation Standard 3).
- Protection of streams and other water bodies from chemical contaminants (Soils Guideline 2; Water and Riparian Resources Standards 11, 12, and 13).

DIRECT AND INDIRECT EFFECTS

Effects on Habitat

The habitat for this species is primarily downstream of the White River National Forest. Effects to roundtail habitat from Forest activities are limited to those that affect the amount or timing (or temperature) of water or chemical contaminants reaching flowing water. The greatest effect to roundtail chub habitat would be water depletions upstream of

their habitat. Most water depletions are not associated with activities on the White River National Forest and are therefore independent of 2002 Forest Plan alternatives. Snowmaking is one water depleting activity that is related to 2002 Forest Plan management areas. It is assumed that the amount of snowmaking is related to the amount of area dedicated to ski-based resorts, such that if a ski area is larger, it will probably include more snowmaking. Forest plan alternatives with more area dedicated to ski-based resorts are expected to eventually include more water used for snowmaking than those with less area dedicated to ski-based resorts. Alternatives with the least amount of area dedicated to ski-based resorts are D, I, and K. Alternatives B and E have the most area dedicated to ski-based resorts. Because the ski areas in the headwaters are located far from roundtail chub habitat in mainstem rivers, it is unlikely that any change in flow in roundtail habitat could be detected due to the difference in snowmaking per alternative. Risk of a chemical contaminant spill does not vary by 2002 Forest Plan alternative and is expected to be low in all alternatives due to resource protection measures. Therefore, no difference in roundtail chub habitat is expected between forest plan alternatives.

Effects on Populations

Since there should be no difference in roundtail chub habitat between 2002 Forest Plan alternatives and 2002 Forest Plan alternatives to not affect populations directly, there will be no difference between alternatives on roundtail chub populations. Activities that could affect roundtail chub populations, such as introduction or removal of exotic fish or changes to fishing regulations, are governed by the Colorado Division of Wildlife and are independent of the 2002 Forest Plan.

Table V-18

Roundtail Chub—Estimated potential changes for roundtail chub habitat and populations during the life of the 2002 Forest Plan

Roundtail Chub	Existing Condition	ALTERNATIVE						
		B	C	D	E	F	I	K
Habitat Quantity	Glenwood Canyon & Downstream of WRNF	S	S	S	S	S	S	S
Habitat Quality	S	S	S	S	S	S	S	S
Population Trend	D	S	S	S	S	S	S	S
Viability Outcome	III	III	III	III	III	III	III	III

Key: D – Decreasing; S – Stable; IN – Increasing; U – Unknown

CUMULATIVE EFFECTS

Roundtail chub historic habitat has been greatly altered from the large, deep, slow moving rivers of the recent past to large reservoirs and rivers with lower flows due to water diversions. Within the occupied habitat on the White River National Forest, the Shoshone Dam creates a barrier (the dam itself and a dewatered reach) that disconnects the local population.

The historic habitat of the roundtail chub, mainstem large rivers up to the mountain foothills, has been greatly altered by development. The once deep, slow moving rivers have been impounded, diverted, channelized, and their floodplains roaded and developed. Hybridization among the individuals of the *Gila* genus has been noted within impoundments where natural habitats and flow regimes that tended to separate the chub species are lost (Sigler and Sigler 1996). Roundtail chub do not persist in impoundments (Bezzarides and Bestgen 2000).

The introduction of exotic fish species into their native habitat has stressed the roundtail chub making individuals more susceptible to disease and parasites. In addition, more diseases and parasites that fare better when the fish are stressed appear to be present now (Sigler and Sigler 1996). Tapeworm was often present in fish greater than 8 inches in Green River fish studied (Vanicek and Kramer 1969 cited in Sigler and Sigler 1996).

Roundtail chub is considered extremely susceptible to an exotic external parasite called “Lernaea.” This parasite may negatively impact populations in the future, especially in reservoirs (Gross 1998).

The exotic red shiner may be contributing to the decline of some southwestern cyprinids, including the roundtail chub (Bestgen and Propst 1989). Exotic predators such as smallmouth bass, flathead catfish, channel catfish, brown trout, and rainbow trout are believed to be limiting roundtail populations in some parts of its range (Bestgen and Propst 1989). In a New Mexico roundtail chub study, populations with multiple age classes were found only in the absence of exotic predators (Bestgen and Propst 1989).

The exotic predators that seem to have the greatest impact on roundtail chub—smallmouth bass and northern pike—are not established in the Upper Colorado River Basin (Tom Nesler, Colorado Division of Wildlife, personal communication).

The recovery program for the Endangered fish species occurring downstream of the White River National Forest benefits roundtail chub by augmenting spring peak flows and summer low flows (moving them closer to natural conditions) as well as through exotic predator control. Although the predator control associated with this program occurs well downstream of the White River National Forest and local roundtail populations, the flow augmentation provides direct benefits to the local roundtail populations. Since reservoirs on the White River National Forest are used for the program, the Colorado River in the vicinity of the forest benefits from the increased flow and flood pulses targeted for the “15-Mile Reach” (the Colorado River above the confluence with the Gunnison River).

Leopard Frog

Classification	• Species of Viability Concern • Sensitive Species (see the Biological Evaluation in Appendix N)

Affected Environment

Reasons for Viability Concern	There is a viability concern for this species on the forest because: • It has recently experience a rapid decline range-wide, and • It has disappeared from historically occupied areas locally
Habitat Description	Habitats for this species include the banks and shallow portions of marshes, ponds, lakes, reservoirs, beaver ponds, streams and other bodies of permanent water, including irrigation ditches and wet meadows. Rooted aquatic vegetation appears to be an important component of its habitat. Apparently suitable habitat for this species occurs across the White River National Forest and it is not clear why leopard frogs are not more widely distributed.
Population Description	There are two known populations of northern leopard frogs on the White River National Forest. One is in the Sterry Lake-Baloon Lake-Burro Mountain area, and the other is in the June Creek drainage on the Rifle Ranger District. The only other recent sighting of a leopard frog on the forest was northwest of Trappers Lake in the Flat Tops Wilderness Area. It is possible that chytrid fungus or another pathogen is preventing occupation of other suitable habitats.
General Risk Factors	Dominant risk factors for this species include habitat loss, exotic predators (bullfrogs and fish), and disease. Chemical contaminants can also cause direct mortality of leopard frogs.

Environmental Consequences

Risk Factors	Habitat loss can be associated with either wetland loss or disturbance or changes in flow. Loss of riparian vegetation can make young frogs more susceptible to avian predation. Exotic predators can make some streams or lakes unsuitable. Chemical contaminants can cause direct mortality of leopard frogs. Disease, specifically chytrid fungus, is currently believed to be the primary threat to leopard frogs and many other species of amphibians. How chytrid fungus moves through the environment is not known, making control of spread difficult to address.
Resource Protection Measures	The 2002 Forest Plan establishes key decisions for long-term direction, including forest-wide goals and objectives, forest-wide standards and guidelines, direction applying to future activities within management areas, determining suitability and capability of lands, and establishing monitoring and evaluation requirements.

The resource protection measures applicable to management of northern leopard frog habitat that are common to all alternatives include:

Forest-wide Goals, Objectives, and Strategies, 2002 Forest Plan, Chapter 1:

- Strategies that direct us to protect and improve wetlands, watershed health, and habitat for species of viability concern (Objective 1a, Strategy 1a.4, Objective 1b, Strategy 1b.4, Objective 1c, Strategies 1c.1, 1c.2, and 1c.14).
- Strategies that direct us to protect stream flow (Objective 1a and Strategy 1a.6).
- Strategies that direct us to work with the State to reduce exotic introductions and to coordinate on reintroduction of leopard frogs (Strategy 1c.4, 1c.15, and 2b.7).

Forest-wide Standards and Guidelines, 2002 Forest Plan, Chapter 2:

- Wetland protection direction from various land uses (Soils Standard 3; Water and Riparian Resources Standards 5, 6, and 8, and Guideline 2; Rangeland Ecosystem Management Standard 2 and Guidelines 2 and 3; Boreal Toad and Leopard Frog Standards 1 and 2, and Guidelines 2, 3, and 4; General Recreation Standard 1, and Wilderness Resources Guideline 1).
- Protection of streamflow (Water and Riparian Resources Standards 1 and 9, and Guidelines 3 and 4; and General Recreation Standard 3).
- Protection of sensitive species is required for all forest activities (Proposed, Threatened, and Endangered Species and Sensitive Species Standards 1- 3).
- Protection of streams and other water bodies from chemical contaminants (Soils Guideline 2; Water and Riparian Resources Standards 11, 12, and 13; and Boreal Toad and Leopard Frog Standards 3 and 4).

DIRECT AND INDIRECT EFFECTS

Effects on Habitat

Habitat quality at both known breeding sites is expected to increase in all alternatives as we undertake restoration of these sites as directed in the Standards and Guidelines, and with general improvements in management of wetland and riparian areas associated with improving management practices.

All alternatives are expected to cause an increase in habitat quality and population trend due to implementation of the resource protection measures outlined above. However, the rate of increase in population trend (frogs expanding into adjacent habitat) could vary by alternative. Habitat quality of adjacent suitable habitat is likely to be influenced by the amount of disturbance. In all alternatives, the June Creek population is in a management area focused on resource production. The management area allocation of the Sterry Lake population varies between alternatives. The population is in an alternative focused on resource production in Alternatives B, C, and F and therefore the population trend is expected to experience the least amount of increase compared to the other alternatives; it's in a management area with a moderate level of disturbance (not focused on resource production, but year-round motorized use allowed) in Alternative E; and it's in minimal use and non-motorized management areas in Alternatives D, I, and K.

Road construction and other disturbance associated with resource production has the potential to reduce the quality of adjacent habitat by creating at least a partial barrier

between suitable habitats, possibly reducing habitat quality, and providing a mechanism for the spread of disease (transport on vehicles) and chemical contaminants. Illegal introduction of exotic species is also associated with roads. Therefore, Alternatives D, I, and K are more likely to have higher quality habitat adjacent to the Sterry Lake population (see leopard frog summary table below).

Effects on Populations

Population expansion of the Sterry Lake population is more likely in alternatives in which it is within a minimal use or non-motorized management area (see habitat description above). There is no difference in alternatives around the June Creek population. Potential reintroductions of leopard frogs should not vary by alternatives since there are enough suitable sites in minimal use areas, such as wilderness and roadless areas, on the Forest with all alternatives.

Table V-19
Leopard Frog – Estimated potential changes for northern leopard frog habitat and populations on the White River National Forest during the life of the 2002 Forest Plan

Northern Leopard Frog	Existing Condition	ALTERNATIVE						
		B	C	D	E	F	I	K
Habitat Quantity	2 pops.	IN	IN	IN	IN	IN	IN	IN
Habitat Quality	S	IN	IN	IN	IN	IN	IN	IN
Population Trend*	D	Least IN	Least IN	Most IN	IN	Least IN	Most IN	Most IN
Viability Outcome	IV	IV	IV	IV	IV	IV	IV	IV

Key: D – Decreasing; S – Stable; IN – Increasing; U – Unknown

Note: Based on differences in management allocation around the Sterry Lake population, since there is no difference in alternatives associated with the June Creek population.

CUMULATIVE EFFECTS

The northern leopard frog decline is at least partly due to habitat loss by wetland draining. Flood control and water withdrawal for irrigation have eliminated previously available breeding habitat. In other areas, humans have altered wetlands, increasing their depth and permanence, resulting in fishes and bullfrogs replacing leopard frogs.

In some areas, crayfish, which were introduced in Colorado in 1954, have caused eradication of entire beds of aquatic vegetation that would reduce habitat quality for leopard frogs. Crayfish are aggressive predators on fish and amphibian eggs, in addition to eating plant material and aquatic insects.

The emergent vegetation and surrounding area of the occupied pond in the June Creek drainage on the White River National Forest was heavily grazed in 2000. This reduction in cover could increase the vulnerability to avian and other predators, especially the vulnerability of newly metamorphosed frogs. Fencing projects are currently proposed for

both known breeding sites on the White River National Forest, therefore habitat conditions are expected to improve at both sites.

This species and its relatives are used extensively for education and research. Large companies hire collectors to gather the frogs. Although contributing to the scarcity of this species in Canada, Mexico, and the United States, the severe declines and localized extirpations cannot be explained by overcollecting alone.

Redleg disease has been associated with leopard frog declines in some areas, but it may not be the proximate cause of the overall decline. More recently, chytrid fungus has been associated with amphibian extirpations in Australia. Chytrid fungus has been found in the southern Rocky Mountains in Colorado in western boreal toad in 1999 and in a museum specimen of northern leopard frog collected from the Colorado Rockies in 1974. In Colorado, chytrid fungus has not caused total mortality of any known populations, although declines associated with chytrid fungus have been observed.

In some areas of overlap, such as eastern Colorado, reduced or extirpated northern leopard frog populations are associated with the presence of bullfrogs, which are increasingly abundant. Fish stocking in breeding ponds and lakes can make the habitat unsuitable. Known predators on larvae include pied-billed grebe and tiger salamander. Reported predators on metamorphosed frogs in Colorado include great blue heron, burrowing owl, northern water snake, and western terrestrial garter snake. Adults and larvae are vulnerable to many game fishes. Eggs and small larvae are probably vulnerable to predation by bullfrog larvae.

(Literature citations available in Northern Leopard Frog Species Viability Report)

Macroinvertebrate Communities

- Classification** • Management Indicator Species (water quality)

Affected Environment

Monitoring Question/ Reasons for Selection as MIS	Does forest management maintain or improve water quality (including chemical aspects as well as sediment) such that aquatic faunal communities are similar between managed and reference sites? To answer the question, we will establish reference streams across the Forest to use for comparison of macro-invertebrate communities in managed streams. Other appropriate comparisons include sites upstream and downstream from an activity (if physical stream characteristics are still similar) and before and after sampling (if taken at the same time of year). Trends in community composition (and numbers of individuals) will indicate whether forest management is providing the required water quality to maintain desired macro-invertebrate communities.
Habitat Description	The White River National Forest has 3,400 miles of perennial streams, 4,200 miles of intermittent streams, and 13,900 acres of lakes and reservoirs. Stream and lake habitat on the forest is generally in good condition with some exceptions. There are a few streams with severely degraded water quality from past mining activity, mostly in the Blue River Subbasin. Livestock grazing has degraded some localized areas of streams. Streams within ski areas have been rerouted, armored, and otherwise altered. Water is diverted from streams for snowmaking, domestic uses, and irrigation. There are large transbasin diversions shipping water to the Front Range. Most of the private and local domestic and irrigation diversions occur along the edges of the forest and have little effect on National Forest System lands.
Population Description	Very little information is available on current population characteristics. It is assumed that macroinvertebrate community characteristics (species composition and density) is currently aligned with existing aquatic condition, such that polluted waters would contain fewer individuals and the loss of sensitive taxa; streams with increased sediment loads would show a shift to more sediment tolerant taxa; and healthy, clean waters would contain high numbers of individuals and many taxa. Macroinvertebrates are very sensitive to their physical and chemical environment and respond quickly to changes therein.
General Risk Factors	Impacts on aquatic systems generally come from roads, mining, grazing, recreational developments (including ski areas), water diversions, chemical contaminants, and organic contaminants (such as from wastewater).

Environmental Consequences

Risk Factors	Risk factors on the White River National Forest include loss of habitat due to loss of stream flow, physical alteration of habitat, increased sediment delivery to occupied habitat, and introduction of chemical contaminants or changes in pH.
Resource Protection Measures	The 2002 Forest Plan establishes key decisions for long-term direction, including forest-wide goals and objectives, forest-wide standards and guidelines, direction applying to future activities within management areas, determining suitability and

capability of lands, and establishing monitoring and evaluation requirements.

The resource protection measures applicable to management of aquatic macroinvertebrate habitat that are common to all alternatives include:

Forest-wide Goals, Objectives, and Strategies, 2002 Forest Plan, Chapter 1:

- Strategies that direct us to protect and improve streams, watershed health and habitat for MIS and focal species (Objective 1a, Strategy 1a.4, Objective 1b, Strategy 1b.4, Objective 1c, Strategies 1c.1, 1c.2, and 4a.2).
- Strategies that direct us to protect stream flow (Objective 1a and Strategy 1a.6)

Forest-wide Standards and Guidelines, 2002 Forest Plan, Chapter 2:

- Stream protection direction that addresses physical stream habitat such as pools, banks, large wood, riparian vegetation (Water and Riparian Resources Standards 4, 5, and 7, and Guidelines 1 and 2; Rangeland Ecosystem Management Standard 2 and Guidelines 2 and 3; Wildlife General Standard 6; Colorado River Cutthroat Trout Standard 1 and Guidelines 4 and 5; General Recreation Standard 1; and Wilderness Resources Guideline 1).
- Protection of stream flow (Water and Riparian Resources Standards 1 and 9, and Guidelines 3 and 4, and General Recreation Standard 3).
- Protection measures to minimize erosion and sedimentation from disturbances (Soils Standards 1 – 7 and Guidelines 1 and 4; Water and Riparian Resources Standards 2, 3, and 10; and Colorado River Cutthroat Trout Standard 2 and Guidelines 1-3).
- Protection of streams and other water bodies from chemical contaminants (Soils Guideline 2; Water and Riparian Resources Standards 11, 12, and 13).

DIRECT AND INDIRECT EFFECTS

Effects on Habitat

Stream health and water quality are expected to generally increase as Watershed Conservation Practices and other habitat protection measures are applied to new and ongoing activities. However, areas with fewer disturbances are expected to improve faster than areas with ongoing disturbance such as timber sales, roads, and concentrated recreation, which increase the risk of sediment introduction into streams or chemical contaminant spills. All streams on the Forest were analyzed based on management area prescription to determine the percentage of stream miles in areas with ongoing disturbances and how much was in areas with minimal disturbances. The table below displays the percentage of stream miles within each level of activity. The alternatives within which streams are expected to improve the fastest are Alternative I, followed by E, then C. The alternative in which streams are expected to improve the slowest is Alternative F.

No additional habitat is expected to be created and none is expected to be destroyed; therefore, habitat quantity is expected to remain constant.

Table V-20

Percentage of streams on the White River National Forest per management activity level by 2002 Forest Plan Alternative

Activity Level	ALTERNATIVE						
	B	C	D	E	F	I	K
Low	36.5	46.7	41.9	45.9	33.2	59.5	44.3
Moderate	24.5	23.8	17.7	34.6	7.7	27.5	16.7
High	34.4	26.2	38.3	14.8	55.7	10.6	36.2
Very High	4.6	3.3	2.1	5.1	3.4	2.4	2.9

Notes: “Low” is non-motorized, “moderate” is motorized without concentrated recreation or contributing to ASQ, “high” is motorized and either concentrated recreation or contributing to ASQ, and “very high” is concentrated development.

Effects on Populations

Macroinvertebrate communities are expected to move more towards reference (or expected) conditions with improving habitat and alternatives with the most habitat improvement are expected to have the greatest improvement in macroinvertebrate communities. Macroinvertebrate communities are very responsive to the physical and chemical environment and are expected to change rapidly with changing habitat conditions. Macroinvertebrate communities are expected to improve (move towards the reference condition) along with improving stream habitat condition (those with the most habitat improvement would also have the most improvement in macroinvertebrate community). The table below shows identical rankings of macroinvertebrate communities to those of habitat conditions.

Table V-21

Macroinvertebrate Communities—Estimated potential changes for macroinvertebrate habitat and populations during the life of the Forest Plan

Macro. Community	Existing Condition	ALTERNATIVE						
		B	C	D	E	F	I	K
Habitat Quantity	7,600 miles 13,900 acres	S	S	S	S	S	S	S
Habitat Quality	Improving	4 th	3 rd	4 th	2 nd	5 th	1 st	4 th
Population Trend	Improving	4 th	3 rd	4 th	2 nd	5 th	1 st	4 th

Key: D – Decreasing; S – Stable; IN – Increasing; U – Unknown

Note: Rankings indicate the comparative improvement rate, such that Alternative I is improving faster than Alternative F.

CUMULATIVE EFFECTS

Stream conditions on the White River National Forest are generally in good condition. Past mining activities have degraded water quality in several streams, most of which will not recover in the foreseeable future. Railroads were built along some streams at the lower ends of the forest boundary. These have all been closed or converted to roadways. Major highways on the forest run parallel to streams (for example, Straight Creek, Gore Creek, and the North Fork of the Snake River). Sand and gravel used on the roads during winter does wash into the streams. Cattle grazing is ongoing, but at a much lower intensity than what occurred in the past.

Water is diverted from the White River National Forest to the Front Range from the Roaring Fork River, Eagle River, and Blue River drainages. The Roaring Fork drainage is still in good condition and supports healthy fisheries. In the Eagle and Blue River drainages, water diversions exacerbate water quality problems by reducing dilution. Ruedi Reservoir on the Fryingpan River is one of several western slope reservoirs that provide water to the Colorado River. As a participant in the Upper Colorado River Endangered Fish Recovery Program, the Bureau of Reclamation releases water from Ruedi in the summer and fall to augment flows in the 15 Mile Reach (the stretch of the Colorado River starting at the confluence with the Gunnison River and extending 15 miles upstream). These releases cause short-term reductions in the fishability of the river, but they provide benefits for channel maintenance and interstitial habitat. Dillon Reservoir stores water for Denver. The reservoir could be drained if needed to provide domestic water for Denver; as the population of Denver increases, such a scenario becomes more likely. Dillon Reservoir is a high-elevation, oligotrophic lake and does not sustain a productive fishery.

Colorado pikeminnow, razorback sucker, humpback chub, and bonytail

- Classification**
- Species of Viability Concern
 - Endangered Species (see the Biological Evaluation in Appendix N)

Affected Environment

Reasons for Viability Concern

There is a viability concern for this species on the forest because:

- These species have experienced dramatic range-wide declines, and
- All four species are listed as endangered under the Endangered Species Act.

Habitat Description

These species inhabit warmwater reaches of large rivers throughout the Colorado River basin. Very little information is available on the influence of turbidity on the endangered Colorado River fishes. Turbidity allows use of relatively shallow habitats ostensibly by providing adults with needed cover; this allows foraging and resting in areas otherwise exposed to avian or land predators. It is unknown whether the river was as turbid in the past as it is today. For now, it is assumed that these endemic fishes evolved under natural conditions of high turbidity; therefore the retention of these highly turbid conditions is probably an important factor in maintaining the ability of these fish to compete with exotic fish species that may not have evolved under similar conditions.

Population Description

Colorado pikeminnow

Colorado pikeminnow were historically distributed throughout warmwater reaches of the Colorado River Basin from Wyoming and Colorado south to the Gulf of California. By the 1970's they were extirpated from the entire lower basin (downstream of Glen Canyon Dam) and from portions of the upper basin as a result of major alterations to the riverine environment. Having lost about 75-80 percent of its former range, the Colorado pikeminnow was federally listed as an endangered species in 1967.

Colorado pikeminnow are presently restricted to the Upper Colorado River Basin and inhabit warmwater reaches of the Colorado, Green, and San Juan Rivers and associated tributaries. The species inhabits about 350 miles of the mainstem Green River from its confluence with the Colorado River upstream to the mouth of the Yampa River. In the Yampa River, its range extends upstream an additional 160 miles. Colorado pikeminnow also occur in the lowermost 104 miles of the White River, another tributary to the Green River. In the mainstem Colorado River, distribution of the species extends 201 miles upstream from the upper end of Lake Powell to Palisade, Colorado.

Razorback sucker

There are no current population estimates of razorback sucker in the upper Colorado River due to low numbers captured in recent years. The razorback sucker, an endemic species unique to the Colorado River Basin, was historically abundant and widely distributed within warmwater reaches throughout the Colorado River Basin. Historically, razorback suckers were found in the mainstem Colorado River and major tributaries in Arizona, California, Colorado, Nevada, New Mexico, Utah, Wyoming, and in Mexico.

The current range of the razorback sucker in the Colorado River extends upstream to Rifle, Colorado.

Humpback Chub

Populations of this species occur in the Little Colorado and Colorado Rivers in the Grand Canyon, and in Black Rocks and Westwater Canyon in the upper Colorado River. Other populations have been reported in De Beque Canyon of the Colorado River, Desolation and Gray Canyons of the Green River, Yampa and Whirlpool Canyons in Dinosaur National Monument.

Bonytail

The last known riverine area where bonytail were common was the Green River in Dinosaur National Monument.

**General
Risk Factors**

The decline of these species has been attributed to habitat loss due to construction of mainstream dams and subsequent interruption or alteration of natural flow and physio-chemical regimes, inundation of river reaches by reservoirs, channelization, water quality degradation, introduction of non-native fish species and resulting competitive interactions or predation, and other man-induced disturbances.

Environmental Consequences

Risk Factors

Management of the White River National Forest can contribute to the recovery of these listed species with near natural stream flows leaving the Forest. The important aspects of stream flow are water quality, water quantity, and timing of peak runoff.

**Resource
Protection
Measures**

A forest plan establishes key decisions for long-term direction, including forest-wide goals and objectives, forest-wide standards and guidelines, direction applying to future activities within management areas, determining suitability and capability of lands, and establishing monitoring and evaluation requirements.

The resource protection measures applicable to management of Colorado pikeminnow, razorback sucker, humpback chub, and bonytail habitat that are common to all alternatives include:

Forest-wide Goals, Objectives, and Strategies, 2002 Forest Plan, Chapter 1:

- Strategies that direct us to protect stream flow (Objective 1a and Strategy 1a.6); and
- Strategies that direct us to work with the state agencies to reduce exotic introductions (Strategy 1c.4).

Forest-wide Standards and Guidelines, 2002 Forest Plan, Chapter 2:

- Protection of flow (Water and Riparian Resources Standards 1 and 9, and Guidelines 3 and 4, and General Recreation Standard 3)
- Protection of streams and other water bodies from chemical contaminants (Soils Guideline 2, Water and Riparian Resources Standards 11, 12, and 13)

DIRECT AND INDIRECT EFFECTS

Effects on Habitat

The habitat for the four endangered fish species is downstream of the White River National Forest. Effects to occupied habitat from Forest activities are limited to those that affect the amount or timing of water or chemical contaminants reaching flowing water. The greatest effect to endangered fish habitat is water depletions. Most water depletions are not associated with National Forest activities and are therefore independent of Forest Plan alternative. Snowmaking is one water depleting activity that is related to Forest Plan management areas. It is assumed the amount of snowmaking is related to the amount of allocation of acreage to Management Prescription 8.25, Ski Areas, such that if a ski area expands, it will probably add more snowmaking. Forest plan alternatives with more acreage dedicated to ski areas are expected to eventually include more water used for snowmaking than those with less area dedicated to ski areas. Alternatives with the least amount of area dedicated to ski areas are D, I, and K. Alternatives B and E have the most area dedicated to ski areas. Because the ski areas in the headwaters are located far from occupied habitat in mainstem rivers, it is unlikely that any change in flow in occupied habitat could be detected due to the difference in snowmaking per alternative. Risk of a chemical contaminant spill does not vary by forest plan alternative and is expected to be low in all alternatives due to resource protection measures. **Therefore, no difference in Colorado pikeminnow, razorback sucker, humpback chub, or bonytail habitat is expected between Forest Plan alternatives.**

Effects on Populations

Since there should be no difference in endangered fish habitat between Forest Plan alternatives and Forest Plan alternatives to not affect populations directly, **there will be no difference between Forest Plan alternatives on Colorado pikeminnow, razorback sucker, humpback chub, or bonytail populations.** Activities that could affect roundtail chub populations, such as introduction or removal of exotic fish or changes to fishing regulations, are governed by the Colorado Division of Wildlife and are independent of the 2002 Forest Plan.

Table V-22

Endangered fish – Estimated potential changes for Colorado pikeminnow, razorback sucker, humpback chub, and bonytail habitat and populations during the life of the 2002 Forest Plan

Endangered Fish	Existing Condition	ALTERNATIVE						
		<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
Habitat Quantity	Downstream of WRNF	S	S	S	S	S	S	S
Habitat Quality	S	S	S	S	S	S	S	S
Population Trend	D	S	S	S	S	S	S	S
Viability Outcome	IV	IV	IV	IV	IV	IV	IV	IV

Key: D – Decreasing; S – Stable; IN – Increasing; U – Unknown

CUMULATIVE EFFECTS

The USFWS has determined water depletions are the current activity with the greatest on the endangered Colorado River fishes. Water depletions reduce peak flows and durations. This causes losses of backwater pools for spawning and rearing. It also reduces suspended sediments which confers a competitive advantage on non-native species. Water depletions occur as a result of municipal and domestic uses, irrigation, snowmaking, transbasin diversions, evaporation, and numerous other causes.

Large dams and reservoirs have changed the natural flow and temperature regimes, reduced suspended sediments, created barriers to fish migration and transformed thousands of miles of lotic habitats into lentic habitats. The reservoirs have been stocked with an assortment of non-native fish species, which are now competing with the native fishes.

Development in the floodplains has reduced backwater pools, which are important for spawning and rearing.

To benefit these fish species, the USFWS has implemented a Recovery Program and Recovery Action Plan which includes items such as a spring flood pulse to mimic natural conditions, late summer flow augmentation, exotic fish removal, reclamation of floodplain ponds, and reintroductions of endangered fish.

Boreal Toad

- Classification**
- Species of Viability Concern
 - Sensitive Species (see the Biological Evaluation in Appendix N)

Affected Environment

Reasons for Viability Concern	There is a viability concern for this species on the forest because: • It has recently experienced a rapid decline range-wide, • It has disappeared from historically occupied areas locally, and • It is considered critically imperiled in Colorado by the Colorado Natural Heritage Program
Habitat Description	Distribution of boreal toads are restricted to areas with suitable breeding habitat in lodgepole pine, spruce-fir forests, and alpine meadow areas. It is commonly found in shallow water or among sedges and shrubby willows where the micro-climate is moist. Breeding habitat includes lakes, marshes, ponds, bogs, and wet meadows with sunny exposures and quiet, shallow, perennial water. The elevational range for this species within the southern Rocky Mountains is between 7,000 and 12,900 feet.
Population Description	There are 12 known breeding populations on or adjacent to the White River National Forest. Three of these populations are on private land adjacent to the Forest. In the past 20 years boreal toads have disappeared from many previously occupied sites.
General Risk Factors	Dominant risk factors for this species include habitat loss, exotic predators (bullfrogs and fish), and disease. Chemical contaminants can also cause direct mortality of leopard frogs.

Environmental Consequences

Risk Factors	Habitat loss can be associated with either wetland loss or disturbance or changes in flow. Loss of riparian vegetation can make newly metamorphosed toads more susceptible to avian predation. Chemical contaminants can cause direct mortality of leopard frogs. Disease, specifically chytrid fungus, is currently believed to be the primary threat to boreal toads and many other species of amphibians. How chytrid fungus moves through the environment is not known, making control of spread difficult to address.
Resource Protection Measures	The 2002 Forest Plan establishes key decisions for long-term direction, including forest-wide goals and objectives, forest-wide standards and guidelines, direction applying to future activities within management areas, determining suitability and capability of lands, and establishing monitoring and evaluation requirements. The resource protection measures applicable to management of boreal toad habitat that are common to all alternatives include: Forest-wide Goals, Objectives, and Strategies, 2002 Forest Plan, Chapter 1: • Strategies and objectives that direct us to protect and improve wetlands, watershed health and habitat for species of viability concern (Objective 1a, Strategy 1a.4, Objective 1b, Strategy 1b.4, Objective 1c, Strategies 1c.1, 1c.2, and 1c.14).

- Strategies and objectives that direct the Forest to protect streamflow (Objective 1a and Strategy 1a.6).
- Strategies that direct us to work with the State to reduce exotic introductions and to coordinate on reintroduction of boreal toads (Strategy 1c.4, 1c.15, and 2b.7).

Forest-wide Standards and Guidelines, 2002 Forest Plan, Chapter 2:

- Wetland protection direction from various land uses (Soils Standard 3; Water and Riparian Resources Standards 5, 6, and 8, and Guideline 2; Rangeland Ecosystem Management Standard 2 and Guidelines 2 and 3; Boreal Toad and Leopard Frog Standards 1 and 2, and Guidelines 1, 2, 3, and 4; General Recreation Standard 1, and Wilderness Resources Guideline 1).
- Protection of streamflow (Water and Riparian Resources Standards 1 and 9, and Guidelines 3 and 4, and General Recreation Standard 3).
- Protection of sensitive species is required for all Forest activities (Proposed, Threatened, and Endangered Species and Sensitive Species Standards 1, 2, and 3).
- Protection of streams and other water bodies from chemical contaminants (Soils Guideline 2; Water and Riparian Resources Standards 11, 12, and 13, Boreal Toad and Leopard Frog Standards 3 and 4).

DIRECT AND INDIRECT EFFECTS

Effects on Habitat

Three of the twelve known boreal toad breeding sites on the White River National Forest area are on private land adjacent to the forest. Habitat quality at these sites is not affected by decisions made in the 2002 Forest Plan. Five of the nine known boreal toad breeding sites on the White River National Forest are within designated wilderness areas. Habitat quality at these sites is expected to be excellent since these areas are undisturbed and are expected to remain stable over the life of the Forest Plan. The level of activity associated with management area prescriptions for the remaining four populations does vary by alternative as described in the table below. Although the resource protection measures outlined in this document are expected to foster habitat improvement and the potential for population expansion at all sites, concentrated disturbance in the area around breeding sites can impact adjacent habitat (relating to the potential for population expansion). The alternative with the least amount of disturbance around known, occupied boreal toad breeding sites is Alternative K, followed by B and then I. Alternative F has the most potential to impact adjacent boreal toads habitat by having very high levels of activity near three breeding populations.

Table V-23
Boreal toad – Level of human activity at known population locations outside wilderness by alternative

Boreal Toad Population	ALTERNATIVE						
	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
Peru Creek	M	H	H	H	H	M	M
Lower North Tenmile	M	H	H	M	M	H	L
North Fork Snake River (2 Populations)	H	H	H	VH	VH	H	H

Key: L = Low activity level, non-motorized

M = Moderate activity level, motorized without concentrated recreation use, not contributing to ASQ

H = High activity level, motorized, contributing to ASQ or concentrated recreation use

VH = Very high activity level, concentrated development

The quantity of suitable boreal toad habitat is not expected to change with any alternative. No suitable wetlands are expected to be lost due to resource protection measures. Additional suitable wetlands may be created through habitat improvement projects, independent of Forest Plan alternative, but unoccupied suitable habitat appears to be readily available.

Effects on Populations

The two mechanisms with the greatest effect on boreal toad populations are reintroductions and the spread of chytrid fungus to existing populations (which could extirpate local populations). Both of these mechanisms are independent of 2002 Forest Plan decisions. Forest plan alternatives could impact boreal toad populations by the level of activity prescribed by management area allocations around boreal toad breeding sites. Greater amounts of disturbance around breeding sites may decrease the likelihood of that population expanding into adjacent suitable habitat by constructing roads or changing vegetation characteristics that could decrease toad dispersal. However, only four of the twelve known breeding sites vary by alternative and the resource protection measures should minimize negative impacts to adjacent habitat. Therefore, although Alternative K has the least amount of disturbance around known boreal toad breeding sites and Alternative F has the most disturbance (as described under Habitat above), these effects will be overshadowed by the effects of reintroductions and spread of chytrid fungus.

It is unknown whether more populations will be introduced or expanded or whether more will be lost to chytrid fungus or other causes.

Table V-24

Boreal Toad – Estimated potential changes for boreal toad habitats and populations on the White River National Forest during the life of the 2002 Forest Plan

Boreal Toad	Existing Condition	ALTERNATIVE						
		<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
Habitat Quantity	S	S	S	S	S	S	S	S
Habitat Quality*	S	2 nd	4 th	4 th	4 th	5 th	3 rd	1 st
Population Trend	Declining 12 pops.	U	U	U	U	U	U	U
Viability Outcome	IV	IV	IV	IV	IV	IV	IV	IV

Key: *D* – Decreasing; *S* – Stable; *I* – Increasing; *U* – Unknown

Note: * Based on management area prescription activity level on the 4 breeding populations which vary by alternative. Alternative *K* has the least disturbance or activity around the 4 breeding areas and Alternative *F* has the most disturbance or activity. The other alternatives are ranked.

CUMULATIVE EFFECTS

A wide variety of land use practices may impact boreal toads. Because boreal toads are highly dependent on aquatic habitat any action that changes water volume, water quality, aquatic vegetation, or the aquatic fauna can have significant negative impacts on the toads. Water withdrawals for snowmaking or other water uses can eliminate or reduce the quality of boreal toad habitat. The increased water yield and change in runoff timing associated with snowmaking can also impact boreal toad habitat by keeping the water cooler, longer and changing the hydrology of the breeding pond.

Fish prey on amphibian eggs. Trout have been widely stocked in many historically fishless lakes. Fish stocking in toad habitat can impact toad survival. Fish populations that are already established may preclude toad recolonization. Gray jays also feed on young toads.

In some areas, crayfish, which were introduced in Colorado in 1954, have caused eradication of entire beds of aquatic vegetation that would reduce habitat quality for leopard frogs. Crayfish are aggressive predators on fish and amphibian eggs, in addition to eating plant material and aquatic insects.

Chytrid fungus has been associated with amphibian extirpations in Australia. Chytrid fungus has been found in the southern Rocky Mountains in Colorado in western boreal toad in 1999 and in a museum specimen of northern leopard frog collected from the Colorado Rockies in 1974. Chytrid fungus is now suspected to be a major factor causing the recent decline of boreal toads throughout their range.

The Boreal Toad Conservation Plan and Agreement between the Colorado Division of Wildlife, Wyoming Game and Fish Department, New Mexico Game and Fish, U.S. Forest Service, National Park Service, U.S. Fish and Wildlife Service, Bureau of Land Management, Colorado Natural Heritage Program, and US Geological Survey establishes a framework for reintroduction of boreal toads, control of chytrid fungus, breeding pond surveys, and habitat protection recommendations.

(Literature citations available in Boreal Toad Species Viability Report)

All Trout, Brown Trout, and Brook Trout

- Classification**
- Management Indicator Species (all trout – salmonid habitat management)
 - Management Indicator Species (brook and brown trout – winter water depletions/fall spawning success)

Affected Environment

Monitoring Question/ Reasons for Selection as MIS	All trout: Does Forest management maintain or improve the physical habitat quality for salmonids in mountain streams? To answer the question, we will use either trout biomass or trout density as a measure of habitat quality. Trends in density or biomass will indicate if the physical habitat is being maintained for salmonids. Brook and brown trout: Do winter water depletions associated with Forest special uses impact spawning success of fall spawning fish? To answer the question, we will determine spawning success of brook and brown trout in areas affected by winter water withdrawals. Trends in spawning success will indicate if water depletions are impacting populations.
Habitat Description	The White River National Forest has 3,400 miles of perennial streams and 13,900 acres of lakes. Fish habitat on the forest is generally in good condition with some exceptions. There are a few streams that cannot support healthy fish populations because of severely degraded water quality from past mining activity, mostly in the Blue River Subbasin. Livestock grazing has degraded some localized areas of streams. Streams within ski areas have been rerouted, armored, and otherwise altered. Water is diverted from streams for snowmaking, domestic uses, and irrigation. Most of the domestic and irrigation diversions occur along the edges of the forest and have little effect on National Forest System lands. Lakes have excellent water quality and habitat.
Population Description	Trout occur in all but the smallest perennial streams across the White River National Forest. Whirling disease is a parasitic infection of fish. It has been discovered in most of the state's hatcheries and is known to occur in the wild. The full extent of the disease in the region has not been determined, but population declines have been documented in some large streams (Colorado River, Roaring Fork River, and Fryingpan River). Rainbow trout populations are in serious decline in many areas on and adjacent to the forest. Brown trout, which exhibit a much lower infection rate, and mountain whitefish, believed to be immune, are becoming more dominant in several popular fisheries. Trout stocking by the Colorado Division of Wildlife continues, though at a lower level than historically, in many streams and lakes across the forest.
General Risk Factors	Impacts on aquatic systems generally come from roads, mining, grazing, recreational developments (including ski areas), and water diversions. Whirling disease has affected trout populations in some of the larger systems.

Environmental Consequences

Risk Factors	Risk factors include fragmentation or reduction of habitat due to man-made barriers and loss of habitat due to loss of stream flow, physical alteration of habitat, increased sediment delivery to occupied habitat, and other chemical contaminants. Whirling disease is another risk factor impacting trout species.
Resource Protection Measures	The 2002 Forest Plan establishes key decisions for long-term direction, including forest-wide goals and objectives, forest-wide standards and guidelines, direction applying to future activities within management areas, determining suitability and capability of lands, and establishing monitoring and evaluation requirements. The resource protection measures applicable to management of trout habitat that are common to all alternatives include: Forest-wide Goals, Objectives, and Strategies, 2002 Forest Plan, Chapter 1: - Strategies that direct us to protect and improve streams, watershed health, and specifically habitat for MIS and focal species (Objective 1a, Strategy 1a.4, Objective 1b, Strategy 1b.4, Objective 1c, Strategies 1c.1, 1c.2, and 4a.2). Forest-wide Standards and Guidelines, 2002 Forest Plan, Chapter 2: - Stream protection direction that addresses physical stream habitat such as pools, banks, large wood, and riparian vegetation (Water and Riparian Resources Standards 4, 5, and 7, and Guidelines 1 and 2; Rangeland Ecosystem Management Standard 2 and Guidelines 2 and 3; Wildlife General Standard 6; Colorado River Cutthroat Trout Standard 1 and Guidelines 4 and 5, General Recreation Standard 1, and Wilderness Resources Guideline 1). - Protection of stream flow (Water and Riparian Resources Standards 1 and 9, and Guidelines 3 and 4, and General Recreation Standard 3). - Road direction to ensure that populations are not fragmented (allow upstream and downstream passage by the road) (Water and Riparian Resources Standard 6) - Protection measures to minimize erosion and sedimentation from disturbances (Soils Standards 1 – 7 and Guidelines 1 and 4; Water and Riparian Resources Standards 2, 3, and 10, and Colorado River Cutthroat Trout Standard 2 and Guidelines 1-3). - Protection of streams and other water bodies from chemical contaminants (Soils Guideline 2; Water and Riparian Resources Standards 11, 12, and 13).

DIRECT AND INDIRECT EFFECTS

Effects on Habitat

All Trout

Habitat quality is expected to generally increase as Watershed Conservation Practices and other habitat protection measures are applied to new and ongoing activities. However, areas with fewer disturbances are expected to improve faster than areas with ongoing disturbance such as timber sales, roads, and concentrated recreation. All 2nd through 7th order streams (an approximation of which streams are fishbearing for this analysis) on the White River National Forest were analyzed based on management area prescription to

determine the percentage of stream miles in areas with ongoing disturbances and the percentage of stream miles in areas with minimal disturbances. The table below displays the percentage of stream miles within each level of activity. The alternatives within which streams are expected to improve the fastest are Alternative I, then E, then C, and the alternative in which streams are expected to improve the slowest is Alternative F.

No additional habitat is expected to be created and none is expected to be destroyed, therefore habitat quantity is expected to remain constant.

Table V-25
All Trout. Percentage of 2nd through 7th order streams per management activity level by 2002 Forest Plan alternative.

Activity Level	ALTERNATIVE						
	B	C	D	E	F	I	K
Low	36.5	45.5	41.4	43.2	33.1	55.9	43.0
Moderate	25.1	23.8	17.2	35.4	8.6	28.4	18
High	34.3	27.0	39.1	15.7	55.1	12.9	35.9
Very High	4.1	3.6	2.3	5.7	3.2	2.8	3.1

Note: "Low" is non-motorized, "moderate" is motorized without concentrated recreation or contributing to ASQ, "high" is motorized and either concentrated recreation or contributing to ASQ, and "very high" is concentrated development.

Brook and brown trout

Brook and brown trout were selected as management indicator species because they are fall spawning fish. Activities that alter winter flows, such as snowmaking, have the potential to alter spawning habitat quality as well as general trout habitat quality if the hydraulic alterations are sufficient to cause channel adjustments. Spawning habitat quality can be impacted by reductions in winter flow when eggs are in the gravels. Flow reductions can dewater spawning sites and increase the occurrence of anchor ice. Decreases in habitat quality from channel adjustments include channel downcutting and simplification, and increased sediment from bank instability. The number of stream miles, by stream order, in areas dedicated to ski-based resorts (Management Area Prescription 8.25) is presented in the table below by alternative. Alternatives with the most miles of stream within ski area permit boundaries (Management Area Prescription 8.25) are expected to have the greatest negative impact on brook and brown trout habitat. The ranking of alternatives from least impact to greatest impact is: I and D, followed by K, C, F, E, and B. Because the land and channel alternations associated with ski area development are extensive and permanent, habitat quality in affected streams is expected to decrease as more area is developed in spite of mitigation measures and Watershed Conservation Practices.

Habitat quantity may decrease in alternatives with the greatest amount of ski area development (such as B, E, and F) if stream alterations are great enough. It is likely that there have already been habitat losses (existing condition) associated with ski area development.

Table V-26

Brook and brown trout – Number of stream miles within Management Area 8.25 by 2002 Forest Plan alternative

Stream Order	ALTERNATIVE						
	B	C	D	E	F	I	K
1	188.01	91.65	65.61	148.86	112.60	66.28	82.83
2	50.38	28.15	23.81	41.21	30.92	24.37	25.45
3	15.96	9.61	8.69	16.40	10.71	12.35	10.22
4	4.06	2.28	0.25	3.26	2.50	0.25	0.25

Key: D – Decreasing; S – Stable; IN – Increasing; U – Unknown

Effects on Populations

All trout

Trout populations are expected to increase with improving habitat, and alternatives with the most habitat improvement are expected to have the greatest improvement in trout populations. However, generally improving habitat conditions may not address the limiting factor of each population, so population responses are expected to be less than habitat responses and are probably not going to be detectable at the forest scale.

Therefore, population response is reported as “stable” in the table below.

Table V-27

All trout – Estimated potential changes for trout habitat and populations during the life of the 2002 Forest Plan

	Existing Condition	ALTERNATIVE						
		B	C	D	E	F	I	K
Habitat Quantity	3,400 mi. 13,900 acres	S	S	S	S	S	S	S
Habitat Quality	Improving	4 th	3 rd	4 th	2 nd	5 th	1 st	4 th
Population Trend	S	S	S	S	S	S	S	S

Key: D – Decreasing; S – Stable; IN – Increasing; U – Unknown

Note: Rankings indicate the comparative improvement rate, such that habitat in Alternative I is improving faster than Alternative F.

Brook and brown trout

Populations of brook and brown trout in areas with ski area development may decrease as habitat quality of spawning areas and rearing areas is decreased as described above. The more miles of stream impacted, the greater the decrease in brook and brown trout populations that could occur. Existing conditions of brook and brown trout in and around ski areas are unknown.

Table V-28

Brook and brown trout – Estimated potential changes for brook and brown trout habitat and populations in ski areas during the life of the Forest Plan

		ALTERNATIVE						
	Existing Condition	B	C	D	E	F	I	K
Habitat Quantity	D	Some Loss	S	S	Some Loss	Some Loss	S	S
Habitat Quality	D	6 th	3 rd	1 st	5 th	4 th	1 st	2 nd
Population Trend	U	6 th	3 rd	1 st	5 th	4 th	1 st	2 nd

Key: D – Decreasing; S – Stable; IN – Increasing; U – Unknown

Note: Rankings indicate the degree of impact, such that Alternatives D and I are less impacted by potential ski area development than Alternative B

CUMULATIVE EFFECTS

Fish habitat on the White River National Forest is generally in good condition. Past mining activities have degraded water quality in several streams, most of which will not recover in the foreseeable future. Railroads were built along some streams at the lower ends of the forest boundary. These have all been closed or converted to roadways. Major highways on the forest run parallel to streams (for example, Straight Creek, Gore Creek, and the North Fork of the Snake River). Sand and gravel used on the roads during winter does wash into the streams. Cattle grazing is ongoing, but at a much lower intensity than what occurred in the past.

Water is diverted from the White River National Forest to the Front Range from the Roaring Fork River, Eagle River, and Blue River drainages. The Roaring Fork drainage is still in good condition and supports healthy fisheries. In the Eagle and Blue River drainages, water diversions exacerbate water quality problems by reducing dilution. Ruedi Reservoir on the Fryingpan River is one of several western slope reservoirs that provides water to the Colorado River. As a participant in the Upper Colorado River Endangered Fish Recovery Program, the Bureau of Reclamation releases water from Ruedi in the summer and fall to augment flows in the 15 Mile Reach (the stretch of the Colorado River starting at the confluence with the Gunnison River and extending 15 miles upstream). These releases cause short-term reductions in the fishability of the river, but they provide benefits for channel maintenance and interstitial habitat. Dillon Reservoir stores water for Denver. The reservoir could be drained if needed to provide domestic water for Denver; as the population of Denver increases, such a scenario becomes more likely. Dillon Reservoir is a high-elevation, oligotrophic lake and does not sustain a productive fishery.

Stocking of non-native fish began around 1900. Introduction of brook, brown, and rainbow trout greatly boosted recreational fisheries and at the same time caused the downfall of the native cutthroat trout. Stocking has declined in recent years because of whirling disease and a new emphasis on wild trout management. As whirling disease is eradicated from some of the larger hatcheries, stocking will increase from its current low point, but is unlikely to reach historical highs. Daily creel limits have been reduced to

compensate for lack of hatchery fish. Reduced stocking and the decline of rainbow trout due to whirling disease is evident in several rivers around the forest. Anglers are beginning to move farther into the forest to fish sustainable brook trout populations in lakes and smaller creeks. This trend is likely to continue.

The popularity of trout fishing has remained relatively stable over the past several years. The number of anglers will continue to increase with an increasing population. Cooperative agreements involving the Colorado Division of Wildlife, Colorado Department of Transportation, Bureau of Land Management, Forest Service, other state and federal agencies, conservation groups, and private landowners are making progress in providing more access to high-quality fisheries. These efforts should be sufficient to meet increasing demands.

Colorado River Cutthroat Trout

- Classification**
- Species of Viability Concern
 - Sensitive Species (see the Biological Evaluation in Appendix N)

Affected Environment

- Reasons for Viability Concern**
- There is a viability concern for this species on the forest because:
- The species has experienced a severe decline range-wide (including the White River National Forest),
 - Remaining populations on the White River National Forest are vulnerable invasion by exotic trout, and
 - The populations on the White River National Forest are small and isolated.

- Habitat Description**
- Most of the cutthroat trout habitat on the White River National Forest is in good condition physically (good riparian condition, deep pools, complex habitat, etc.). Livestock grazing has degraded some localized areas of cutthroat streams. There is a large, transbasin diversion above at least one cutthroat stream that may be reducing the quantity and quality of habitat available. In general, lakes on the White River National Forest have excellent water quality and habitat. The most significant factor affecting cutthroat trout habitat is the presence of exotic trout species. Genetically pure cutthroat trout are only considered secure if they are physically isolated from other trout species, which can hybridize with them or replace them through competition. Cutthroat are most limited by the amount of habitat available without exotic trout (see Population Description below). For a detailed description of the physical characteristics preferred by cutthroat trout see the Viability Species Report on file.

- Population Description**
- There are 62 known Colorado River cutthroat trout populations on the White River National Forest; 28 populations are isolated above a secure barrier and 18 are isolated above a barrier that is not secure. Nine of the isolated populations are mixed with other trout species, and there is incomplete information for six populations. Four streams have an insecure population below a secure population. Numerous lake populations also occur. Many streams and lakes on the forest have not been surveyed for cutthroat.

Although there are 28 secure populations, they occupy only 140 kilometers of streams for an average of 5 kilometers per population. Population viability is based on the ability of a population to withstand stochastic events such as fires, major storms, or landslides. Small populations are at higher risk from such events and require more restrictive protection measures such as catch and release. A draft viability model for cutthroat has been developed. The model showed a viability target for any given population is 10,000 total trout. A population of that size is believed to be adequate to persist for 100 years. It is estimated that 30 kilometers of connected perennial streams are needed to support a population of this size.

- General Risk Factors**
- Risks to Colorado River cutthroat trout are both biological and habitat related. The greatest threats to Colorado River cutthroat trout are biological: exotic trout and to some degree whirling disease. These populations can be further reduced by decreases in habitat quality from fragmentation, loss of flows, or physical decreases in habitat

quality (such as pools, large woody debris, embeddedness of spawning gravels).

Environmental Consequences

Risk Factors

Risk factors include threats from exotic trout species fragmentation or reduction of habitat due to man-made barriers and loss of habitat due to loss of stream flow, physical alteration of habitat, increased sediment delivery to occupied habitat, and other chemical contaminants. These risk factors can be managed to acceptable levels through resource protection measures and mitigation.

Resource Protection Measures

The 2002 Forest Plan establishes key decisions for long-term direction, including forest-wide goals and objectives, forest-wide standards and guidelines, direction applying to future activities within management areas, determining suitability and capability of lands, and establishing monitoring and evaluation requirements.

The Resource Protection Measures applicable to management of Colorado River cutthroat trout habitat that are common to all alternatives include:

Forest-wide Goals, Objectives, and Strategies, 2002 Forest Plan, Chapter 1:

- Strategies that direct us to protect and improve streams, watershed health, and habitat for MIS and species of viability concern (Objective 1a, Strategy 1a.4, Objective 1b, Strategy 1b.4, Objective 1c, Strategies 1c.1, 1c.2, 1c.10, 1c.11, and 4a.2).
- Strategies that direct us to protect stream flow (Objective 1a and Strategy 1a.6)
- Strategies that direct the Forest to work with the State to reduce exotic introductions and fishing pressure on cutthroat (Strategy 1c.4, 1c.12, and 2b.7).

Forest-wide Standards and Guidelines, 2002 Forest Plan, Chapter 2:

- Stream protection direction that addresses physical stream habitat such as pools, banks, large wood, riparian vegetation (Water and Riparian Resources Standards 4, 5, and 7, and Guidelines 1 and 2; Rangeland Ecosystem Management Standard 2 and Guidelines 2 and 3; Wildlife General Standard 6; Colorado River Cutthroat Trout Standard 1 and Guidelines 4 and 5; General Recreation Standard 1; and Wilderness Resources Guideline 1).
- Protection of flow in cutthroat streams (Water and Riparian Resources Standards 1 and 9, and Guidelines 3 and 4; and General Recreation Standard 3)
- Protection of sensitive species is required for all forest activities (Proposed, Threatened, and Endangered Species and Sensitive Species Standards 1- 3).
- Road direction to ensure that populations are not fragmented such as allowing upstream and downstream passage by the road (Water and Riparian Resources Standard 6).
- Protection measures to minimize erosion and sedimentation from disturbances (Soils Standards 1 – 7 and Guidelines 1 and 4; Water and Riparian Resources Standards 2, 3, and 10; and Colorado River Cutthroat Trout Standard 2 and Guidelines 1-3).
- Protection of streams and other water bodies from chemical contaminants (Soils Guideline 2; Water and Riparian Resources Standards 11, 12, and 13)

DIRECT AND INDIRECT EFFECTS

Effects on Habitat

Habitat quality across the White River National Forest is generally increasing as Watershed Conservation Practices and other habitat protection measures are applied to new and ongoing activities. However, areas with fewer disturbances are expected to improve faster than areas with ongoing disturbance such as timber sales, roads, and concentrated recreation. The known cutthroat trout populations on the White River National Forest were analyzed based on management area to determine how many populations were in areas with ongoing disturbances and how many populations were in areas with minimal disturbances. Table 3-60 (in the Aquatic Resources section of Chapter 3) displays how many populations are within each level of activity. Alternatives with the most populations in management areas with little to no disturbance are assumed to improve the fastest and the alternative with the most populations in management areas with the most activity is assumed to improve the slowest (see **Table V-29**, cutthroat trout below).

Effects on Populations

Resource protection measures are sufficient to prevent habitat or population reduction from forest activities. Extirpations of local populations are possible by extreme events such as large wildfires, chemical spills, or replacement or hybridization by exotic trout. Forest plan decisions are not expected to influence these types of events. Water withdrawals from cutthroat streams have the potential to reduce habitat quality and population density from individual cutthroat populations. Reintroduction of cutthroat populations or range expansion of individual populations is likely to occur in the future in partnership with the Colorado Division of Wildlife and is independent of 2002 Forest Plan alternatives. It is unknown whether more populations will be introduced or expanded or whether more will be lost to extreme events or water development, however this is independent of 2002 Forest Plan alternatives, and these effects will overshadow any expected increases due to increasing habitat quality.

Table V-29

Colorado River cutthroat trout – Estimated potential changes for Colorado River cutthroat trout habitat and populations during the life of the 2002 Forest Plan

<i>Cutthroat Trout</i>	<i>Existing Condition</i>	ALTERNATIVE						
		<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
Habitat Quality	62 pops.	IN	IN	IN	IN	IN	IN	IN
Population Trend	S	Slight IN	Moderate IN	Slight IN	Most IN	Lease IN	Most IN	Moderate IN
Viability Outcome	IV	IV	IV	IV	IV	IV	IV	IV

Key: D – Decreasing; S – Stable; IN – Increasing; U – Unknown

CUMULATIVE EFFECTS

The Colorado Division of Wildlife, Utah Division of Wildlife Resources, Wyoming Game and Fish Department, US Fish and Wildlife Service, U.S. Forest Service, Bureau of Land Management, Ute Indian Tribe, and the National Park Service have all agreed to the conditions set forth in the Conservation Agreement and Strategy for Colorado River cutthroat trout in the States of Colorado, Utah, and Wyoming. This plan includes strategies such as exotic trout removal, cutthroat reintroduction, cutthroat genetic analysis and surveys, habitat improvement, and educational programs, among other activities intended to reverse the decline of the subspecies.

Elevated concentrations of metals and other pollutants may also limit populations. In one case on the White River National Forest, French Gulch, metal contamination in the stream is an effective barrier preventing upstream migration of non-native trout and is thus protecting the Colorado River cutthroat trout from invasion, however, there are no opportunities to expand that population downstream.

This subspecies may not be extremely vulnerable to habitat perturbations. Binns (1977) noted the Colorado River cutthroat trout sometimes persists in marginal, degraded habitats, often as the only fish species. Behnke and Zarn (1976) reported the Colorado River cutthroat trout remaining in such habitats even after the introduction of rainbow trout. However, given the severe decline of the species, we are very protective of occupied habitat to maximize the robustness of local populations to increase their chances of persistence.

Cutthroat trout populations can be susceptible to over-angling. The catch rates for this trout species are second only to those of brook trout. The Colorado Division of Wildlife has an artificial lures and catch and release regulation on many Colorado River cutthroat trout streams. Angling mortality is rarely heavy enough to reduce population viability, but it can change the age structure of fish populations. Loss of breeding individuals could lead to increased inbreeding and long-term loss of viability.

Whirling disease occurs in many fish hatcheries throughout Colorado and infected fish have been stocked statewide. Whirling disease is a parasitic, protozoan, which attacks the cartilage of young fish. Whirling disease affects rainbow, cutthroat, brook, and to a lesser degree, brown trout. Mortality rates for rainbow, cutthroat, and brook trout can exceed 80 percent. Dramatic declines in rainbow trout populations have been recorded in the Madison River in Montana, and the Colorado and Fryingpan rivers in Colorado. Research has shown cutthroat trout are as susceptible as rainbows. Infected fish, birds, mammals, boats, fishermen, and other equipment can spread the spores from area to area.

PLANTS

***Armeria scabra* Pallas ssp. *sibirica* (Turczaninov ex Boissier) Hylander,
Sea pink**

- Classification**
- Species of Viability Concern
 - Endangered Species (see the Biological Evaluation in Appendix N)

Affected Environment

Armeria scabra ssp. *sibirica* (Sea pink) came into consideration for this assessment because it is known to occur on the White River National Forest, and the species is rated G5T5/S1 by the Colorado Natural Heritage Program (CNHP 2000a). These ratings mean: “G5T5. Both species and subspecies ... demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.”

“S1. Critically imperiled in state because of extreme rarity (5 or fewer occurrences, or very few remaining individuals), or because of some factor of its biology making it especially vulnerable to extirpation from the state. (Critically endangered in state)” (CNHP 2000b).

- Reasons for Viability Concern**
- There is a viability concern for this species on the forest because:
- The populations are few and small, and
 - The two known population sites on the White River National Forest are vulnerable to impacts.

Habitat Description

On the White River National Forest, the species is known from only two populations in the Alpine Life Zone. The only other population of the genus (and family) in Colorado outside cultivation is a small, nearby population on the Pike National Forest. These three sites are all in the alpine on low-angle, well-vegetated tundra slopes. The three sites range 11,800–12,500 ft (3,595–3,810 m) elevation, from west-northwest to east aspect, 2–55% slope. There are very different geologies for what seems to be closely similar habitats for the three populations, so it is unlikely that geology is limiting on these populations.

There is nothing especially distinctive about the habitat of *Armeria* at these three sites. Apparently, the plants in these populations of *Armeria* have very restricted dispersal capabilities, either of pollen or seeds or quite possibly both.

In the two populations on the White River National Forest, the largest populations, the plants are associated with *Deschampsia cespitosa*–*Acomastylis rossii* tundra, relatively well-vegetated.

Population Description

Associated plant species are mostly common alpine plants, found together in thousands of other similar sites in the alpine of Colorado and elsewhere. All three Colorado populations have been counted, and the total number of individuals in Colorado remains at fewer than 500. Population size varies from about 25 to 325. This species has been considered very rare ever since these populations were discovered. Weber and Wittmann (1996) say the species “is so extremely restricted that it should never be collected unless to document a new locality.”

Additional populations of the species may exist however, many people have searched for *Armeria scabra* in hundreds of similar alpine areas throughout Colorado and elsewhere without discovery of additional populations.

**General
Risk Factors**

The major risk factors for this species are activities such as vehicle use, concentrated hiking activity, and domestic livestock grazing that might result in ground disturbances within the occupied habitat of the species.

Environmental Consequences

Risk Factors

The primary risk factor to this species on the White River National Forest is from unauthorized motorized vehicle use directly impacting populations and habitats.

**Resource
Protection
Measures**

These protection measures are developed to protect existing known populations as well as any new populations discovered through the life of the 2002 Forest Plan.

The 2002 Forest Plan establishes key decisions for long-term direction, including forest-wide goals and objectives, forest-wide standards and guidelines, direction applying to future activities within management areas, determining suitability and capability of lands, and establishing monitoring and evaluation requirements.

The Resource Protection Measures applicable to management of Sea pink habitat that are common to all alternatives include:

Forest-wide Goals, Objectives, and Strategies, 2002 Forest Plan, Chapter 1:

- Strategies that direct the Forest to manage for ecological conditions to sustain viable populations of native and desired nonnative species. (Objective 1b, Strategy 1b.4, Objective 1c, Strategies 1c.1 and 1c.2, and 1C16.).

Forest-wide Standards and Guidelines, 2002 Forest Plan, Chapter 2:

- Management direction that restricts activities in the alpine zone in order to maintain ecological conditions important to the maintenance of native flora. (Chapter 2, Section 2, Alpine Standards 1 and 2 and Alpine Guidelines 1-3).
- Rangeland Ecosystem Management Standards and Guidelines assure proper management of the non-forested vegetation resources. (Chapter 2, Section 2, Rangeland Ecosystem Management, Standards 1-2, Guidelines 1-3).
- Management direction that restricts all non-snow motorized and mechanized uses to designated travelways. (Chapter 2, Section 5, Standard 4).
- Specific direction for plant species of viability concern that directs the Forest to:
 - Survey for possible new populations of plants in areas identified as potential habitat that may be affected by project activities. (Chapter 2, Section 2, Species of Viability Concern, Plant, Standard 1)
 - Avoid project disturbances that would significantly affect species viability or trend the species towards federal listing. (Chapter 2, Section 2, Species of Viability Concern, Plant, Standard 1)

DIRECT AND INDIRECT EFFECTS

In the 2002 Forest Plan, management of Site 1 would be as an established Research Natural Area. The area would be closed to motorized travel year round in all alternatives.

Impacts to *Armeria scabra* and its habitat at Site 1 by implementation of any alternative of the 2002 Forest Plan would be insignificant. The population is within an established research natural area and within an area closed to grazing, and motorized and mechanized travel is either prohibited or restricted to designated routes (which are far away).

The very small watershed above the White River National Forest *Armeria scabra* population is protected from vehicle use, grazing use, and road and trail construction, since it is within the established Hoosier Ridge Research Natural Area. Since this watershed is protected from use, water quality critical to the species would not be changed or impaired. The 2002 Forest Plan proposes no sources of air pollution in this area that might indirectly affect the population or its habitat.

Site 2 on the White River National Forest would be managed for dispersed recreation in Alternatives B, C, E, and I; for resource production (range vegetation emphasis) in Alternative F; and as a "Limited Use Area" in Alternative D. These alternatives all allow some level of recreation use, such as dispersed hiking and horseback riding that may impact the habitat and population on this site.

Impacts to *Armeria scabra* and its habitat at Site 2 by implementation of any alternative of the revised Forest Plan may occur due to dispersed recreation uses such as hiking and horseback riding.

Air and water pollution from vehicles passing over or near the site may well affect this population, although there is no data to support what impacts these factors might cause.

Under the 2002 Forest Plan this area would be closed to domestic livestock grazing in all alternatives. Both known population sites are currently ungrazed by livestock, and Site 1 would remain closed to livestock grazing in all alternatives. The large grazing allotment surrounding Site 2 is now vacant and ungrazed by livestock. Under Alternatives B and F the allotment would be retained as vacant; it would be partially closed under Alternatives D and K; and closed entirely under Alternatives C, E, and I.

Effects on Habitat

The impacts to habitat for Sea pink from any of the alternatives in the 2002 Forest Plan are expected to occur due mainly from dispersed recreation use of the known or other suitable habitat areas. The strategies, standards and guidelines discussed above were developed to provide protection for alpine ecosystems and therefore, habitats for this species. Dispersed recreation use will occur in both known and potential habitats that may have some level of impacts to the habitats due to trampling effects. Increased motorized and mechanized vehicle use is occurring throughout the White River National Forest, and this use is expected to increase throughout the life of the 2002 Forest Plan. It is likely that some level of illegal use of these vehicles may occur in Sea pink habitats that could lead to impacts to habitats. Although domestic livestock grazing does not occur on the two known population sites, it is possible that undiscovered populations occur within currently active sheep allotments. The impacts of this use on Sea pink are unknown.

Effects on Populations

The two known sea pink populations are expected to maintain themselves throughout the life of the plan. Impacts to the populations would occur only due to unauthorized activities. The 2002 Forest Plan direction detailed above is expected to provide broad protection to known and currently unknown populations of sea pink. Some incidental trampling of individual plants may occur due to dispersed recreation use or from domestic livestock grazing within active sheep allotments containing currently unknown populations of this species. The level of this use is not expected to reduce overall population vigor for either of the two known populations or for any currently unknown populations.

Table V-30

Expected trends in populations and habitats for *Armeria scabra*, Sea pink during the life of the 2002 Forest Plan

		ALTERNATIVE						
	Existing Condition	B	C	D	E	F	I	K
Amount of Habitat	Limited - currently known from two locations	Same	Same	Same	Same	Same	Same	Same
Habitat Quality	High	S	S	S	S	S	S	S
Expected Population Trend	S	S	S	S	S	S	S	S
Viability Outcome*	I	I	I	I	I	I	I	I

Key: D – Decreasing; S – Stable; IN – Increasing; U – Unknown

Note: * Viability outcomes are defined in the introduction to this section (Topic 1, Part 2, Section 3).

CUMULATIVE EFFECTS

This is a circumpolar species found in arctic/alpine habitats. The closest population outside of Colorado is in Alaska. All three populations of *Armeria scabra* in Colorado are on national forests, and the two largest are on the White River National Forest. The third population is on the Pike National Forest. It is a Region 2 sensitive species and is afforded the protection associated with that listing on both forests. There is no indication of declines in any of these populations from historic levels.

Both of the White River National Forest populations will come under increasing threats from unauthorized vehicle use, especially at Site 2, since recreational vehicle pressure is increasing in Summit County, as elsewhere. The research natural area including site 1 would be surrounded by a non-motorized management area in all alternatives, accidental unauthorized vehicle use would be very small both summer and winter.

At Site 2, motorized and mechanized vehicles would be prohibited from leaving the road and traversing the *Armeria scabra* population in the summertime in all alternatives. In the

winter, motorized vehicle use may be allowed based on management area direction. In both summer and winter, there are no physical barriers to prevent vehicles from leaving designated routes and traversing the *Armeria scabra* population.

Cumulative impacts to *Armeria scabra* and its habitat at Site 1 would be insignificant, but may occur at Site 2. One pass over the population at Site 2 by a vehicle would do damage to the plants and their habitat, which may not recover for decades. The soils of the *Armeria scabra* populations are fine-textured and relatively deep and loamy for the alpine, and natural rehabilitation of alpine ecosystems is slow to very slow (Marr 1964-1979, Thilenius 1975). The probability of damage events from unauthorized use is increasing, and the damage would be cumulative and could lead to degradation of the populations and their habitat.

It is possible that additional, currently unknown populations of this species exist on either the White River National Forest or the Pike National Forest. As these populations are identified, they will be afforded the protection associated with the Forest Service sensitive species program and the direction detailed in the 2002 Forest Plan.

***Astragalus molybdenus* Barneby, Leadville milkvetch**

Classification

- Species of Viability Concern
- Sensitive Species (see the Biological Evaluation in Appendix N)

Affected Environment

There is a viability concern for this species on the Forest because: it is known to occur on the White River National Forest, and the species is rated G3/S2 by the Colorado Natural Heritage Program (CNHP 2000a). These ratings mean:

“G3. Very rare or local throughout its range or found locally in a restricted range (21 to 100 occurrences). (Threatened throughout its range).

“S2. Imperiled in state because of rarity (6 to 20 occurrences), or because of other factors demonstrably making it very vulnerable to extirpation from the state. (Endangered or threatened in state)” (CNHP 2000b).

Astragalus molybdenus is rated as sensitive by the Forest Service, Rocky Mountain Region, but not by the Bureau of Land Management in Colorado.

Reasons for Viability Concern

There is a viability concern for this species on the forest because:

- It is known to occur on the White River National Forest, and
- The species is rated G3/S2 by the Colorado Natural Heritage Program (CNHP 2000a).

Habitat Description

Astragalus molybdenus plants occur on alpine gravelly gentle slopes and dry sedgy Alpine tundra at elevations of 11,800–12,700 ft (3,595–3,870 m), averaging 12,250 ft (3,730 m). Soil surfaces tend to be gravelly. Aspects are various, and slopes angles are relatively shallow for Alpine sites, usually <35% slope. The sites usually are sparsely vegetated, with much gravel cover.

Alpine soils have not been mapped sufficiently in these areas to be able to characterize soil habitat for this species.

Marriott (1990) described the Colorado sites:

In Colorado, *Astragalus molybdenus* is clearly alpine in habitat, in contrast with the predominantly subalpine *A. shultziorum* ... It was found on somewhat-vegetated talus/scree reminiscent of *Astragalus shultziorum* sites in Wyoming. However, the Leadville milkvetch also occurs in “lusher” alpine tundra communities with 100% cover, on well-developed soils.

Astragalus molybdenus often forms “dense patches of silvery-gray or ashen-green foliage, spreading by slender sucker-like stolons which may give rise at intervals to an independent root system” (Barneby 1964); these stolons connecting individual flowering stems make this species difficult to count. *Astragalus molybdenus* often occurs on calcareous substrates, such as limestone or limy shale, or in areas close to limestone outcrops (Tweto 1979, Ray 2000).

On the White River National Forest, *Astragalus molybdenus* occurs in seven areas: the Taylor Pass area, the Pearl Pass area, Mount Bellview, North Pole Basin, the Hoosier Ridge area, the French Pass area, and Frigid Air Pass. These sites are located along the

**Population
Description**

Continental Divide on the boundaries of Gunnison, Lake, Park, Summit, and Pitkin counties.

The plants of *Astragalus molybdenus* are small and sometimes difficult to spot, and there are a number of areas that have not been searched by botanists. In the 2001 field season, four new populations were discovered, one of which is the largest one to date; so it appears that there are many populations remaining to be discovered. In addition, the plants are vigorously stoloniferous. It is difficult to determine how many separate individuals there are; hence, number of stems that could potentially flower are usually counted.

On the White River National Forest, six populations have recently been counted. The two populations in the North Pole Basin-Bear Basin area are estimated to have > 30,000 stems each. In the North Pole Basin area is apparently the largest population yet, covering about 30 acres; the densest part of the population has been estimated (using statistical sampling) at over 3,000,000 stems, so the whole population probably has over 4,000,000 stems (Rossignol, personal communication). For these three populations, the land ownership is shared between the White River National Forest and private mineral patents.

The population on the summit of Mt. Bellview is estimated at > 7,000 stems, all within the Maroon Bells-Snowmass Wilderness. The population is astride the boundary between the White River National Forest and the Gunnison National Forest (Rossignol, personal communication).

Another recently discovered population on the White River National Forest is west of Frigid Air Pass, in the Maroon Bells-Snowmass Wilderness. This population is estimated to total about 2,000 stems in four subpopulations (Austin, personal communication).

Several of the White River National Forest populations are on ridges, where the Forest boundary divides the population; so the White River National Forest shares some populations with the Gunnison National Forest and the Pike National Forest.

**General
Risk Factors**

The major risk factors for this species are activities such as vehicle use, concentrated hiking activity, and domestic livestock grazing that might result in ground disturbances within the occupied habitat of the species.

Environmental Consequences

Risk Factors

The primary risk factor to this species on the White River National Forest is from motorized vehicle use directly impacting populations and habitats.

**Resource
Protection
Measures**

These protection measures are developed for existing known populations as well as any new populations discovered through the life of the 2002 Forest Plan.

The 2002 Forest Plan establishes key decisions for long-term direction, including forest-wide goals and objectives, forest-wide standards and guidelines, direction applying to future activities within management areas, determining suitability and capability of lands, and establishing monitoring and evaluation requirements.

The Resource Protection Measures applicable to management of Leadville milkvetch habitat that are common to all alternatives include:

Forest-wide Goals, Objectives, and Strategies, 2002 Forest Plan, Chapter 1:

- Strategies that direct the Forest to manage for ecological conditions to sustain viable populations of native and desired nonnative species. (Objective 1b, Strategy 1b.4, Objective 1c, Strategies 1c.1 and 1c.2, and 1C16.).

Forest-wide Standards and Guidelines, 2002 Forest Plan, Chapter 2:

- Management direction that restricts activities in the alpine zone in order to maintain ecological conditions important to the maintenance of native flora. (Chapter 2, Section 2, Alpine Standards 1 and 2 and Alpine Guidelines 1-3).
- Rangeland Ecosystem Management Standards and Guidelines assure proper management of the non-forested vegetation resources. (Chapter 2, Section 2, Rangeland Ecosystem Management, Standards 1-2, Guidelines 1-3).
- Management direction that restricts all non-snow motorized and mechanized uses to designated travelways. (Chapter 2, Section 5, Standard 4).
- Specific direction for plant species of viability concern that directs the Forest to:
 - Survey for possible new populations of plants in areas identified as potential habitat that may be affected by project activities. (Chapter 2, Section 2, Species of Viability Concern, Plant, Standard 1)
 - Avoid project disturbances that would significantly affect species viability or trend the species towards federal listing. (Chapter 2, Section 2, Species of Viability Concern, Plant, Standard 1)

DIRECT AND INDIRECT EFFECTS

The Taylor Pass *Astragalus molybdenus* populations would be partially protected by the designation of a proposed Research Natural Area in Alternatives D and I, or by the designation of a proposed Special Interest Area in Alternatives C, D and K. In the other alternatives, the populations would be unprotected by any special designation. Potential impacts associated with motorized use in areas adjacent to this population would be most significant in Alternatives B, E, and F due to management area (MA) delineation that allows more motorized uses.

The Pearl Pass Area west of the road corridor is in designated Wilderness in all alternatives. The area to the east of the road corridor is to managed as 1.31 under Alternatives I and K, 3.31 in Alternative B, 4.3 in Alternative C and E and 5.4 in Alternative F. Management Area 1.31 provides a higher level of protection from potential motorized use impacts in areas adjacent to this population than MA 4.3.

Mount Bellview and Frigid Air Pass are both within the Maroon Bells-Snowmass Wilderness. This designation offers protection to these populations and does not change under any alternative.

The North Pole Basin population in Alternatives C, D, F, and K would be within a 1.31 Management Area. In Alternatives D and I the population is split between Management Areas 1.31 and 4.3, and in Alternative E it is totally within Management Area 4.3. The Alternatives in which the population is within MA 1.31 will provide a higher level of protection from possible impacts from motorized use in areas adjacent to this population.

The French Pass area would be managed within Management Area 1.31 in Alternatives B, C, I, and K. Under Alternative D it would be in Management Area 3.21, Alternative E, Management Area 4.3, and in Alternative F, Management Area 3.31. There are more potential impacts associated with motorized use in areas adjacent to this population in Alternatives E and F.

The area east of Hoosier Ridge would be managed as an established Research Natural Area (USDA Forest Service 1999) in all alternatives. The area would be closed to motorized travel in the winter. In the summer, motorized and mechanized (bicycle) travel would be prohibited on the site.

The area west of Hoosier Ridge would be managed much more openly. All alternatives require vehicles to stay on designated routes, however, the area has many undesignated routes that are nonetheless used. Terrain is generally such that once access is gained to the Alpine Zone, it would be difficult to restrict vehicle travel. In Alternative D, this population would be protected by designation of a special interest area. In Alternatives B, C, D, and E the area would be managed as either Management Area 1.31, or 2.1 that would prohibit motorized uses. In Alternative F it would be in a 5.42 Management Area, Alternative I is MA 4.3 and Alternative K is 3.31. These MAs do not provide as much protection from potential impacts associated with motorized use in areas adjacent to this population as 1.31 or 2.1.

Grazing allotment management under the 2002 Forest Plan is as follows: Taylor Pass, Pearl Pass, North Pole Basin, and French Pass are in sheep grazing allotments, but are now vacant. Mt. Bellview and Hoosier Ridge are closed to grazing use, and Frigid Air Pass is in an active sheep grazing allotment. In all alternatives, the Mt. Bellview and Frigid Air Allotments would remain active, while the Hoosier Ridge East and Hoosier Ridge West allotments would both remain closed. Taylor Pass, French Pass, and Pearl Pass Allotments would be retained as vacant in Alternatives B and F, and closed entirely in all other Alternatives. North Pole Basin would be retained as vacant in Alternatives B, C, D, F, and K and closed in Alternatives E and I.

The only potential impacts from grazing are to the Frigid Air Pass population. All other populations are either within closed or vacant allotments or are in areas inaccessible to domestic livestock.

Effects on Habitat

The impacts to habitat for Leadville milkvetch from any of the alternatives in the 2002 Forest Plan are expected to occur due mainly from dispersed recreation use of the known or other suitable habitat areas. The strategies, standards and guidelines discussed above were developed to provide protection for alpine ecosystems and therefore, habitats for this species. Dispersed recreation use will occur in both known and potential habitats that may have some level of impacts to the habitats due to trampling effects. Increased motorized and mechanized vehicle use is occurring throughout the White River National Forest, and this use is expected to increase throughout the life of the 2002 Forest Plan. It is likely that some level of illegal use of these vehicles may occur in occupied habitats that could lead to detrimental impacts. Domestic livestock grazing does not currently occur on 5 of the 7 known population sites. Two of the known sites are within active sheep allotments and it is possible that undiscovered populations occur within currently active sheep allotments. The impacts of this use on Leadville milkvetch are unknown, but

the species evolved in areas grazed by native herbivores. Overall impacts to the quantity and quality of Leadville milkvetch habitat are anticipated to be low during the life of the plan in all alternatives except in Alternative E. Management area allocations in Alternative E promote an increase in motorized use.

Effects on Populations

The known populations of Leadville milkvetch are expected to maintain themselves throughout the life of the 2002 Forest Plan. Significant impacts to the populations would occur only due to unauthorized activities. The 2002 Forest Plan direction detailed above is expected to provide broad protection to known and currently unknown populations of Leadville milkvetch for most alternatives. Overall impacts to populations of Leadville milkvetch are anticipated to be low during the life of the 2002 Forest Plan in all alternatives except in Alternative E. Management area allocations in Alternative E promote an increase in motorized use. Some incidental trampling of individual plants may occur due to dispersed recreation use or from domestic livestock grazing within active sheep allotments containing populations of this species.

Table V-31
Estimated potential changes in populations and habitats for *Astragalus molybdenus*, Leadville milkvetch for the life of the 2002 Forest Plan

	<i>Existing Condition</i>	ALTERNATIVE						
		<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
Amount of Habitat	Known from seven Alpine areas	Same	Same	Same	Same	Same	Same	Same
Habitat Quality	High	S	S	S	S to slight D	S	S	S
Expected Population Trend	S	S	S	S	S to slight D	S	S	S
Viability Outcome*	I	I	I	I	II	I	I	I

Key: D – Decreasing; S – Stable; IN – Increasing; U – Unknown

Note: * Viability outcomes are defined in the introduction to this section (Topic 1, Part 2, Section 3).

CUMULATIVE EFFECTS

Most populations of *Astragalus molybdenus* are on National Forests, with a few all or partially on Bureau of Land Management public lands and private patented lands. The four largest populations known are on the White River National Forest.

Populations on other National Forests are protected as Region 2 sensitive species. Populations on BLM and private lands do not have any special protective status.

***Eriophorum altaicum* Meinshausen var. *neogaeum* Raymond, Altai cottongrass**

Classification

- Species of Viability Concern
- Sensitive Species (see the Biological Evaluation in Appendix N)

Affected Environment

Eriophorum altaicum var. *neogaeum* (Altai cottongrass) came into consideration for this assessment because it is known to occur on the White River National Forest, and the species is rated G4/S3 by the Colorado Natural Heritage Program (CNHP 2000a). These ratings mean:

“G4. The species is ... apparently secure globally, though it might be quite rare in parts of its range, especially at the periphery.

“S3. Rare in state (21 to 100 occurrences)” (CNHP 2000b).

Eriophorum altaicum var. *neogaeum* is rated as Sensitive by the Forest Service, Rocky Mountain Region, but not by the Bureau of Land Management in Colorado.

Reasons for Viability Concern

There is a viability concern for this species on the forest because:

- The habitat is limited on the forest,
- The habitat on the forest is vulnerable to management that may result in negative impacts to Altai cottongrass habitat quality and quantity, and
- The known breeding populations on the forest are small and isolated.

Habitat Description

In Colorado, the plants of *Eriophorum altaicum* occur on the margins of pools and fens fed by slowly flowing, cold water. Several observers commented that *E. altaicum* seems to prefer inundated sites, where water flows slowly through. Soils seem to be consistently Histosols (Colorado Natural Heritage Program 2000). Elevations range from 10,500–12,600 ft, and average 12,260 ft – the higher elevations in southern Colorado. Sites are often in the upper Subalpine Zone, below timberline, but sometimes above timberline.

The plant community is often dominated by *Carex aquatilis*, a wide variety of other *Carex* species, and *Eleocharis palustris*. Several observers commented that *Eriophorum altaicum* seems to grow where there is a lot of water cover, and not as much aerial vegetation cover. The water chemistry of *Eriophorum altaicum* sites in Colorado is unknown.

Population Description

On the White River National Forest, *Eriophorum altaicum* is known from three or four sites; two of these sites are close together southeast of Aspen; another two are a few miles apart in southeastern Eagle County and one is in northeastern Pitkin County.

Counting of Colorado populations is made difficult by the plants' habitat (wet fens and pond margins), and by the rhizomes connecting tufts. Nonetheless, counts have been made of 22 Colorado populations. The four White River National Forest populations were counted as 100, 137, 100, and 100 individuals; obviously three of those numbers are estimates rather than actual counts.

The total known White River National Forest population is <500 individuals (Colorado Natural Heritage Program 2000). It is likely that additional, currently unknown populations of this species occur on the forest.

**General
Risk Factors**

These habitats are very sensitive to human use. One pass over one of these wetlands with any motorized vehicle often results in permanent damage. Use by bicycles can be damaging as well.

If trails pass too close to these wetland sites, damage can occur because normal trail use will compact the soil around the trail and result in drainage of the wetland.

Use in the winter is not as damaging, but there still may be some damage resulting from vehicle use or people entering the wetland area, even above deep snow (Joslin and Youmans 1999, Olliff and Kaeding 1999).

Environmental Consequences

Risk Factors

The risk factors on the White River National Forest are similar to those listed above.

**Resource
Protection
Measures**

These protection measures are developed to protect existing known populations as well as any new populations discovered through the life of the 2002 Forest Plan.

The 2002 Forest Plan establishes key decisions for long-term direction, including forest-wide goals and objectives, forest-wide standards and guidelines, direction applying to future activities within management areas, determining suitability and capability of lands, and establishing monitoring and evaluation requirements.

The Resource Protection Measures applicable to management of Altai cottongrass habitat that are common to all alternatives include:

Forest-wide Goals, Objectives, and Strategies, 2002 Forest Plan, Chapter 1:

- Strategies that direct the Forest to manage for ecological conditions to sustain viable populations of native and desired nonnative species. (Objective 1b, Strategy 1b.4, Objective 1c, Strategies 1c.1 and 1c.2, and 1C16.).

Forest-wide Standards and Guidelines, 2002 Forest Plan, Chapter 2:

- Management direction that restricts activities in the alpine zone in order to maintain ecological conditions important to the maintenance of native ecosystems. (Chapter 2, Section 2, Alpine Standards 1 and 2 and Alpine Guidelines 1-3).
- Management direction that restricts activities in the riparian and wetland areas of the Forest in order to maintain ecological conditions important to the maintenance of native ecosystems. (Chapter 2, Section 1, Soil Standard 3 and Water and Riparian Standards 1-13 and Guidelines 1-4).
- Rangeland Ecosystem Management Standards and Guidelines assure proper management of the non-forested vegetation resources. (Chapter 2, Section 2, Rangeland Ecosystem Management, Standards 1-2, Guidelines 1-3).
- Management direction that restricts all non-snow motorized and mechanized uses to designated travelways. (Chapter 2, Section 5, Standard 4).

Specific direction for plant species of viability concern that directs the Forest to:

- Survey for possible new populations of plants in areas identified as potential habitat that may be affected by project activities. (Chapter 2, Section 2, Species of Viability Concern, Plant, Standard 1)
- Avoid project disturbances that would significantly affect species viability or trend the species towards federal listing. (Chapter 2, Section 2, Species of Viability Concern, Plant, Standard 1)

Management Area Direction 2002 Forest Plan, Chapter 3:

- No management area direction is specific to this species. However, 2 of the 3 known population areas on the White River National Forest are protected within designated Wilderness.

DIRECT AND INDIRECT EFFECTS

This discussion focuses mainly on the known populations on the White River National Forest. Other undiscovered populations may exist in similar habitats.

Impacts to the Hunter-Fryingpan populations would not be significant under any alternative. The 2002 Forest Plan would continue to manage the two sites in the Hunter-Fryingpan Wilderness as 1.11 Pristine Wilderness in all alternatives, with all motorized and mechanized travel prohibited both summer and winter, and the Recreation Opportunity Spectrum “Primitive” summer and winter. There is no trail into this area; the closest trail is about ¼ mile away over a low ridge. However, these sites are less than ten miles from Aspen, and the area around Aspen continues to receive more use in all seasons. The area would not be grazed by livestock under any alternative.

The small watershed above these populations—about 3,000 acres—would be managed as pristine wilderness, and so there would not be any significant possibility of water pollution. The city of Aspen is less than 10 miles away, and so there is a remote possibility of air pollution from Aspen affecting the plant.

The 2002 Forest Plan would continue to manage the site in the Holy Cross Wilderness as 1.12 Primitive Wilderness in all alternatives, with all motorized and mechanized travel prohibited both summer and winter, and the Recreation Opportunity Spectrum “Primitive” summer and winter. There is a trail into this area, that reportedly runs close to the wetlands containing *Eriophorum altaicum*, which makes it possible that people or pack stock might wander onto the wetland, which may trample the plants and de-water the habitat. The small watershed above these populations – about 1,500 acres – would be managed as wilderness, so there would not be significant water pollution, and the area is similarly away from sources of air pollution. The risk of these impacts is considered to be low.

There may be impacts to the Fryingpan population under any alternative. Under Alternatives B, C, D, and F, this would remain a backcountry non-motorized area, where vehicles are not allowed off established routes; but there is an established route close to the populations in this area, which makes it possible that people or pack stock might wander onto the wetland. Under Alternative E, the area is allocated to dispersed recreation use. Winter use on these wetlands (even over snow) may cause damage to the habitat (Joslin and Youmans 1999, Olliff and Kaeding 1999). Under Alternatives I and K,

this area would be recommended for wilderness, and vehicles would not be allowed. It would still be possible that people or pack stock might wander onto the wetland, which may trample the plants and de-water the habitat. The area would not be grazed by livestock under any alternative. The small watershed above these population—about 3,000 acres—is only about half wilderness, and so water pollution is a possibility from human use above and around these sites; air pollution is a possibility from motorized use on the trail nearby, or off the trail in the winter under Alternative E.

Grazing allotments in which these populations are found will be managed as vacant or closed in all alternatives.

Effects on Habitat

The overall habitat quantity and quality for this species is expected to remain stable throughout the life of the 2002 Forest Plan. There is some potential for impacts from recreation use and recreational livestock use of wetlands containing habitat for this species, but this risk is considered to be low.

Effects on Populations

The overall populations for this species are expected to remain stable throughout the life of the 2002 Forest Plan. There is some potential for impacts from recreation use and recreational livestock use of wetlands containing this species, but this risk is considered to be low.

Table V-32

Estimated potential changes in populations and habitats for *Eriophorum altaicum*, Altai cottongrass during the life of the 2002 Forest Plan

	<i>Existing Condition</i>	ALTERNATIVE						
		<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
Amount of Habitat	Limited-Currently known from three general locations	Same	Same	Same	Same	Same	Same	Same
Habitat Quality	High	S	S	S	S	S	S	S
Expected Population Trend	S	S	S	S	S	S	S	S
Viability Outcome *	I	I	I	I	I	I	I	I

Key: *D* – Decreasing; *S* – Stable; *IN* – Increasing; *U* – Unknown

Note: * Viability outcomes are defined in the introduction to this section (Topic 1, Part 2, Section 3).

CUMULATIVE EFFECTS

Eriophorum altaicum is known from high mountains in Colorado, Utah, Wyoming, Montana, and in the Rocky Mountains of Canada; and also in Alaska and northeastern Asia. In Colorado, the species is known from a number of sites in the central San Juan Mountains, four sites in the Elk Mountains and northern Sawatch Range, one site in the Mosquito Range, one site in the Sierra Sangre de Cristo, and one site in the Front Range.

The known Colorado sites of *Eriophorum altaicum* mostly occur on National Forests. Even though many of these sites are in wilderness, the habitat is extremely sensitive to human use, especially travel nearby and changes in water or air quality. These populations are protected as a Region 2 sensitive species on all NFS lands in Colorado.

***Machaeranthera coloradoensis* (A. Gray) Osterhout, Brandegees tansy-aster or Colorado tansy-aster**

- Classification**
- Species of Viability Concern
 - Sensitive Species (see the Biological Evaluation in Appendix N)

Affected Environment

Machaeranthera coloradoensis (Brandegee or Colorado tansy-aster) came into consideration for this assessment because it is known to occur on the White River National Forest, and the species is rated G2/S2 by the Colorado Natural Heritage Program (CNHP 2000a). These ratings mean:

“G2. Imperiled globally because of rarity (6 to 20 occurrences), or because of other factors demonstrably making it very vulnerable to extinction throughout its range. (Endangered throughout its range).

“S2. Imperiled in state because of rarity (6 to 20 occurrences), or because of other factors demonstrably making it very vulnerable to extirpation from the state. (Endangered or threatened in state)” (CNHP 2000b).

Machaeranthera coloradoensis is rated as sensitive by the Forest Service, Rocky Mountain Region, but not the Bureau of Land Management in Colorado.

Reasons for Viability Concern

There is a viability concern for this species on the forest because:

- The habitat is limited on the Forest,
- The habitat on the Forest is vulnerable to management that may result in negative impacts to Colorado tansy-aster habitat quality and quantity, and
- The known breeding populations on the Forest are small and isolated.

Habitat Description

Machaeranthera coloradoensis is known from the high San Juan Mountains (central and eastern) and adjacent parks off the northeastern end of the San Juans; the high Elk Mountains; the Mosquito Range and adjacent South Park; and flats and low-elevation parks in south-central Wyoming.

In Colorado, populations of *Machaeranthera coloradoensis* are often associated with limestone, dolomite, shale, or other calcareous substrates (Spackman and others 1999). In Wyoming, the species occurs in gravelly places in mountain parks, dry tundra, and on sandstone or limestone outcrops (Fertig 1997).

On the White River National Forest sites, *Machaeranthera coloradoensis* occurs in the Alpine Zone on Pennsylvanian limestones, dolomites, or shales, mostly associated with calcareous rocks, at elevations of 12,200–12,600 ft (3,720–3,840 m), towards the upper end of its known elevational range (Tweto 1979).

Population Description

On the White River National Forest, there are two or three populations of *Machaeranthera coloradoensis* within a mile of each other, in the Alpine Zone south and west of Taylor Pass near the divide with Gunnison County and the Gunnison National Forest, at 12,200–12,600 ft elevation.

On National Forests in Colorado, four of the populations have been counted; counts range 100 to over 1,500 individuals, averaging around 700. The area covered ranges

from 2-25 acres. One of the White River National Forest populations has been counted at approximately 100 individuals. The total known White River National Forest population of *Machaeranthera coloradoensis* probably is between 300 and 2,500 individuals.

**General
Risk Factors**

The major risk factors for this species are activities such as vehicle use, concentrated hiking activity, and domestic livestock grazing that might result in ground disturbances within the occupied habitat of the species.

Environmental Consequences

Risk Factors

On the White River National Forest, the risk factors are the same as listed above.

**Resource
Protection
Measures**

These protection measures are developed to protect existing known populations as well as any new populations discovered through the life of the 2002 Forest Plan.

The 2002 Forest Plan establishes key decisions for long-term direction, including forest-wide goals and objectives, forest-wide standards and guidelines, direction applying to future activities within management areas, determining suitability and capability of lands, and establishing monitoring and evaluation requirements.

The Resource Protection Measures applicable to management of Colorado tansy-aster habitat that are common to all alternatives include:

Forest-wide Goals, Objectives, and Strategies, 2002 Forest Plan, Chapter 1:

- Strategies that direct the Forest to manage for ecological conditions to sustain viable populations of native and desired nonnative species. (Objective 1b, Strategy 1b.4, Objective 1c, Strategies 1c.1 and 1c.2, and 1C16.).

Forest-wide Standards and Guidelines, 2002 Forest Plan, Chapter 2:

- Management direction that restricts activities in the alpine zone in order to maintain ecological conditions important to the maintenance of native flora. (Chapter 2, Section 2, Alpine Standards 1 and 2 and Alpine Guidelines 1-3).
- Management direction that restricts all non-snow motorized and mechanized uses to designated travelways. (Chapter 2, Section 5, Standard 4).
- Specific direction for plant species of viability concern that directs the Forest to:
 - Survey for possible new populations of plants in areas identified as potential habitat that may be affected by project activities. (Chapter 2, Section 2, Species of Viability Concern, Plant, Standard 1)
 - Avoid project disturbances that would significantly affect species viability or trend the species towards federal listing. (Chapter 2, Section 2, Species of Viability Concern, Plant, Standard 1)

DIRECT AND INDIRECT EFFECTS

The Taylor Pass area would be partially protected by the designation of a proposed Research Natural Area in alternatives D and I, or by the designation of a proposed Special Interest Area in alternatives C, D, and K. In the other alternatives, the populations would be unprotected by Management Action (MA) direction.

The Taylor Pass area is in a sheep grazing allotment, which is now vacant; the 2002 Forest Plan would either retain this allotment as vacant or close it entirely. In both cases, the areas would not be grazed by domestic livestock.

Impacts to *Machaeranthera coloradoensis* or its habitat in the Taylor Pass area would not be significant under alternatives B, C, D, F, I, and K. Summer travel in this area would be at least restricted to designated routes, and there are no designated routes in or near populations. Winter travel is closed or restricted to designated routes in most alternatives. There are no restrictions to motorized winter travel in Alternative E, so vehicles could traverse the populations even though the populations are on ridges where there would likely be little snow. Hence, there may be some level of impacts to *Machaeranthera coloradoensis* habitat from winter vehicle use under alternative E. The area is in a vacant sheep grazing allotment, which would be closed or retained as vacant; so livestock grazing impacts would be insignificant.

None of the populations in this area are below or close to designated motor vehicle routes, and none are close to areas grazed by livestock or any National Forest sources of air or water pollution. There are no restrictions to motorized winter travel in Alternative E, so vehicles could traverse the populations even though the populations are on ridges where there would likely be little snow. Hence, there may be impacts to *Machaeranthera coloradoensis* plants from damage to the habitat by winter vehicle use under alternative E. If adjacent private patented land is later developed, there may be effects, but analysis of those effects are outside the scope of the 2002 Forest Plan.

Effects on Habitat

The habitat conditions for this species on the White River National Forest are not expected to change significantly under any of the 2002 Forest Plan alternatives. The potential risk of impacts from off-road use is considered to be low and much of the suitable habitat is included in designated wilderness.

Effects on Populations

The populations for this species on the White River National Forest are not expected to change significantly under any of the 2002 Forest Plan alternatives.

Table V-33
Estimated potential changes in population and habitat for *Machaeranthera coloradoensis*, Colorado aster-tansy during the life of the 2002 Forest Plan

	<i>Existing Condition</i>	ALTERNATIVE						
		<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
Amount of Habitat	Limited – currently known from one small area	Same	Same	Same	Same	Same	Same	Same
Habitat Quality	High	S	S	S	S	S	S	S
Expected Population Trend	S	S	S	S	S	S	S	S
Viability Outcome *	I	I	I	I	I	I	I	I

Key: *D* – Decreasing; *S* – Stable; *IN* – Increasing; *U* – Unknown

Note: * Viability outcomes are defined in the introduction to this section (Topic 1, Part 2, Section 3).

CUMULATIVE EFFECTS

About half the populations of *Machaeranthera coloradoensis* are on National Forests, with a few all or partially on Bureau of Land Management public lands and somewhat less than half on private lands. The White River National Forest population will come under increasing threats from unauthorized vehicle use, since recreational vehicle pressure is increasing throughout the White River National Forest.

The soils of *Machaeranthera coloradoensis* populations are coarse and shallow; for rocky ridges, they are moderately well vegetated. Natural rehabilitation of alpine ecosystems is slow to very slow (Marr 1964-1979, Thilenius 1975). The probability of damage events from unauthorized vehicle use is increasing, and the damage could lead to some degradation of the populations and their habitat. A large portion of the potential habitat for this species is included in designated wilderness that offers a high level of protection from these impacts.

***Parnassia kotzebuei* Chamisso and Schlechtendal, Kotzebue grass-of-Parnassus**

Classification • Species of Viability Concern

Affected Environment

Parnassia kotzebuei (Kotzebue grass-of-Parnassus) came into consideration for this assessment because it is known to occur on the White River National Forest, and the species is rated G4/S2 by the Colorado Natural Heritage Program (CNHP 2000a). These ratings mean:

“G4. Apparently secure globally, though it might be quite rare in parts of its range, especially at the periphery.

“S2. Imperiled in state because of rarity (6 to 20 occurrences), or because of other factors demonstrably making it very vulnerable to extirpation from the state. (Endangered or threatened in state)” (CNHP 2000b).

Parnassia kotzebuei is not rated as sensitive by the Forest Service or the Bureau of Land Management.

Reasons for Viability Concern

There is a viability concern for this species on the forest because:

- The habitat is limited on the Forest,
- The habitat on the Forest is vulnerable to management activities that may result in negative impacts to Kotzebue grass-of-Parnassus habitat quality and quantity, and
- The known breeding populations on the Forest are small and isolated.

Habitat Description

The plants usually grow in wet, moss-covered sandy soil at the edges of ponds, lakes, and pools in streams. Elevations range 11,000–12,400 ft, averaging 11,650 ft.

Soils have not been mapped sufficiently in this area to assess soil habitat of this species.

The species is only known growing in wet, moss-covered sandy soil by ponds or quiet streams. It is not known why the species is so restricted in number of sites. There must be habitat limits not yet detected, or else some sort of strong limits on dispersal or germination are indicated.

The associated species indicate that *Parnassia kotzebuei* occurs in cold, wet habitats in high elevations of mountains. Moisture is abundant throughout the growing season, but it must be frozen during many nights.

Population Description

In Colorado, *Parnassia kotzebuei* occurs in four separate areas: the northern Front Range, the Mt. Evans area in Clear Creek County, the area west of Hoosier Ridge, and the central San Juan Mountains, comprising perhaps 15 populations currently known. There have been four population counts in Colorado, ranging from 25–650 individuals per population.

On the White River National Forest, there are two sites west of Hoosier Pass, about 1½ mi apart. One of these populations has been counted twice, three years apart,

numbering “30 to 40” and then 636 three years later. The reasons for the big differences in counts could include different survey methods, different precipitation the two years counted, response to changes in management, or colonization by *Parnassia kotzebuei*. The total population of *Parnassia kotzebuei* from the White River National Forest might be as low as 80 or as high as 1,400.

**General
Risk Factors**

The greatest is soil disturbance of these riparian wetland sites by vehicles, including road vehicles and off-road vehicles such as four-wheelers and motorcycles. Most of the sites are accessible to these vehicles, either because the sites are open to travel, or because enforcement of current travel rules and regulations is lacking.

The effect of winter snowmobile use on these sites and populations is unknown. Some effects are assumed, especially at high use levels, because *Parnassia kotzebuei* occurs in areas where snow lies late. Also, the sites are wet and that would make them especially sensitive to damage in early winter and late winter when at least some of the soil and water is in liquid form.

Environmental Consequences

Risk Factors

The risk factors on the White River National Forest are similar to those listed above.

**Resource
Protection
Measures**

The 2002 Forest Plan establishes key decisions for long-term direction, including forest-wide goals and objectives, forest-wide standards and guidelines, direction applying to future activities within management areas, determining suitability and capability of lands, and establishing monitoring and evaluation requirements.

The Resource Protection Measures applicable to management of Porter feathergrass habitat that are common to all alternatives include:

Forest-wide Goals, Objectives, and Strategies, 2002 Forest Plan, Chapter 1:

- Strategies that direct the Forest to manage for ecological conditions to sustain viable populations of native and desired nonnative species. (Objective 1b, Strategy 1b.4, Objective 1c, Strategies 1c.1 and 1c.2, and 1C16.).

Forest-wide Standards and Guidelines, 2002 Forest Plan, Chapter 2:

- Management direction that restricts activities in the alpine zone in order to maintain ecological conditions important to the maintenance of high quality alpine habitats. (Chapter 2, Section 2, Alpine Standards 1 and 2 and Alpine Guidelines 1-3).
- Management direction that restricts activities in the riparian and wetland areas of the Forest in order to maintain ecological conditions important to the maintenance of high quality riparian and aquatic habitats. (Chapter 2, Section 1, Soil Standard 3 and Water and Riparian Standards 1-13 and Guidelines 1-4).
- Rangeland Ecosystem Management Standards and Guidelines assure proper management of the non-forested vegetation resources. (Chapter 2, Section 2, Rangeland Ecosystem Management, Standards 1-2, Guidelines 1-3).
- Management direction that restricts all non-snow motorized and mechanized uses to designated travelways. (Chapter 2, Section 5, Standard 4).

Specific direction for plant species of viability concern that directs the Forest to:

- Survey for possible new populations of plants in areas identified as potential habitat that may be affected by project activities. (Chapter 2, Section 2, Species of Viability Concern, Plant, Standard 1)
- Avoid project disturbances that would significantly affect species viability or trend the species towards federal listing. (Chapter 2, Section 2, Species of Viability Concern, Plant, Standard 1)

Management Area Direction, 2002 Forest Plan, Chapter 3:

- No management area direction is specific to this species.

DIRECT AND INDIRECT EFFECTS

In Alternatives B, C, and E the two known populations on the White River National Forest would be managed under a backcountry non-motorized recreation allocation. In Alternative D they are included under a special interest area, in Alternative F they are allocated to bighorn sheep management, in I they are dispersed recreation and in Alternative K the areas are partially in a special interest area and partially in backcountry recreation, year-round motorized. The highest potential for impacts to these populations is from the allocations that provide the highest level of motorized use, Alternatives K and I. Alternatives B, C, D, and E all would provide a high level of protection to the known populations. Motorized travel is restricted to designated roads and trails in all alternatives.

Proposed grazing allotment management is to leave this area closed to livestock grazing use in all alternatives.

Effects on Habitat

The habitat for this species, both known and currently unknown, but suitable, is not expected to significantly decline over the life of the 2002 Forest Plan in most alternatives. There is a potential for a decrease in habitat quantity and quality in Alternatives I and K, due to higher levels of motorized use in the management area allocations for areas surrounding the known habitats for this species. Management direction has been developed to protect habitat from off-road use and the two known populations are not within an active grazing allotment.

Effects on Populations

The two known populations are expected to remain stable in most alternatives due to the protection of habitat. There is some potential for illegal off-road motorized activities to impact the two known populations, especially in Alternatives K and I.

Table V-34

Estimated potential changes in population and habitat for *Parnassia kotzebue*, Kotzebue grass-of-Parnassus during the life of the 2002 Forest Plan

		ALTERNATIVE						
	Existing Condition	B	C	D	E	F	I	K
Amount of Habitat	Limited – currently known from two locations	Same	Same	Same	Same	Same	Same	Same
Habitat Quality	High	S	S	S	S	S	S to slight D	S to slight D
Expected Population Trend	S	S	S	S	S	S	S to slight D	S to slight D
Viability Outcome*	I	I	I	I	I	I	II	II

Key: D – Decreasing; S – Stable; IN – Increasing; U – Unknown

Note: * Viability outcomes are defined in the introduction to this section (Topic 1, Part 2, Section 3).

CUMULATIVE EFFECTS

In Colorado, *Parnassia kotzebuei* occurs in four separate areas: the northern Front Range, the Mt. Evans area in Clear Creek County, the area west of Hoosier Ridge, and the central San Juan Mountains, comprising perhaps 15 populations currently known. There have been four population counts in Colorado, ranging from 25–650 individuals per population.

It is a high elevation wetland plant and most of its populations are on federal lands. It is not listed as a sensitive species in Region 2 and has no special protection status. Its habitat is sensitive to impacts from off-road vehicle use throughout its range. With increasing OHV use, it is likely that some habitats for this species will be impacted through both legal and illegal use.

***Penstemon harringtonii* Penland, Harrington beardtongue**

Classification

- Species of Viability Concern
- Sensitive Species (see the Biological Evaluation in Appendix N)

Affected Environment

Penstemon harringtonii (Harrington beardtongue) came into consideration for this assessment because it is known to occur on the White River National Forest, and the species is rated G3/S3 by the Colorado Natural Heritage Program (CNHP 2000a). These ratings mean:

“G3. Very rare or local throughout its range or found locally in a restricted range (21 to 100 occurrences). (Threatened throughout its range).

“S3. Rare in state (21 to 100 occurrences)” (CNHP 2000b).

Penstemon harringtonii is rated as Sensitive by the Forest Service, Rocky Mountain Region, and the Bureau of Land Management for Colorado.

Reasons for Viability Concern

There is a viability concern for this species on the forest because:

- there are few populations on White River National Forest, and
- they are relatively small and very vulnerable.

Habitat Description

Penstemon harringtonii is an endemic species, known only from west-central Colorado in sagebrush and desert shrub stands. Its distribution covers most of the west half of Eagle County, and also areas in adjacent Garfield, Routt, and Grand Counties in the elevation range between 6,800–8,400 ft (2,070–2,470 m), but mostly 7,200–7,800 ft (2,190–2,380 m). The plants are found on all exposures and mostly gentle slopes. The plants occur in open sagebrush stands on moderate slopes. “Soils are typically loams and clay loams derived from coarse calcareous parent materials, especially Pleistocene gravels, but also limy shales, limestones, and other [assorted] parent rocks” (Buckner and Bunin 1992). Several of the recorded populations are in part in roadways or beside trails, but usually the larger part of the population is outside the roadway or trailway.

Geology substrates are varied, without any obvious consistency (Tweto 1979).

Apparently, the populations of *Penstemon harringtonii* are not limited by geological substrate.

Plant species associated with *Penstemon harringtonii* tend to be very normal species of sagebrush and adjacent piñon-juniper sites throughout western Colorado. They do show a tendency toward species indicating long-term disturbance by domestic and wild herbivore grazing, as expected given the history of long term livestock grazing and fairly large big game populations in the sites where *Penstemon harringtonii* grows.

Penstemon harringtonii occurs within low-elevation sagebrush areas on the White River National Forest boundary in three general areas: southeast of Eagle, north of Edwards and Avon, and the Taylor Creek area, east of Basalt.

Population Description	Around 45 known populations of <i>Penstemon harringtonii</i> were described by Buckner and Bunin (1992), and about five more have been discovered since 1992; most populations had 50–300 individuals. There are three known population areas on the White River National Forest. These had 9,137, and 3,000 individuals at last count (Buckner and Bunin 1992, Colorado Natural Heritage Program 2000); the population with 137 individuals is very diffuse and part of it is on private land. Surveys over the past ten years have identified many additional populations of this species both on federal and private lands. It is anticipated that additional populations will be discovered as these surveys continue.
General Risk Factors	The primary risk factor to this species is from private land site conversion to human developments including homesites and associated facilities. Activities such as vehicle use, concentrated hiking activity, and domestic livestock grazing that might result in ground disturbances within the occupied habitat of the species also pose a risk to the species.

Environmental Consequences

Risk Factors	The primary risk factor to this species on the White River National Forest is from motorized vehicle use directly impacting populations and habitats.
Resource Protection Measures	These protection measures are developed to protect existing known populations as well as any new populations discovered through the life of the 2002 Forest Plan. The 2002 Forest Plan establishes key decisions for long-term direction, including forest-wide goals and objectives, forest-wide standards and guidelines, direction applying to future activities within management areas, determining suitability and capability of lands, and establishing monitoring and evaluation requirements. The Resource Protection Measures applicable to management of Harrington penstemon habitat that are common to all alternatives include: Forest-wide Goals, Objectives, and Strategies, 2002 Forest Plan, Chapter 1: • Strategies that direct the Forest to manage for ecological conditions to sustain viable populations of native and desired nonnative species. (Objective 1b, Strategy 1b.4, Objective 1c, Strategies 1c.1 and 1c.2, and 1C16.). Forest-wide Standards and Guidelines, 2002 Forest Plan, Chapter 2: • Rangeland Ecosystem Management Standards and Guidelines assure proper management of the non-forested vegetation resources. (Chapter 2, Section 2, Rangeland Ecosystem Management, Standards 1-2, Guidelines 1-3). • Management direction that restricts all non-snow motorized and mechanized uses to designated travelways. (Chapter 2, Section 5, Standard 4).

- Management direction that provides for maintenance of sagebrush habitats for the protection of sage grouse and Brewer's sparrow would also provide protection for Harrington penstemon. (Chapter 2, Section 2, Biological, Species of Viability Concern, Terrestrial, Sage Grouse and Brewer's sparrow, Standards 1-4 and Guidelines 1-7).
- Specific direction for plant species of viability concern that directs the Forest to:
 - Survey for possible new populations of plants in areas identified as potential habitat that may be affected by project activities. (Chapter 2, Section 2, Species of Viability Concern, Plant, Standard 1)
 - Avoid project disturbances that would significantly affect species viability or trend the species towards federal listing. (Chapter 2, Section 2, Species of Viability Concern, Plant, Standard 1)

Management Area Direction, 2002 Forest Plan, Chapter 3:

- No management area direction is specific to this species.

DIRECT AND INDIRECT EFFECTS

This discussion focuses mainly on the known populations on the White River National Forest. Other undiscovered populations may exist in similar habitats.

Grazing allotment management under the 2002 Forest Plan would be the same in all alternatives. The areas south of Eagle and east of Basalt are both included in active cattle allotments, while the area north of Edwards is in an active sheep allotment.

Southeast of Eagle – Impacts to this area are expected to be minor under Alternatives C, D, E, I, or K. In these alternatives, motorized vehicle use would be restricted to designated routes in the summer. Under these alternatives, the area would continue to be in a grazing allotment, available for grazing by cattle; but livestock grazing (if it occurs) would be moderate at most, and there is no significant impact to *Penstemon harringtonii* from moderate grazing pressure.

In all alternatives (except B and F), the area north of the road corridor would be managed as elk and deer winter range. There is the potential for damage to *Penstemon harringtonii* or its habitat from intense use by elk and deer in their winter ranges; but this area is not heavily used by deer or elk in the winter, so impacts from big game animals would not be significant in those alternatives.

Under Alternative B, impacts may occur due to the large area south of the creek assigned for a possible ski-based resort; the disturbance from that activity would likely impact habitat for the species through erosion by construction and maintenance vehicles in the heavy-use area around the new ski area.

Under Alternative F, impacts may occur, because management emphasis of the area north of the road corridor would be on range vegetation production; increased livestock use of these open habitats may lead to habitat deterioration for *Penstemon harringtonii*.

Point sources of water pollution in all alternatives would be away from and below the site. Impacts would be minor from erosion and water pollution from sites grazed by domestic livestock above the site (*Penstemon harringtonii* is probably not affected by

changes in stream water quality) from the (at most) moderate levels of grazing that might occur on adjacent sites.

North of Edwards and Avon – Impacts in this area may occur under any alternative. Under all alternatives, motor and mechanized vehicles are restricted to designated routes; but there are a number of designated routes through and adjacent to populations of *Penstemon harringtonii*, and these routes get a great deal of use in summer and in winter. This use is expected to increase. Motorized and mechanized use of these roads and the associated off-road dispersed recreation use may result in trampling of plants and deterioration of their habitat through erosion.

In all alternatives, a portion of the populations in this area is in the corridor for a large overhead power line; maintenance activities along this corridor involves large vehicles, which would have impacts on *Penstemon harringtonii* and its habitat through trampling of the plants and disturbance of the soil. The species has been documented to occur in areas with historic disturbances and the impacts of this maintenance are expected to be minor.

In all alternatives except B and F, the area would be managed as elk and deer winter range. Since this winter range is very intensely used by elk and deer, there will likely be damage to *Penstemon harringtonii* and its habitat, through trampling of the plants leading to mortality of the plants, and through soil erosion leading to degraded habitat for the plants. Since this species evolved over time with seasonal use by native herbivores, it is unknown how significant this trampling use might be.

This area would be continued in an active domestic sheep grazing allotment; however, the sheep use this area very lightly for a few days only, so the impacts would be minor.

In all alternatives, maintenance activities for the power line corridor through the portion of the populations may cause some damage to *Penstemon harringtonii* populations and their habitats through erosion and increased air and water pollution. The power line corridor is above the largest portion of populations of *Penstemon harringtonii*. These impacts are not expected to change overall habitat quantity or quality or significantly affect overall populations.

East of Basalt – In all alternatives, motorized and mechanized vehicles would be restricted to designated routes. Some of the population in this area may well occur in the roadway, in which case there may be minor impact to a few plants of *Penstemon harringtonii*.

Under Alternatives B, C, D, and K, the area would be managed as elk and deer winter range. There is the potential for impacts to *Penstemon harringtonii* or its habitat from intense use by elk and deer in their winter ranges; but this area is not heavily used by deer or elk in the winter, so impacts from big game animals would be minor in those alternatives. These areas have been historically used by big game animals for hundreds of years and it is logical that they have evolved to be able to withstand the grazing by native herbivores.

Under Alternatives C, E, and I, the area would be recommended for inclusion in wilderness, and vehicles would be restricted from the area.

The light summer vehicle use that would occur in some of these alternatives on the road above the population would be unlikely to cause erosion down to the population or increased air and water pollution.

Under Alternative F, impacts may occur, because management emphasis of the area north of the road corridor would be on range vegetation production; intense livestock use of these open habitats may lead to erosion from sites above the *Penstemon harringtonii* population.

Effects on Habitat

The impacts to habitat for Harrington penstemon from any of the alternatives in the 2002 forest Plan are expected to occur due mainly from dispersed recreation use of the known or other suitable habitat areas. The strategies, standards and guidelines discussed above were developed to provide protection for all ecosystems across the White River National Forest and therefore, habitats for this species. Dispersed recreation use will occur in both known and potential habitats that may have some level of impacts to the habitats due to trampling effects. Increased motorized and mechanized vehicle use is occurring throughout the White River National Forest, and this use is expected to increase throughout the life of the 2002 Forest Plan. It is likely that some level of illegal use of these vehicles may occur in Harrington penstemon habitats that could lead to impacts to habitats. Domestic livestock grazing does occur on the known population sites, and it is possible that undiscovered populations also occur within currently active allotments. It is believed that low levels of grazing by domestic and wild herbivores are not detrimental to this species.

Effects on Populations

The known populations are expected to maintain themselves throughout the life of the plan. Major impacts to the populations would occur only due to unauthorized activities. The 2002 Forest Plan direction detailed above is expected to provide broad protection to known and currently unknown populations of penstemon. Some incidental trampling of individual plants may occur due to dispersed recreation use or from domestic livestock grazing within active allotments containing populations of this species. The level of this use is not expected to reduce overall population vigor for any known populations or for any currently unknown populations.

Table V-35

Estimated potential changes in population and habitat for *Penstemon harringtonii*,
Harrington penstemon during the life of the 2002 Forest Plan

	<i>Existing Condition</i>	ALTERNATIVE						
		<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
Amount of Habitat	Limited – currently known from three general areas	Same	Same	Same	Same	Same	Same	Same
Habitat Quality	High	S	S	S	S	S	S	S
Expected Population Trend	S	S	S	S	S	S	S	S
Viability Outcome*	I	I	I	I	I	I	I	I

Key: *D* – Decreasing; *S* – Stable; *IN* – Increasing; *U* – Unknown

Note: * Viability outcomes are defined in the introduction to this section (Topic 1, Part 2, Section 3).

CUMULATIVE EFFECTS

Even though the endemic species *Penstemon harringtonii* is geographically restricted to west-central Colorado, there are many populations within this area, and some are large and healthy. Most populations are on Bureau of Land Management (BLM) public lands, with some on private lands.

Given the abundance and number of recently discovered populations on BLM public lands, this species is likely not a viability concern there. A few of the populations could be impacted by management on public land including the White River National Forest, but the species as a whole has no major viability concerns.

Nonetheless, the sagebrush stands where *Penstemon harringtonii* grows are affected by activities that occur on those lands. On federal and state lands, there often is livestock grazing pressure, and motorized and mechanized vehicle use is increasing.

More and more of the private lands within the range of *Penstemon harringtonii* are being developed every year, which often deteriorates the populations of this plant and its habitats.

***Phacelia submutica* J. T. Howell, De Beque phacelia**

Classification

- Species of Viability Concern
- Sensitive Species (see the Biological Evaluation in Appendix N)

Affected Environment

Phacelia submutica (De Beque phacelia) came into consideration for this assessment because it is known to occur on the White River National Forest, and the species is rated (as *Phacelia scopulina* var. *submutica*) G4T2/S2 by the Colorado Natural Heritage Program (CNHP 2000a). These ratings mean:

“G4. The species (*Phacelia scopulina*) is ... apparently secure globally, though it might be quite rare in parts of its range, especially at the periphery.

“T2. The variety (*Phacelia submutica*) is ... imperiled globally because of rarity (6 to 20 occurrences), or because of other factors demonstrably making it very vulnerable to extinction throughout its range. (Endangered throughout its range).

“S2. Imperiled in state because of rarity (6 to 20 occurrences), or because of other factors demonstrably making it very vulnerable to extirpation from the state. (Endangered or threatened in state)” (CNHP 2000b).

Phacelia submutica is rated as Sensitive by the Forest Service, Rocky Mountain Region, but not by the Bureau of Land Management (BLM) for Colorado. It is a candidate for federal listing by the U. S. Fish and Wildlife Service.

Reasons for Viability Concern

There is a viability concern for this species on the forest because:

- There are few populations on White River NF, and
- they are relatively small and vulnerable.

Habitat Description

The plants of *Phacelia submutica* occur on nearly barren patches within flats and slopes. These brown clay patches are barren because there is a hard clay layer about 3–4 in below the surface, preventing the growth of almost all perennial vegetation. These barren clay flats are nearly always from a narrow geological stratum, the Atwell Gulch or Shire Member of the Wasatch Formation.

Elevations range from 5,040–6,200 ft. Below the National Forest sites, *Phacelia submutica* sometimes grows near other rare plant species: *Sclerocactus glaucus*, listed as Threatened; and *Astragalus debequaeus*, rated G2/S2 by CNHP and sensitive on the BLM. These have been searched for on the White River National Forest, but none have been found.

The populations on the White River National Forest are all on soils derived from the Shire Member of the Wasatch Formation (Donnell and others 1992). All the known populations are within about ten miles of De Beque, Colorado, in a narrow range of elevations, so the combination of climate and hard clay-pan soils making only annual growth possible is important. It is very likely that there is a strong affinity for some chemical characteristics of the Atwell Gulch and Shire Members; there may also be pollination, seed dispersal, or germination attributes that limit the species as well (O’Kane 1987, Burt and Spackman 1995).

	The potential habitat for this species has been well documented, and it is felt that the major habitats and populations on National Forest Service lands have been documented.
Population Description	The species is known only from south-central Garfield and north-central Mesa Counties, Colorado. Its distribution in Colorado is several hundred miles away from closest occurrences of other related <i>Phacelia</i> species. Since it is an annual plant, <i>Phacelia submutica</i> populations tend to fluctuate widely from one year to the next, based on the timing and quantity of spring and early summer precipitation. Population sizes vary from 1–10,000 and site areas vary from 1–150 ac. Most sites are <1 acre, corresponding to patches of the hardpan clay on which <i>Phacelia submutica</i> grows. On the White River National Forest, the three known populations of <i>Phacelia submutica</i> have been counted at >1,700; >2,500; and 50. The total known White River National Forest population is probably around 5,000. One of the populations is shared with public land managed by the Bureau of Land Management.
General Risk Factors	The major risks that have been identified for this species involve activities that involve ground disturbance during the early spring flowing season. These would include vehicle use and grazing and trampling by herbivores.

Environmental Consequences

Risk Factors	The primary risks to this species are domestic and native herbivore grazing and trampling, and vehicle ground disturbances.
Resource Protection Measures	These protection measures are developed for existing known populations as well as any new populations discovered through the life of the 2002 Forest Plan. The 2002 Forest Plan establishes key decisions for long-term direction, including forest-wide goals and objectives, forest-wide standards and guidelines, direction applying to future activities within management areas, determining suitability and capability of lands, and establishing monitoring and evaluation requirements. The Resource Protection Measures applicable to management of <i>Phacelia</i> habitat that are common to all alternatives include: Forest-wide Goals, Objectives, and Strategies, 2002 Forest Plan, Chapter 1: • Strategies that direct the Forest to manage for ecological conditions to sustain viable populations of native and desired nonnative species. (Objective 1b, Strategy 1b.4, Objective 1c, Strategies 1c.1 and 1c.2, and 1C16.). Forest-wide Standards and Guidelines, 2002 Forest Plan, Chapter 2: • Rangeland Ecosystem Management Standards and Guidelines assure proper management of the non-forested vegetation resources. (Chapter 2, Section 2, Rangeland Ecosystem Management, Standards 1-2, Guidelines 1-3). • Management direction that restricts all non-snow motorized and mechanized uses to designated travelways. (Chapter 2, Section 5, Standard 4).

Specific direction for plant species of viability concern that directs the Forest to:

- Survey for possible new populations of plants in areas identified as potential habitat that may be affected by project activities. (Chapter 2, Section 2, Species of Viability Concern, Plant, Standard 1)
- Avoid project disturbances that would significantly affect species viability or trend the species towards federal listing. (Chapter 2, Section 2, Species of Viability Concern, Plant, Standard 1)

Management Area Direction, 2002 Forest Plan, Chapter 3:

- No management area direction is specific to this species.

DIRECT AND INDIRECT EFFECTS

In the 2002 Forest Plan, the area is assigned to management as deer and elk winter range in Alternative B, and as part of a Research Natural Area in all other alternatives. Since improved roads and trails are not allowed in Research Natural Areas, motorized vehicles are prohibited from the area of the *Phacelia submutica* populations.

The area of the populations of *Phacelia submutica* is in a vacant grazing allotment. In one alternative (B), the plan is to retain the allotment as vacant; in all other alternatives, the plan is to close the entire allotment.

Phacelia submutica and its habitat would not be significantly impacted under any alternative. Under most alternatives (all but B), the area would be assigned to management as a research natural area, which would adequately protect the populations. Under Alternative B, the area would be managed for deer and elk winter range, which would have insignificant impacts, since habitat for *Phacelia submutica* is not useable as winter range. Under Alternative B, vehicles would be restricted to designated routes in summer, and the area would be closed to motorized travel in winter. Under all other alternatives, the entire area would be closed to motorized and mechanized vehicle use year round. The area is in a vacant sheep grazing allotment, which would be closed or retained as vacant; so livestock grazing impacts would be insignificant.

The area is away from any sources of air pollution. Since there would be no livestock grazing in this allotment, which comprises the entire small watershed above the *Phacelia submutica* populations, there would be no water quality effects from uphill sites.

Effects on Habitat

Habitat conditions for *Phacelia* are anticipated to remain stable for all alternatives throughout the life of the 2002 Forest Plan. The management area allocation for the known and suspected habitat for this species provides adequate direction to assure future habitat stability.

Effects on Populations

Populations for *Phacelia* are expected to remain stable throughout the life of the 2002 Forest Plan under all alternatives. The management area allocation for the known and suspected habitat for this species provides adequate direction to assure future population stability.

Table V-36
Estimated potential changes in population and habitat for *Phacelia submutica*, DeBeque phacelia, during the life of the 2002 Forest Plan

	<i>Existing Condition</i>	ALTERNATIVE						
		<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
Amount of Habitat	Limited – currently known from three locations	Same	Same	Same	Same	Same	Same	Same
Habitat Quality	High	S	S	S	S	S	S	S
Expected Population Trend	S	S	S	S	S	S	S	S
Viability Outcome*	I	I	I	I	I	I	I	I

Key: *D* – Decreasing; *S* – Stable; *I* – Increasing; *U* – Unknown

Note: * Viability outcomes are defined in the introduction to this section (Topic 1, Part 2, Section 3).

CUMULATIVE EFFECTS

Phacelia submutica is an endemic annual species, found only in a small area of west-central Colorado. The whole species comprises about 25 known populations within a ten mile radius. Most of the populations are on public lands managed by the Bureau of Land Management, but there are some on private lands, and three on the White River National Forest.

Most of the concerns for viability of populations of *Phacelia submutica* occur on private and BLM lands. Since the species has so few populations, there is a possibility for significantly impacting the species by management or development activities on these adjacent lands.

***Ptilagrostis porteri* (Rydberg) W. A. Weber, Porter feathergrass**

Classification

- Species of Viability Concern
- Sensitive Species (see the Biological Evaluation in Appendix N)

Affected Environment

Ptilagrostis porteri (Porter feathergrass) came into consideration for this assessment because it is known to occur on the White River National Forest, and the species is rated (as *P. mongholica* ssp. *porteri*) G3G4T2/S2 by the Colorado Natural Heritage Program (CNHP 2000a). These ratings mean:

“G3G4. The species (*Ptilagrostis mongholica*) is ... very rare or local throughout its range or found locally in a restricted range (21 to 100 occurrences) (Threatened throughout its range); or apparently secure globally, though it might be quite rare in parts of its range, especially at the periphery.

“T2. The subspecies (*Ptilagrostis porteri*) is ... Imperiled globally because of rarity (6 to 20 occurrences), or because of other factors demonstrably making it very vulnerable to extinction throughout its range. (Endangered throughout its range).

“S2. Imperiled in state because of rarity (6 to 20 occurrences), or because of other factors demonstrably making it very vulnerable to extirpation from the state. (Endangered or threatened in state)” (CNHP 2000b).

Ptilagrostis porteri is rated as sensitive by both the Forest Service, Rocky Mountain Region, and the Bureau of Land Management (BLM) for Colorado.

Reasons for Viability Concern

There is a viability concern for this species on the forest because:

- The habitat on the Forest is vulnerable to management that may result in negative impacts to Porter feathergrass habitat quality and quantity, and
- The known breeding populations on the forest are small and isolated.

Habitat Description

The plants occur in short- to medium-height willow carrs, where *Deschampsia cespitosa* (tufted hairgrass) is codominant (Johnston and Hendzel 1982). However, the species seems to be more abundant on peat hummocks in calcareous fens in northern South Park. Sometimes *Ptilagrostis* occurs with shrubby cinquefoil, *Pentaphylloides floribunda*, but *Ptilagrostis* does not seem to prefer much shade (von Ahlefeldt 1989).

The habitat for the one occurrence of *Ptilagrostis porteri* on the White River National Forest is somewhat different. Here, the very small population occurs in a very small willow stand in the alpine zone, with bareground willow (*Salix brachycarpa*) and “cliff” sedge (*Carex scopulorum*). As far as known, the large-carr planeleaf willow–bog birch (*Salix planifolia*–*Betula glandulosa*) sites that represent the typical habitat for *Ptilagrostis porteri* do not occur on the White River National Forest.

The sites where *Ptilagrostis porteri* grows on the Pike National Forest are very sensitive to human use and livestock grazing, as is expected given the cold, wetland habitat. Just one vehicle pass, sustained hiking across these wetlands, or livestock use that is too intense or that continues too long in this habitat, all can cause de-watering of the wetlands or physical damage such as hummocking. The result is decline in the

population and degradation of the habitat, and eventually its disappearance.

**Population
Description**

The one population on the White River National Forest is small, only 15 individuals counted at last count (Colorado Natural Heritage Program 2000a). In some years the plants were not found after some searching, probably because they didn't flower and the basal leaves look like other grass species. The White River National Forest site is small to very small, although the population is apparently stable.

**General
Risk Factors**

Currently, the site for *Ptilagrostis porteri* on the White River National Forest is managed under Management Prescription 9A, for Riparian Areas (including wetlands). This prescription, which applies to all riparian areas and wetlands on the White River National Forest, gives protection for all riparian areas and wetlands (wherever they are found) and preference to watershed values and riparian and wetland plant communities in management.

This site is unprotected, with the current travel management "Off-road travel closed to all motor vehicles." However, there are many roads on this side of the ridge, some going close to the population. "The area is very heavily used both summer and winter by hikers, mountain bicycles, skiers, and snowshoers The roads are not gated" (Ray 2000). There are several parcels of private land and private patented land in this general area, although the population of *Ptilagrostis porteri* is on National Forest land.

This terrain is relatively gentle and it would be easy to access the *Ptilagrostis* site in summer or winter. The most recent visit by botanists to the site did not note any vehicle use off-road in this area, but it is certainly possible. Given the steadily increasing vehicle use of the roads in this area, it is only a matter of time before vehicles begin using the *Ptilagrostis* site, which would have a detrimental effect on the population. This *Ptilagrostis* site has fairly deep soil (for an alpine site), so is sensitive to vehicle use.

Environmental Consequences

Risk Factors

The risk factors to *Ptilagrostis porteri* on the White River National Forest are those described above.

**Resource
Protection
Measures**

The 2002 Forest Plan establishes key decisions for long-term direction, including forest-wide goals and objectives, forest-wide standards and guidelines, direction applying to future activities within management areas, determining suitability and capability of lands, and establishing monitoring and evaluation requirements.

The Resource Protection Measures applicable to management of Porter feathergrass habitat that are common to all alternatives include:

Forest-wide Goals, Objectives, and Strategies, 2002 Forest Plan, Chapter 1:

- Strategies that direct the Forest to manage for ecological conditions to sustain viable populations of native and desired nonnative species. (Objective 1b, Strategy 1b.4, Objective 1c, Strategies 1c.1 and 1c.2, and 1C16.).

Forest-wide Standards and Guidelines, 2002 Forest Plan, Chapter 2:

- Management direction that restricts activities in the alpine zone in order to maintain ecological conditions important to the maintenance of high quality alpine habitats. (Chapter 2, Section 2, Alpine Standards 1 and 2 and Alpine Guidelines 1-3).
- Management direction that restricts activities in the riparian and wetland areas of the Forest in order to maintain ecological conditions important to the maintenance of high quality riparian and aquatic habitats. (Chapter 2, Section 1, Soil Standard 3 and Water and Riparian Standards 1-13 and Guidelines 1-4)
- Rangeland Ecosystem Management Standards and Guidelines assure proper management of the non-forested vegetation resources. (Chapter 2, Section 2, Rangeland Ecosystem Management, Standards 1-2, Guidelines 1-3).
- Management direction that restricts all non-snow motorized and mechanized uses to designated travelways. (Chapter 2, Section 5, Standard 4).

Specific direction for plant species of viability concern that directs the Forest to:

- Survey for possible new populations of plants in areas identified as potential habitat that may be affected by project activities. (Chapter 2, Section 2, Species of Viability Concern, Plant, Standard 1)
- Avoid project disturbances that would significantly affect species viability or trend the species towards federal listing. (Chapter 2, Section 2, Species of Viability Concern, Plant, Standard 1)

Management Area Direction, 2002 Forest Plan, Chapter 3:

- No management area direction is specific to this species.

DIRECT AND INDIRECT EFFECTS

In Alternatives B, C, and E the one known population on the White River National Forest would be managed under a backcountry non-motorized recreation allocation. In Alternative D it is included under a special interest area, in Alternative F it is allocated to bighorn sheep management, in I it is dispersed recreation and in Alternative K it is partially in a special interest area and partially in backcountry recreation, year-round motorized. The highest potential for impacts to the population is from the allocations that provide the highest level of motorized use, Alternatives K and I. Alternatives B, C, D, and E all would provide a high level of protection to the known population. Motorized travel is restricted to designated roads and trails in all alternatives.

Proposed grazing allotment management is to leave this area closed to livestock grazing use in all alternatives.

Effects on Habitat

The habitat for this species, both known and currently unknown, but suitable, is not expected to change over the life of the 2002 Forest Plan. Management direction has been developed to protect habitat from off-road use and the one known population is not within an active grazing allotment. As far as known, the large-carr planeleaf willow–bog birch (*Salix planifolia*–*Betula glandulosa*) sites that represent the typical habitat for *Ptilagrostis porteri* do not occur on the White River National Forest. The one identified

population appears to be a disjunct population, and additional populations are not expected to occur on the White River National Forest.

Effects on Populations

The one known population is expected to remain stable in all alternatives due to the protection of its habitat. There is some potential for illegal off-road motorized activities to impact the one known population, especially in Alternatives K and I.

Table V-37
Estimated potential changes in population and habitat for *Ptilagrostis porteri*, Porter feathergrass during the life of the 2002 Forest Plan

	<i>Existing Condition</i>	ALTERNATIVE						
		<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
Amount of Habitat	Limited – currently known from one location	Same	Same	Same	Same	Same	Same	Same
Habitat Quality	High	S	S	S	S	S	S to slight D	S to slight D
Expected Population Trend	S	S	S	S	S	S	S to slight D	S to slight D
Viability Outcome*	I	I	I	I	I	I	II	II

Key: D – Decreasing; S – Stable; IN – Increasing; U – Unknown

*Key: D – Decreasing; S – Stable; IN – Increasing; U – Unknown * Viability outcomes are defined in the introduction to this section (Topic I, Part 2, Section 2).*

CUMULATIVE EFFECTS

Almost all the sites for *Ptilagrostis porteri* are in northern Park County, Colorado; there is one small site in adjacent Summit County, Colorado, and a newly-discovered site on the U. S. Air Force Academy in northwestern El Paso County, Colorado. There is an old collection (1873) from Twin Lakes, Lake County, but the populations there have not been rediscovered in recent years; perhaps the species has been eliminated from Lake County.

Population sizes vary from 15 to over 1,500.

The sites where *Ptilagrostis porteri* grows on the Pike National Forest are very sensitive to human use and livestock grazing, as is expected given the cold, wetland habitat. Just one vehicle pass, sustained hiking across these wetlands, or livestock use that is too intense or that continues too long in this habitat, all can cause de-watering of the wetlands or physical damage such as hummocking. The result would be the decline in the population and degradation of the habitat, and eventually disappearance of the population. All of the sites on National Forest System lands are provided the protection included as a Region 2 sensitive species.

***Ranunculus gelidus* ssp. *grayi*, Tundra buttercup**

Classification • Species of Viability Concern

Affected Environment

Ranunculus gelidus ssp. *grayi* (tundra buttercup) came into consideration for this assessment because it is known to occur on the White River National Forest, and the species is rated G4G5/S2 by the Colorado Natural Heritage Program (Colorado Natural Heritage Program 2000a). These ratings mean:

“G4. Apparently secure globally, though it might be quite rare in parts of its range, especially at the periphery.

“G5. Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.

“S2. Imperiled in state because of rarity (6 to 20 occurrences), or because of other factors demonstrably making it very vulnerable to extirpation from the state. (Endangered or threatened in state).” (CNHP 2000b).

Ranunculus gelidus ssp. *grayi* is not rated as sensitive by the Forest Service or the Bureau of Land Management (BLM).

Reasons for Viability Concern

There is a viability concern for this species on the forest because:

- There are few sites on the forest,
- There are small populations, and
- The habitat on the forest is vulnerable to management that may result in negative impacts to buttercup habitat quality and quantity.

Habitat Description

Ranunculus gelidus ssp. *grayi* occurs in three sites on the White River National Forest, all in Summit County: Peak Ten, east of Montezuma, and Grays Peak.

In Colorado, the plants of *Ranunculus gelidus* are only found in the high alpine zone, what Löve (1970) called the Nival Zone. Elevations range 12,700–14,100 ft (3,870–4,300 m), and average 13,200 ft (4,020 m). The populations occur on ridge tops and peaks, in rocks and scree, where there have been low-lying snow banks or in the rivulets below them.

The species seems to prefer scree of igneous origin, although it can be found sometimes on calcareous sedimentary rocks. In Colorado, *Ranunculus gelidus* ssp. *grayi* grows in very cold, exposed sites, among small-sized scree on high Alpine ridges and peaks, especially in small rocky rivulets below late-lying snow banks.

Population Description

On the White River National Forest, the Peak Ten occurrence is represented by an herbarium specimen collected in 1973 on the north slopes of this peak. The site has not been visited since then, and the population has not been counted. East of Montezuma, the population was discovered in 1997 by the Colorado Natural Heritage Program, when the population was estimated to be 3–10 individuals in about 1 ac searched. The population on the ridge east of Grays Peak was said to be “probably quite small” when it was last visited. The total known population on the forest is less than 100.

**General
Risk Factors**

Activities that create excavations or disturbance to the rock scree slopes where this species is found would be the most likely impacts to this species. Road and trail building and maintenance, developed recreation facility construction, and off-road vehicle travel are all likely to impact this species.

Environmental Consequences

Risk Factors

One of the White River National Forest populations is surrounded by old mining roads, now mainly used for recreation in summer and winter. This site could be eliminated by off-road vehicles, road or trail construction and maintenance. Another White River National Forest population is close to an area proposed for expansion of a ski area, where motorized travel may be permitted in the winter in the future.

**Resource
Protection
Measures**

These protection measures are developed to protect existing known populations as well as any new populations discovered through the life of the 2002 Forest Plan.

The 2002 Forest Plan establishes key decisions for long-term direction, including forest-wide goals and objectives, forest-wide standards and guidelines, direction applying to future activities within management areas, determining suitability and capability of lands, and establishing monitoring and evaluation requirements.

The Resource Protection Measures applicable to management of tundra buttercup habitat that are common to all alternatives include:

Forest-wide Goals, Objectives, and Strategies, 2002 Forest Plan, Chapter 1:

- Strategies that direct the Forest to manage for ecological conditions to sustain viable populations of native and desired nonnative species. (Objective 1b, Strategy 1b.4, Objective 1c, Strategies 1c.1 and 1c.2, and 1C16.).

Forest-wide Standards and Guidelines, 2002 Forest Plan, Chapter 2:

- Management direction that restricts activities in the alpine zone in order to maintain ecological conditions important to the maintenance of high quality alpine habitats. (Chapter 2, Section 2, Alpine Standards 1 and 2 and Alpine Guidelines 1-3).
- Rangeland Ecosystem Management Standards and Guidelines assure proper management of the non-forested vegetation resources. (Chapter 2, Section 2, Rangeland Ecosystem Management, Standards 1-2, Guidelines 1-3).
- Management direction that restricts all non-snow motorized and mechanized uses to designated travelways. (Chapter 2, Section 5, Standard 4).

Specific direction for plant species of viability concern that directs the Forest to:

- Survey for possible new populations of plants in areas identified as potential habitat that may be affected by project activities. (Chapter 2, Section 2, Species of Viability Concern, Plant, Standard 1)
- Avoid project disturbances that would significantly affect species viability or trend the species towards federal listing. (Chapter 2, Section 2, Species of Viability Concern, Plant, Standard 1)

Management Area Direction, 2002 Forest Plan, Chapter 3:

- No management area direction is specific to this species.

DIRECT AND INDIRECT EFFECTS

Management of the area around Peak Ten would receive more recreation pressure and vehicle use under alternatives C, E and F, including expansion of the Breckenridge Ski Area in Alternatives C and E. The area would be managed under a non-motorized allocation in the other alternatives.

Management of the ridge east of Grays Peak would be managed for non-motorized recreation in all alternatives except for Alternatives F and K that would be managed as forested flora and fauna (F) and dispersed recreation (K).

Management of the area east of Montezuma would be managed for recreation (mostly motorized) both summer and winter in most alternatives. This use would be restricted to designated roads and trails.

Effects on Habitat

Habitat quality and quantity for this species is expected to remain stable in all alternatives except for C and E where ski area expansion may impact the Peak 10 habitat area.

Effects on Populations

Populations of this species are expected to remain stable in all alternatives except for C and E where ski area expansion may impact the Peak 10 habitat area and reduce the population.

Table V-38

Estimated potential changes in population and habitat for *Ranunculus gelidus* ssp. *grayi*, Tundra buttercup during the life of the 2002 Forest Plan

		ALTERNATIVE						
	<i>Existing Condition</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
Amount of Habitat	Limited – currently known from three locations	Same	Potential Reduction	Same	Potential Reduction	Same	Same	Same
Habitat Quality	High	S	Potential D	S	Potential D	S	S	S
Expected Population Trend	S	S	Potential D	S	Potential D	S	S	S
Viability Outcome*	I	I	III	I	III	I	I	I

Key: D – Decreasing; S – Stable; IN – Increasing; U – Unknown

Note: * Viability outcomes are defined in the introduction to this section (Topic 1, Part 2, Section 3).

CUMULATIVE EFFECTS

The subspecies, *Ranunculus gelidus* ssp. *grayi* occurs in the high mountains of central Colorado and northeastern Utah, where all known locations are on National Forests (Utah Division of Wildlife Resources 1998, Colorado Natural Heritage Program 2000a). The subspecies also occurs in Montana, Idaho, Wyoming, Oregon, Washington, Alberta, British Columbia, Yukon, Northwest Territories, Alaska, and eastern Siberia (Hitchcock and others 1964, Hultén 1968). The populations on the White River National Forest are the southernmost populations within the normal geographic and habitat range for the subspecies. The species has not been well studied, apparently anywhere in North America.

This species is not currently afforded any type of special protection designation on the adjacent forests where it is found. It is possible that earth-disturbing activities such as road and trail construction may occur within its occupied habitat on these other forests during the life of the plan.

***Thalictrum heliophilum* Wilken and DeMott, Sun-loving meadowrue**

Classification • Species of Viability Concern

Affected Environment

Thalictrum heliophilum (Sun-loving meadowrue) came into consideration for this assessment because it is known to occur on the White River National Forest, and the species is rated G3/S3 by the Colorado Natural Heritage Program (CNHP 2000a). These ratings mean:

“G3. Very rare or local throughout its range or found locally in a restricted range (21 to 100 occurrences). (Threatened throughout its range).

“S3. Rare in state (21 to 100 occurrences)” (CNHP 2000b).

Thalictrum heliophilum is not rated as sensitive by the Forest Service or the Bureau of Land Management (BLM).

Reasons for Viability Concern

There is a viability concern for this species on the forest because:

- The habitat is limited on the Forest, only one location has been documented,
- The habitat on the Forest is vulnerable to vegetation management that may result in negative impacts to the species and its habitat, and
- The known breeding population on the Forest is small and isolated.

Habitat Description

Thalictrum heliophilum is an endemic species, very restricted to only one very narrow geological stratum. Its occurrence on the White River National Forest is within the normal range of habitats for the species, but is still separated from all the other populations—this population is at the moment the only known population south of the Colorado River.

The species has been well studied. Wilken and DeMott (1983) studied the habitat and taxonomy of the species for three years. O’Kane (1987) made an intensive study of all then then-known populations for his status report. Personnel from the Colorado Natural Heritage Program and Colorado Natural Areas Program have made periodic re-visits to several of the populations (CNHP 2000a).

The species is known only from Rio Blanco, Garfield, and Mesa Counties, Colorado. There are about 22 known sites, on soils with a very narrow geologic origin, on steep shale slopes derived from the Parachute Creek Member of the Green River Shale Formation (O’Kane 1987).

On National Forest System Land, *T. heliophilum* is known only from one population along the boundary between the Grand Mesa and White River National Forests on Battlement Mesa.

The plants occur on steep shale slopes derived from the Parachute Creek Member of the Green River Shale Formation. “The species is one of several that are endemic to the Parachute Creek Member of the Green River Formation in the arid basins and mesas of western Colorado and eastern Utah. These species have evolved to withstand extreme heat in summer, extreme cold in winter, long dry spells, high incident light, saline and clayey soils, and shifting substrates. Soils in the area are especially dry

because of low regional precipitation, steep slopes, low vegetation cover, low amounts of organic matter, high salt content and because water molecules are hygroscopically bound to small particles found in the clayey soils. Soil stability is, in part, due to the presence of these species” (O’Kane 1987).

Battlement Mesa is not well explored by botanists, so there may be additional undiscovered populations.

**Population
Description**

The root-stocks are sometimes large, indicating that the plants may live to 40 years or more, and seedlings are sometimes abundant in favorable years. Other than a few observations, little is known of demography or population structure of any population of this species.

Populations occupy from <1 ac to >200 ac, and vary in number of individuals from 15 to >100,000 (O’Kane 1987). The White River National Forest site has been visited by botanists twice; a botanist from the first visit estimated the number of individuals as “many,” and the second reported that the “plants are in scattered clumps in barren areas on slope” (Colorado Natural Heritage Program 1999-2000). This population occurs on both the White River and Grand Mesa National Forests, but it is not known how much of the population is on the White River National Forest.

**General
Risk Factors**

The greatest habitat modification taking place is the tracks and trails of wildlife crossing this slope: mule deer, elk (wapiti), and bighorn sheep. The soil is made more unstable by those tracks and trails across the slope, primarily as the animals travel from one place to another. The animals do not stop very long on this slope, but there are quite a few numbers. The population is now in an area where no vehicle use is permitted and unused by livestock on both National Forests.

Environmental Consequences

Risk Factors

The major risk factors for this species on the White River National Forest are related to natural impacts of grazing and trampling by native wildlife. The one known population, and other potentially suitable habitat is found on very steep slopes where other activities are not likely to occur.

**Resource
Protection
Measures**

These protection measures are developed to protect existing known populations as well as any new populations discovered through the life of the 2002 Forest Plan.

The 2002 Forest Plan establishes key decisions for long-term direction, including forest-wide goals and objectives, forest-wide standards and guidelines, direction applying to future activities within management areas, determining suitability and capability of lands, and establishing monitoring and evaluation requirements.

The Resource Protection Measures applicable to management of Sun-loving meadowrue habitat that are common to all alternatives include:

Forest-wide Goals, Objectives, and Strategies, 2002 Forest Plan, Chapter 1:

- Strategies that direct the Forest to manage for ecological conditions to sustain viable populations of native and desired nonnative species. (Objective 1b, Strategy 1b.4, Objective 1c, Strategies 1c.1 and 1c.2, and 1C16.).

Forest-wide Standards and Guidelines, 2002 Forest Plan, Chapter 2:

- Management direction that restricts all non-snow motorized and mechanized uses to designated travelways. (Chapter 2, Section 5, Standard 4).

Specific direction for plant species of viability concern that directs the Forest to:

- Survey for possible new populations of plants in areas identified as potential habitat that may be affected by project activities. (Chapter 2, Section 2, Species of Viability Concern, Plant, Standard 1)
- Avoid project disturbances that would significantly affect species viability or trend the species towards federal listing. (Chapter 2, Section 2, Species of Viability Concern, Plant, Standard 1)

Management Area Direction, 2002 Forest Plan, Chapter 3:

- No management area direction is specific to this species.

DIRECT AND INDIRECT EFFECTS

Under Alternatives B, C, E, F, I and K, the one known population would be included in management areas for bighorn sheep and deer and elk winter range which would offer a high degree of protection for the population of this species. Under Alternative D, the area would be included in an area for elk habitat, managed for winter range and summer use, that would also provide a high level of protection. Impacts that might occur would be tied to the use of the area by native herbivores, a situation in which the species apparently has evolved.

Under all alternatives, there are few activities that would impact the habitat or population of this species.

Effects on Habitat

It is expected that the known and suspected habitat for this species will remain stable through the life of the 2002 Forest Plan. No activities have been identified that would greatly impact the habitat.

Effects on Populations

It is expected that the known and suspected populations for this species will remain stable through the life of the plan. No activities have been identified that would greatly impact the populations.

Table V-39

Estimated potential changes in population and habitat for *Thalictrum heliophilum*, Sunloving meadowrue, during the life of the 2002 Forest Plan

	<i>Existing Condition</i>	ALTERNATIVE						
		<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
Amount of Habitat	Limited – currently known from one location	Same	Same	Same	Same	Same	Same	Same
Habitat Quality	High	S	S	S	S	S	S	S
Expected Population Trend	S	S	S	S	S	S	S	S
Viability Outcome*	I	I	I	I	I	I	I	I

Key: *D* – Decreasing; *S* – Stable; *IN* – Increasing; *U* – Unknown

Note: Viability outcomes are defined in the introduction to this section (Topic 1, Part 2, Section 3).

CUMULATIVE EFFECTS

Thalictrum heliophilum (Sun-loving meadowrue) is known from one population in the piñon-juniper-oak zone on the White River National Forest. The population is partially on the Grand Mesa National Forest. The site is as yet unprotected, and is vulnerable to off-road vehicle use and human foot travel. The one site needs to be better protected. No additional impacts to this species have been identified throughout its range. It is not currently afforded any special protection on the adjacent national forest on which it occurs.

Part 3, Section 1

Terrestrial wildlife

Introduction

Abstract

Many of the species that exist today on the White River National Forest were present before European settlement. Missing from the ecosystem are some of the high trophic level carnivores (grizzly bear and wolf). The lynx and wolverine are also considered to be at very low population levels. One rangeland species, the mountain bison, no longer exists; and sage grouse populations are declining at very rapid rates as a result of deteriorating sagebrush habitat conditions.

Terrestrial wildlife management indicator community and species habitats will remain fairly constant across the forest. Some species such as those dependent on late-successional forests will have an abundance of habitat, especially in spruce-fir forest environments. Road construction activities may have the greatest effect on species that are dependent on interior habitat conditions. Many of the wildlife species associated with shrub and grassland vegetation types will continue to see declines in habitat adjacent to the forest as human developments on private lands along river systems and valley bottoms continue to expand, even though the quality and quantity of these habitats may increase on the forest. Elk habitat quality is expected to increase on the forest, but population trends are unknown since hunting, predation, and weather also impact population numbers. Mule deer herds may continue to decline as the Colorado Division of Wildlife works to clearly define the factors affecting these populations. Overall, little change is expected in the broader composition and makeup of the communities across the forest.

Landscape connectivity will become an increasingly complex issue that crosses ownership boundaries. Many wide-ranging species such as deer, elk, lynx, and wolverine will encounter dispersal impediments as ski areas, towns, outlying housing developments, and highways continue to develop.

Summary

Diverse plant communities on the White River National Forest support more than 250 terrestrial vertebrate species, including 72 mammals; 194 resident and migratory species of birds; and 14 reptiles. These species provide forest users and visitors with a wide range of opportunities that include sport hunting, wildlife viewing, and various commercial enterprises.

In the last century, three species have been introduced (or possibly reintroduced) to the forest, and six species have been extirpated. In recent decades, a number of others have experienced marked declines, although some are making limited comebacks. In contrast to these species, current elk and mule deer populations have increased and are thought to be about the same levels as before European settlement, although recent urban development has encroached on their habitat. A full discussion of these historical changes is found in FEIS Volume 3, Appendix D—*Historic Range of Variability*.

The White River National Forest has almost all the same species present today as were here during the late 1800s. Exceptions are the populations of medium and large

carnivores, including the lynx, wolverine, wolf, and grizzly bear, which have been largely reduced or extirpated from the White River National Forest ecosystem, mainly through hunting and trapping. It is quite possible that the niche or function that these species once occupied in this ecosystem is outside of the historic range of variability. Coyotes, black bears, and mountain lions may now fulfill the function of these species.

The Organic Administration Act, the Multiple Use and Sustained Yield Act, the Forest Land Management Act, the Sikes Act, and U.S. Department of Agriculture and Forest Service policy and agreements with other agencies recognize the shared responsibilities between the Forest Service and state wildlife management agencies in the management of fish and wildlife resources on federal lands. The State of Colorado mainly impacts population numbers through hunting, fishing, and trapping regulations. The Forest Service mainly affects population numbers, diversity, and species viability through the management of habitat (such as timber management) and disturbances (such as recreation or travel management). In 1980, the Forest Service and Colorado Division of Wildlife agreed on a comprehensive statewide wildlife management plan for lands in Colorado.

In recent decades, public interest and participation in nonconsumptive recreation such as wildlife viewing and photography, along with traditional consumptive activities such as hunting, have gained popularity on the forest. Increased interest in wildlife and its management has led to the establishment of such wildlife advocacy organizations as the Audubon Society, the Rocky Mountain Elk Foundation, the Mule Deer Foundation, the Foundation for North American Wildlife Sheep, the Wild Turkey Federation, Ducks Unlimited, and others. Many of these organizations play an active role in wildlife management on the forest in partnership with the state of Colorado and the Forest Service.

Key indicators

- Habitat for each management indicator species (MIS) (discussed in FEIS Volume 1, Chapter 3, Topic 1, Part 3, Section 3—*Species-Level Assessments*)
- Habitat for each special species of concern
- Interior forest habitat
- Connectivity
- Elk habitat management
- Threatened, endangered, proposed, and sensitive species (presented in FEIS Volume 4, Appendix N—*Biological Evaluation*)

Legal and administrative framework

- The **National Environmental Policy Act** (1969), as amended, requires the Forest Service to address fish and wildlife concerns during the environmental analysis process.
- The **National Forest Management Act** (1976) requires the Forest Service to consider all resources in the land management planning process.
- **36 CFR 219.19** directs the Forest Service to maintain habitat for viable populations of existing native and desired non-native vertebrate species, to select management indicator species, to consult with biologists from other agencies, to consider access and dispersal problems associated with hunting, fishing, and other uses, and to evaluate the effects of pest and fire management.

Affected Environment – general wildlife

About 65 percent of the forest consists of forested cover, dominated by spruce-fir (29 percent), aspen (19 percent), lodgepole pine (11 percent) and Douglas fir (3 percent). The remaining 35 percent is comprised of shrubland, grassland, and non-vegetation conditions such as water bodies or rock. Sixty percent of spruce-fir is comprised of mature and old-growth forest stands. Lodgepole pine and aspen forests have more than 50 percent of their forest stands in sapling and pole structural stages.

The early seral stages of forested ecosystems are in limited quantities and patchy distribution due primarily to fire suppression over the last 50 years. Species associated with early seral conditions may be at the low end of their range of variability. Sagebrush communities as an entire ecosystem, including other federal, state, and private lands, are declining (Braun 1995). Changes in this plant community directly relate to the decline in sagebrush associated species such as sage grouse and Brewer's sparrow.

Lynx and wolverine are on the southern periphery of their range in Colorado, and some biologists speculate they were never very abundant. However, this is not to imply that the loss of these species from the White River National Forest and Colorado would not be significant. Some biologists feel that "the distributions of some species, especially those at the extensions of their range, are dynamic" (Brown and Davis 1995). Others feel, however, that these populations may be good indicators of the health of a species as a whole, as most fringe populations would most likely be the first extirpated during a species decline.

The loss of native mountain bison from this ecosystem is of major significance to high-elevation grassland communities. Domestic livestock grazing strategies often do not mimic those of the wandering bison.

Forest and non-forest species composition, structure, and arrangement, as well as riparian and non-vegetated environments, are essential to the habitat needs of many different animal species. These habitats include a diverse range of vegetation cover types: Douglas fir, ponderosa pine, lodgepole pine, spruce-fir, oakbrush-mountain shrub, pinyon-juniper, hardwoods (predominately aspen), grasslands/forblands, shrublands (including mountain mahogany, rabbitbrush, sagebrush, serviceberry, snowberry, and willow), and non-forested elements (rock and water). Specific discussions on these cover types are covered in detail within the forested and non-forested sections of this chapter. **Table 37** summarizes the relationship of some of the species in the different vertebrate groups to vegetation cover types on the White River National Forest (many species occur in more than one cover type).

Table 37
Terrestrial vertebrates known or likely by cover type

Cover types	Reptiles	Mammals	Birds	Total
<i>Douglas-fir</i>	0	18	46	64
<i>Ponderosa pine</i>	8	20	57	85
<i>Lodgepole pine</i>	0	30	46	76
<i>Spruce-fir</i>	0	30	46	76
<i>Conifer (riparian)</i>	6	30	92	128
<i>Hardwoods (predominately aspen)</i>	8	43	37	88
<i>Shrublands</i>	9	45	63	117
<i>Grass/forblands</i>	4	33	60	97
<i>Non-forest (barren)</i>	9	36	47	92
<i>Non-forest (rock/water)</i>	0/4	27/33	10/105	37/142
<i>Special habitats</i>	1	19	20	40

**Resource
protection
measures**

Terrestrial vertebrate species on the forest are very diverse in their habitat use and needs. The habitat of most species may be impacted by management actions, but their population levels and distribution will likely remain close to existing condition. Some species could experience measurable alterations on portions of their habitat so that their population levels or distribution may be measurably impacted. These species needs are addressed through the direction of the 2002 Forest Plan so that sufficient habitat is provided to maintain viable populations well dispersed through the appropriate habitat on the forest.

Most management area prescriptions (MAs) provide direction to protect or manage specific habitat requirements of certain species or categories of wildlife, while others provide for a special emphasis on habitat requirements. MAs 5.41 and 5.43 provide management direction to benefit elk throughout the year. MA 5.5 provides management direction to maintain linkages for wide-ranging species such as lynx. Management area prescription 8.25, while established mainly for ski area management, also requires consideration of lynx habitat needs. Most MAs provide some specific direction for consideration of wildlife management.

Forest-wide direction for other resource management activities will accommodate many of the habitat requirements of most species. Livestock management forage utilization and riparian guidelines (rangeland ecosystem management) are likely to result in maintaining or improving riparian and grassland habitat for many species. Timber management direction (silviculture) limits the size of openings and directs adequate regeneration in harvested areas. Direction for soil, biodiversity, and silviculture management all require maintaining minimum amounts of down woody debris. Biodiversity standard #2 requires management for snags, including large snags and replacement trees (future snags). Direction for other resource disciplines will benefit some wildlife species, including direction for cave, soil, water, and riparian resources, fire and noxious weed management.

Where MA direction or direction for other resources is not adequate to maintain desired habitat or populations for some species, then specific direction is provided in the plan. This direction includes general wildlife standards and guidelines such as for elk, bat, raptor, and threatened, endangered, and sensitive species management. Other direction in the 2002 Forest Plan is specific to individual species, such as for lynx, Barrow's goldeneye or fringed myotis.

It is expected that implementing the forest-wide and MA direction will result in maintaining viable populations of all terrestrial wildlife species dispersed throughout the landscape.

Environmental Consequences

DIRECT AND INDIRECT EFFECTS

Effects on wildlife from mineral resources management

Construction and maintenance of roads and extraction sites during the exploration, development, and extraction of mineral resources will impact the habitat and increase disturbance of some wildlife species.

Oil and Gas (Leasable Minerals). The 2002 Forest Plan identifies additional acres of land administratively withdrawn from oil and gas authorization (see FEIS Volume 1, Chapter 3, Topic 1, Part 2, Section 4—*Mineral resources*). The acreage of such withdrawals varies by alternative based on the amount of acreage assigned to MAs 1.2, 1.5, 3.4, and 4.4. The decrease in acres administratively available range from 6,000 acres (Alternative B) to 218,000 acres (Alternative I).

Locatable minerals. There are currently 859,000 acres withdrawn from locatable mineral entry on the forest. All alternatives except Alternative B will increase the acres withdrawn from entry, depending on MA allocation and site-specific resource needs (additional acres withdrawn range from 0 acres in Alternative B to 209,000 acres in Alternative I) (**Table 36D**).

Salable minerals. Salable minerals are disposed by mineral permit or contract at the discretion of the Forest Service. This discretion does not vary by alternative. Acres of land administratively available for leasable minerals and for locatable minerals does not necessarily mean that development will occur throughout these areas, but that they are available for proposed exploration and extraction, subject to site-specific analysis and approval. Such acres are also subject to protective measures as directed by the 2002 Forest Plan. Exploration and development of mineral extraction sites will alter the habitat characteristics for species that use that area, but the total impacted acres over the forest are likely to be small and impacts to wildlife species would not be measurable forest-wide.

The major concern with mineral development is the increase of disturbance that the mineral sites and associated roads will have on some wildlife species (such as lynx and elk). This may result in less effective use of the areas by these species. This would vary by the acreage of the sites, miles of roads needed, and degree of activity, and not necessarily by acres of leasable mineral authorizations or acres available for locatable mineral activity at the forest level. Fewer conflicts with wildlife management, in general,

would be expected in alternatives that have fewer acres available for mineral extraction (i.e., Alternative I would likely have fewer conflicts than Alternative B), but actual impacts to wildlife species and their habitat would result from site-specific actions.

Effects on wildlife from fisheries and riparian management

Managing fish and riparian habitat includes many techniques, including in-stream structures, riparian plantings, exclosure fences, and bank stabilization. Usually these management tools also result in higher quality habitat conditions for terrestrial wildlife, especially riparian-associated species. Planned activities (based on the first decade) include restoration of streams or riparian areas and restoration or enhancement of lakes and wetlands. The outcomes range from 12 miles and 23 acres (Alternative B) to 38 miles and 78 acres (Alternative I) (**Table 15**—Supplemental Table 2, FEIS Volume 1, Chapter 2.). Even so, less than two percent of the streams/riparian miles and less than one percent of the lake acres on the forest would be improved or restored if all the outcomes of Alternative I were achieved. While the stream, riparian, and lake restorations and improvements may have site-specific positive impacts on riparian associated terrestrial species, there would not be a forest-wide measurable difference on terrestrial wildlife populations between alternatives.

Effects on wildlife from fire/fuels management

Fire and fuels management can have a variety of positive and negative effects on wildlife habitats. The composition, structure, function, and pattern of wildlife habitats on the forest have been dramatically influenced by fire historically, with many being fire-dependent. (see FEIS Volume 1, Chapter 3, Topic 1, Part 7—*Fire management*). Active fire suppression over the last several decades has also played a role in these communities. Historical records indicate that natural and human-caused fire was one of several prominent disturbance agents operating in the forests of the central-southern Rocky Mountains (Veblen 1994). Effective control of fire during the last half-century has resulted in forested wildlife habitats dominated by late-successional stages; particularly in the lodgepole pine and spruce-fir cover types.

Managing fire and fuels can have a positive effect on wildlife habitats by increasing the amount and availability of plant nutrients, and by increasing the diversity of vegetation, especially in early successional stages. Fire/fuels management can be used as a primary management tool for improving and stimulating changes in wildlife habitat, particularly in creating early successional conditions that are favorable to big game management. Fire/fuels management can also have negative impacts on those species requiring dense tree or shrub canopy cover. The estimated fuels treatments (which includes prescribed fire and mechanical treatments) range in the first decade from 38,900 acres (Alternative F) to 62,000 acres (Alternatives C and K) (**Table 76**, *Fire Management* section). Less than three percent of the forest would be burned by prescribed fire in the first decade if the outcomes of Alternatives C or K were fully implemented. While the lands restored, improved, or maintained by prescribed fire may have site-specific positive or negative impacts on terrestrial species habitat, there would not be a forest-wide measurable difference on terrestrial wildlife populations between alternatives.

Effects on wildlife from insects and disease management

Forest insects and diseases have always been a natural component of the forest. Along with fire, they are some of the most important disturbance agents that have created the current composition, structures, and pattern of wildlife habitats. The primary insect species are mountain pine beetles, followed by the spruce beetle and wood-boring insects of aspens. Primary coniferous and deciduous tree diseases include lodgepole pine dwarf mistletoe, Douglas-fir dwarf mistletoe, *Armillaria* root disease, and several decays and cankers of aspens. Many species of wildlife (such as the lynx, marten, and three-toed woodpecker) depend on snags or downed woody material for sustaining portions or all of their life requirements. Unique snag and downed woody dependent species may benefit most from periods of increased insect and disease activity. Infrequent epidemic levels of activity often resulted in large stand-replacing fires that were part of the ecological processes helping to shape the current ecosystems on the forest. The infrequent epidemic outbreaks can also have negative impacts on wildlife habitats in several ways. Some examples include reductions in standing live biomass for species associated with late-successional and old growth habitats and removal of large areas that provide cover and security habitat for big game species. The alternatives do not differ on predicted levels of endemic insect and disease levels.

Alternatives C and I will allow insect and disease infestations to occur without management, which may result in the positive and negative impacts as described in the previous paragraph. All other alternatives may implement management actions to control, to varying levels, insect and disease infestations, mainly through timber harvesting and thinning. Timber harvesting, thinning, and related silvicultural activities can provide tools for preventing or reducing the risk of small and large insect or disease outbreaks that may have negative effects on wildlife habitats for certain species. No management actions for the control of insect and disease outbreaks are planned, but site-specific control projects may be implemented. Areas in which timber stand improvement projects are proposed may reduce the risk to insect and disease outbreaks in those areas. Less than three percent of the forested acres on the forest will be entered under Alternative F (the alternative with the highest treatment). While areas of insect/disease outbreaks impacted by planned and unplanned timber management may have site-specific positive or negative impacts on the habitat of terrestrial species, there would not be a forest-wide measurable difference on most terrestrial wildlife populations between alternatives.

Effects on wildlife from domestic livestock grazing

Activities related to domestic livestock grazing can have positive and negative effects on wildlife and wildlife habitats, depending on the species. Livestock may utilize dense vegetation, stimulating new growth that increases forage nutrient content and availability, and improving habitat for species that associate with more open habitats. Negative impacts occur when shrub or grassland communities are grazed to a level that decreases habitat quality for species associated with dense vegetation, including many ground-nesting birds. Social interaction and competition for forage, space, and water can occur between wildlife and livestock, but timing and distribution of livestock can effectively reduce or eliminate the majority of these conflicts.

Domestic livestock grazing would continue to be permitted under all of the alternatives. While grazing is permitted in most MA allocations, MA 5.12 emphasizes forage

production for livestock, where other MAs that permit livestock grazing emphasize other resource management. Livestock management standards and guidelines apply to all MAs that permit livestock, so impacts to wildlife generally will be the same under all alternatives.

The only other difference may be the decision on vacant allotments. Allotments that are closed would not be stocked during the life of the 2002 Forest Plan, which may result in the maintenance or increase of herbaceous vegetation for forage and cover. Those allotments that remain vacant may or may not be stocked during the life of the forest plan, based on future allotment-specific decisions. If they are not stocked, then the results will be similar to closed allotments. If they are stocked, then herbaceous vegetation may decrease, possibly decreasing the available forage or cover for some species.

Vacant allotments retained, closed, or partially closed varies by alternative (**Table 67**, FEIS Volume 1, Chapter 3, Topic 1, Part 3, Section 5—*Domestic livestock grazing*). Alternatives with the most acres removed from grazing as a result of full and partial closures of vacant allotments may result in fewer conflicts with wildlife management as compared with alternatives with fewer acres removed. For example, based on this assumption, Alternative E (195,000 acres of closures) may result in fewer cattle grazing conflicts with wildlife management as compared with Alternative B (no acres of closure).

Effects on wildlife from noxious weeds

Controlling noxious weeds in infested areas will help maintain habitat for some species of wildlife. No specific actions are directed by the 2002 Forest Plan except general direction to pursue controlling noxious weed infestations. Proactive weed management will not vary by alternative. The *Noxious Weeds* discussion, FEIS Volume 1, Chapter 3, Topic 1, Part 3, Section 6, discusses activities on the forest that may increase the risk of noxious weed infestations spreading. It is not expected that any of the alternatives will provide adequate control to halt or reverse the spread of noxious weeds on the forest, although some may slow their rate of spread. Weed infestations are expected to increase across the forest in all alternatives. This increase may negatively impact herbaceous cover and forage for some species, including elk and some ground-nesting birds in all alternatives.

Effects on wildlife from travel and recreation management

Objectives for travel management are driven by the desires of the public and the managing agency mandates, which generally are spelled out in policy, directives, or laws. Roads or trails can be used as tools to access land for commodity production, such as timber and minerals, or can serve as transportation systems supplying people access to areas of unique scenic beauty or to dispersed or developed recreational sites. The effect roads can have on contiguous blocks of forest is well-documented (Tinker et al. 1998, Reed et al. 1996) and affects a wide variety of species. Roads can directly remove habitat affecting those species that have limited dispersal capabilities, or greatly reduce the amount of interior forest available for species that are interior habitat specialists. Roads also provide access for the public, which reduces effectiveness of surrounding habitats for many wildlife species through disturbance and displacement. Trails have effects that are much harder to describe, but have been linked to disturbance and displacement of some wildlife species.

The most common use of roads and trails on the forest is for recreation. Certain types of recreational activities can result in the loss of wildlife habitat, increased disturbance, and temporary displacement of wildlife species. In general, developed recreation sites would not significantly change the composition or pattern of wildlife habitats across the forest. Effects on wildlife would primarily be associated with increased disturbance from recreational use, such as hiking, four-wheel drive use, snowmobiling, wildlife viewing, skiing, and mountain biking. Dispersed recreation, whether motorized or non-motorized, has the potential to disturb and displace some wildlife species, especially the large, wide-ranging species such as large predators and big game. Many of the non-motorized areas provide areas of solitude for wide-ranging forest wildlife, including carnivores and big game. Increased human activities in these areas may decrease wildlife use in these areas.

Alternatives vary in travel and recreation management through the direction of management prescription allocations and recreation opportunity spectrum (ROS) class designations. Alternatives also differ in the amount and location of allocations that allow motorized and non-motorized use on and off established routes during snow periods (winter) and snow-free periods (summer). Generally, alternatives with the most acres of motorized use will result in more disturbances to wildlife as compared with alternatives with fewer acres of motorized use. Acres of off-route motorized use have the greatest impact on wildlife use. Alternatives D, I, and K have no acres identified for summer off-route motorized use (**Tables 6 and 7**, FEIS Volume 1, Chapter 2—*The Alternatives*). Alternatives C (614,000 acres), E (848,000 acres), B (886,000), and F (1,047,000 acres) all allow some level of summer off-route motorized use. All alternatives have acres identified for winter off-route motorized use, ranging from 462,000 acres in Alternative I to 1,266,000 acres in Alternative F (**Tables 6 and 7**, FEIS Volume 1, Chapter 2—*The Alternatives*). The impacts of motorized use on most wildlife populations will be mitigated by implementing plan direction on limiting disturbances from recreation and travel management forest-wide (such as with the standard to apply seasonal restrictions to reduce disturbances in key wildlife habitats), and by management prescription, so that the differences between alternatives on most wildlife species will not be discernible. Some of the species that may have disturbance impacts from travel and recreation management (such as lynx and elk) are addressed further in this section.

Effects on wildlife from utility corridors

Land corridors set aside for utility access can disturb or displace wildlife species by changing the arrangement of forested and non-forested vegetation types in those general areas. In areas where contiguous forest habitats exist, utility corridors break up these contiguous blocks with long linear landscapes comprised primarily of early seral vegetation components. The arrangements of these corridors on the landscape have the potential to decrease the dispersal capability of some species of wildlife. Access by humans and their associated recreational activities may be provided on the roads constructed to expedite the maintenance of these facilities. Improper power line design can result in potential electrocution hazard for certain raptor species if the lines are within their normal flight paths.

Management Area 8.32 is established in all alternatives to concentrate the placement and management of major utility lines on the forest. Applicants will not be required to analyze alternative locations if new lines are placed in MA 8.32. If applicants request to place a major line outside of MA 8.32, they will be required to analyze alternative

locations. Generally, identification of utility corridors will result in fewer separate locations of utility lines as compared to no utility corridors. Identified corridors have at least one existing line in place, either underground or aerial. Corridors vary as to whether they allow utility lines above ground (aerial), underground, or both. All alternatives have the same utility corridors identified, except for Alternative B, which has fewer areas identified. While more utility lines are expected in the future under all alternatives, Alternative B is more likely to result in a greater number of separate lines as compared with the other alternatives. Alternatives C, D, E, F, I, and K will likely have less impact on wildlife species than Alternative B.

Effects on wildlife from ski areas

Development of ski areas converts forest cover types to grass-forb-shrub stages or barren land, and increases visual and auditory disturbances to the wildlife using these areas. This generally reduces the quality and effectiveness of wildlife habitat for species that require or prefer interior forests or forested travelways (such as brown creeper, marten, and lynx). Reductions in downed wood components reduce the amount of subnivean habitat available for species such as marten and small mammals. These changes are generally permanent, but the effects are less evident when resort development occurs above tree line, on steep rocky treeless slopes, in avalanche paths, and in other non-forested areas. Habitats and wildlife also are negatively impacted by the activities associated with skiing. Skiing and snow-grooming equipment cause increased disturbance to some wildlife species, and snow compaction in long, linear corridors from base areas to mountain summits of most ski mountains impacts some species, such as lynx, by increasing the presence of competitors. Ski-based resorts may impede wildlife movement through key connected forested passes by eliminating or restricting access between connected wildlife habitats. For example, Alternatives B, C, and F would allocate land for ski areas between the Buttermilk and Snowmass ski areas. If this area were eventually developed for skiing, elk movement would be impeded, elk production habitats would be reduced, and elk may be forced to migrate to other areas of less desirable habitats on the forest, increasing impacts from elk use in those areas.

The current permitted ski areas total 43,000 acres, although not all of this acreage has been currently developed with ski area infrastructure. Each alternative will result in different allocations of MA 8.25. The allocations will not necessarily result in an increase in development, but identify areas that may be developed after site-specific analyses. The impacts on habitat for species that use these areas would vary by alternative based on the number of MA 8.25 acres. For example, the MA 8.25 allocation in Alternative D is 43,000 acres, which would result in no increase from the currently permitted acres (FEIS Volume 1, Chapter 2, **Table 14**). Alternative D, therefore, will likely have less impact on wildlife using these areas than Alternative B, which has the greatest increase in MA 8.25 acres (50,000 acres) (FEIS Volume 1, Chapter 2, **Table 14**). The differences between alternatives are not just based on total acres of MA 8.25 area, but on the location of these areas. The possible impacts of the allocated acres and the location of these areas on connectivity are discussed in more detail later in this chapter.

Effects on wildlife from aerial transportation corridors

Aerial transportation corridor development would result in permanent or long-term facilities. These corridors would be developed for gondolas and tramways connecting communities to ski areas and connecting ski areas. Impacts to wildlife species and their habitat are similar to that from ski area expansion, including conversion of forested land to early seral stages, disturbance to wildlife, and reductions in connectivity for some species. The greatest concern regarding aerial transportation corridors is that they will reduce wildlife movement. No corridors would be allocated in Alternatives B, D, I, or K (**Table 14**, FEIS Volume 1, Chapter 2—The Alternatives). Alternatives C, E, and F allocate varying locations and acres to MA 8.31 (aerial transportation corridors) (**Table 101**, FEIS Volume 1, Chapter 3, Topic 3, Part 3—*Aerial transportation corridors*). Generally, the fewer acres allocated to MA 8.31, the less likely wildlife will be disturbed. Further discussion of the possible impacts of development in these corridors is addressed later in this section.

Effects on wildlife from timber management

In the place of decreased levels of historical disturbance agents such as fire and insects and diseases, timber management can provide vegetation treatments that help shape the diversity of habitats by rearranging vegetation composition, structure, and pattern across the forest. These changes can have both positive and negative effects to wildlife and their habitats, depending on the species. Timber management and related road building activity can result in the loss of habitat effectiveness and increased wildlife disturbance and displacement. Cutting of snags for house logs and firewood can affect the availability of these important resources for primary and secondary cavity nesters. Timber stand improvement activities have the potential to accelerate growth and vigor and thereby reduce the forest susceptibility to insect and disease infestations. However, certain treatments such as pre-commercial thinning, done for growth and volume, can have a negative effect on certain prey resources. Prey species such as the snowshoe hare can have portions of their habitat made unusable for periods of time following these treatments. The acres of suitable timberland (allocated through various MAs) vary by alternative, ranging from 91,000 acres in Alternative I to 599,000 acres in Alternative F (**Table 138**, FEIS Volume 1, Chapter 3, Topic 6—*Timber Management*). Not all these acres will be entered, and there are other acres that may be entered to meet other desired conditions or management needs. The expected outcome for the 10 years following implementation of the plan (under the experienced budget level) for acres harvested or thinned ranges from 6,000 in Alternatives C and E to 32,000 in Alternative F (Tables 149 and 146, FEIS Volume 1, Chapter 3, Topic 6—*Timber Management*). Under all alternatives, harvest activities would occur on less than 3 percent of the forested acres on the forest. There may be measurable impacts of these activities on wildlife at the site-specific level, but there would be no measurable differences between alternatives at the forest level on wildlife populations.

CUMULATIVE EFFECTS

Various actions and human activities, which are not governed by the forest plan, are occurring, or likely will occur, in the future. These actions may negatively affect wildlife resources, but are beyond the scope of the forest plan and outside of direct Forest Service control. The cumulative effects for wildlife resources consider lands within the forest

boundary and the private and Bureau of Land Management (BLM) land adjacent to the forest. Railroads that were built along many of the streams on the forest have given way to high-volume roads and utility corridors. Two of the major highways on and near the forest, Interstate 70 and State Highway 82, are movement barriers to many wildlife species, such as deer, elk, lynx, and also pose a direct mortality threat. Some vegetation types that make up a small percentage of the forest, but occur in larger acreages and blocks off the forest, are experiencing declines in cover and associated wildlife species (such as sagebrush and sage grouse).

Forest vegetation is patchily distributed across the forest, generally occurring in a north-south direction along the Continental Divide. The location of the White River National Forest, being in the middle of the state along this north-south axis, has a key role in providing vegetation conditions that maintain habitat connectivity across the forest, providing movement avenues for many species of wildlife. Many of the low-lying valley bottoms are being converted from open space to urbanized uses by the expansion of towns and supporting facilities. Expansion in these valleys, like that occurring in Eagle and Summit counties, is strongly influencing the movement pattern of many of the wide-ranging wildlife species. Development of these areas into higher-density housing also negatively affects the availability and quality of wildlife habitats. Generally, private and BLM lands have higher road densities than those found on adjacent National Forest System (NFS) lands (though access on some private lands may be restricted). Public access and the effect it has on some wildlife species is becoming a focal issue at the federal, county, and state levels. For large game species that are subject to hunting (deer, elk, black bear, mountain sheep, and moose), state regulatory mechanisms such as population objectives, harvest objectives, and lengths and types of harvest seasons play an important role in population ecology and species distribution on the forest.

Most of the wildlife populations and associated habitats on the forest remain within expected or desired condition, and, including cumulative effects, will continue to be so under all alternatives. But as towns and cities adjacent to public lands continue to expand, many of the important forested connections and non-forested habitat off-forest will be affected or lost. Plan standards and guidelines will maintain most vegetation cover types on the forest within or close to the desired conditions. Some cover types that are limited on the forest, such as sagebrush, will be maintained or improved under all alternatives on the forest, but actions off the forest may result in the continuing reduction in populations of species strongly associated with these cover types. All alternatives will maintain connectivity for wide ranging species, but actions off the forest may result in further reducing options for connectivity between forest and other public lands (this concern is addressed later in the section on connectivity).

Special species of concern

Affected environment – mule deer

Before 1879, deer in the Roaring Fork valley are thought to have been very numerous, as noted by many of the prospectors in the area. With an influx of settlers around the late 1800s, deer herds received increasing hunting pressure. It was reported in the summer of 1889 that over 700 deer were killed for their hides alone on the White River Plateau. It was not uncommon to see groups of 40 to 50 bucks. Mule deer herds were thought to be depleted by 1910. The Fryingpan District Ranger reported in 1910 that he only knew of five deer. In the Redcliff area, deer were also reported to be very scarce, with deer reported only in the Elk Creek and Rock Creek drainages during the winter. There was no mention in the historic record of mule deer being extirpated, but it is certainly apparent that numbers were very low from those reported prior to settlement. Protection laws were enacted because of the low populations and the mule deer population eventually rebounded to relatively high numbers in the mid-1900s. It was reported that by 1930 deer herds were at very high levels. In Colorado in 1941, part of the largest migrating deer herd occurred on the White River Plateau. This herd wintered in the Piceance Creek basin and was estimated to be around 40,000 deer. Today, this herd is estimated to be about 75,000 animals, representing a 47 percent increase in deer numbers in the last 60 years. By 1991, the deer population on the forest was thought to be around 120,000 deer.

Mule deer numbers were reported to have dropped to around 110,000 in 1995. In a recent article (Buchanan 1999), Colorado Division of Wildlife (CDOW) biologist Bruce Watkins and associates reported that some of the problems with declining deer herds in Colorado were attributed to coyote predation and land conversion practices, favoring the management of elk and domestic livestock. They estimated it would require killing 70,000 to 80,000 coyotes annually to reduce the coyote population in Colorado sufficiently to affect deer populations. Both Watkins and Dick Bartmann (CDOW) felt that habitat might be the biggest factor in managing Colorado's deer herds. Jim Olterman (CDOW big game biologist) estimated about 20,000 coyotes are already killed annually through hunting and trapping. In addition to predation and habitat loss, Watkins indicated a more serious problem existed with the maturation of forests to a seral stages that do not favor deer survival, increased competition from elk for both prime calving and fawning areas and winter range, and increasing recreation and development in traditional deer areas.

Environmental consequences – mule deer

The 2002 Forest Plan includes management prescription categories specific to mule deer habitat management, as well as those that are specific to other species but that will also benefit mule deer. The acreage allocated to these prescriptions varies by alternative.

These prescriptions are as follows:

- MA 5.41 (deer and elk winter range) – provides winter range management on important wintering areas for deer and elk. Direction for this MA includes maintaining forage and cover for deer and elk, and limiting disturbances during the winter.
- MA 5.4 (forested flora and fauna habitats) – provides management for a broad spectrum of species, including deer. The main direction for deer in this MA is limiting the density of roads and designing vegetation treatments to maintain a diversity of habitats.
- MA 5.43 (elk habitat) – emphasizes management for elk, but most of the direction would also benefit mule deer. Direction for this MA includes low road densities, limiting disturbance in certain areas during critical periods, and managing for optimum forage and cover distribution.

The sum of acreage assigned to these MAs varies by alternative (**Table 39**). Generally, the more acres allocated to these three MAs, the higher the likely survival, reproduction, and health of individual mule deer. For example, Alternative D has 840,000 acres allocated to these MAs, as opposed to Alternative F with only 287,000 acres allocated. Alternative D would likely result in better dispersion of mule deer throughout the landscape and possibly higher survival and reproduction than Alternative F. The differences between some alternatives may be measurable (such as between Alternative D and Alternative F), but some differences would not be (such as Alternative D compared with Alternative K with 754,000 acres). This difference does not indicate that populations would increase or decrease since population numbers also are dependent on other factors, such as harvest (hunting), predation, available high quality winter range off the forest, and habitat improvements on the forest. Harvest is managed by the Colorado Department of Wildlife, which generally maintains a certain buck to doe ratio regardless of population levels unless populations become too low. Winter range off the forest is decreasing and likely to continue to decrease (increasing the value of winter range on the forest). Habitat improvements for mule deer habitat probably will be implemented on the forest in the next ten years, but the actual acres are unknown. If all the acres that are planned for terrestrial wildlife habitat restoration or enhancement under Alternative D (the highest at 35,000 acres, **Table 15**, FEIS Volume 1, Chapter 2—*The Alternatives*) were implemented specifically for mule deer, less than one percent of the forest would be improved for mule deer. Considering all the actions that may occur on and off the forest, there likely will be no difference between alternatives on mule deer population numbers.

Table 39
Acres of MA 5.4, MA 5.41 and MA 5.43 by alternative on the White River National Forest

	ALTERNATIVE						
	B	C	D	E	F	I	K
Acres of MAs 5.4/5.41/5.43	301,000	464,000	840,000	245,000	287,000	217,000	754,000

Affected environment – bighorn sheep

Over a period of 100 years (1859-1959) five major declines of bighorn sheep populations occurred in Colorado. The first and second declines occurred around 1859 and 1885, respectively. The declines were attributed to several factors: scabies infestation, market hunting, and a reduction in winter habitat. Bighorn sheep numbers declined so much in 1885 that the 1887 hunting season was closed. The remaining three high and low peaks in bighorn sheep numbers indicate a trend of rising and falling sheep numbers about every 30 years. Some of the later sheep declines are thought to be from disease transmitted from domestic sheep, since interactions between domestic sheep and bighorn sheep have historically been detrimental to bighorn sheep due to this factor. A decreasing trend in bighorn sheep numbers has occurred since 1915, when over 7,000 sheep were reported in the state, to a low of 2,000 sheep in 1982. Today bighorn sheep numbers are thought to have increased to around 6,000 statewide.

On the forest, the current population of bighorn sheep is thought to be around 720 animals. Historically, herds were widespread on the forest, but today they exist as remnants persisting as isolated bands in portions of their pre-settlement range. Recently (April 1999), the Colorado Division of Wildlife released 15 bighorn sheep into the Homestake Peak area (in Holy Cross Wilderness). This was implemented to begin the process of reestablishing a viable bighorn sheep herd on a portion of their historic range, where records of bighorn sheep have been limited since the early 1960s. The Colorado Division of Wildlife has identified 12 bighorn sheep herds on the forest. Four of these herds—Avalanche Creek, Snowmass/Maroon Creek, Gore Range, and Battlement Mesa—occupy areas that have been identified as the highest-priority areas for maintaining viable populations of bighorn sheep on the forest. The remaining eight bighorn sheep herds are considered to be of medium to low priority because they are transplanted (not endemic), smaller in size, and relatively hard to protect and perpetuate because of threats from habitat loss and disease. Three of the high priority herds (excluding the Battlement Mesa herd) are within or adjacent to wilderness.

The Colorado Division of Wildlife, White River National Forest and local range permittees have agreed to manage for the continued existence of bighorn sheep populations within the four high priority areas on the forest. This cooperative effort addresses the spatial separation needed to reduce potential interaction between domestic and wild sheep populations. This agreement is not part of this decision, but will be addressed specifically by allotment through the Allotment Management Plan and/or the Annual Operating Plan.

Environmental consequences – bighorn sheep

Acreage allocations to MA 5.42 (bighorn sheep habitat) varies by alternative (**Table 14**, FEIS Volume 1, Chapter 2—*The Alternatives*). Some of the land areas are assigned to multiple (overlapping) allocations, in which case they will be managed to the standards and guidelines that are the most restrictive. Alternative K has the most acres allocated to MA 5.42, with most of these acres overlapping with wilderness allocations. All alternatives that have allocations for the three high priority areas adjacent to wilderness (Avalanche Creek, Snowmass/Maroon Creek, and Gore Range) would provide similar management for these three herds regardless of whether the wilderness allocations

included MA 5.42, except with respect to the presence of domestic sheep. Alternatives C, D, E, F, and I provide some protection/management for the four priority herds identified by the Colorado Division of Wildlife, either through designation of MA 5.42 or other restrictive MAs. For example, the Battlement Mesa herd is included in MA 2.2 in Alternatives C and D, and wilderness for the other three herds. In Alternative B the Battlement Mesa bighorn sheep herd is also protected under the 5.42 MA (but assigns no MA 5.42 allocation for the other three herds).

Including MA 5.42 and other protective MAs (such as wilderness), Alternatives B, C, D, I, and K provide protection for the four high priority herds, and have the highest likelihood of maintaining the numbers and health of these herds by protective measures, and, in some areas, by pro-active management. Alternatives E and F provide less protection of the Battlement Mesa herd (no MA 5.42 or other restrictive MAs), which decreases the likelihood of maintaining the herd as compared with the other alternatives. The majority of the other herds (low to moderate priority) are also within or adjacent to wilderness or in areas that are fairly inaccessible to human activity. Some alternatives have allocated MA 5.42 for other sheep habitat areas (Alternative D, six areas; Alternatives C, E, and K, one area; Alternative F, two areas; and Alternative I, five areas). Emphasis on protective management of the lower priority herds may result in a higher likelihood of maintaining these herds.

Alternative K provides the most protection for bighorn sheep from disease from domestic sheep for the Gore herd. Most of area identified for this herd is in wilderness. Alternative K has almost all of the range of this herd that is in wilderness allocated to MA 5.42. MA 5.42 requires that domestic sheep grazing be prohibited unless adequate temporal or spatial separation can be demonstrated. This separation can be accomplished outside of MA 5.42, but it is less likely to occur. Based on this, implementing Alternative K will result in fewer conflicts with domestic sheep grazing, reducing the likelihood of disease transmission from domestic sheep to bighorn sheep. Implementing Alternative K is more likely to maintain the Gore herd as compared with the other alternatives.

The vacant allotment analysis identifies 14 vacant allotments that are adjacent to or near the four priority bighorn sheep MAs. Alternatives vary by vacant allotments that will be closed, partially closed, or retained for future analysis. Livestock would not necessarily be stocked on a vacant allotment that is retained, but would require an allotment analysis for that specific allotment, which may result in stocking or closing the allotment. Allotments that are closed under this decision would not be stocked. The following is a list of the bighorn sheep areas, vacant allotments within or adjacent to the areas, and retention or closure by alternative.

- Battlement Mesa herd area – Horsethief Allotment. All alternatives, except Alternative B, would close this allotment.
- Avalanche Creek herd area – Upper Crystal Allotment. Alternatives B, C, F, and K would retain this allotment. Alternatives D, E, and I would close or partially close this allotment.

- Snowmass/Maroon Creek herd area – Brush/East Snowmass and Conundrum Allotments. Alternative B would retain these allotments. Alternatives C, D, E, I, and K would close both of these allotments. Alternative F would retain the Brush/East Snowmass Allotment, but close the Conundrum Allotment.
- Gore Range herd area – Buffalo Creek, Copper Mountain, Corral, Officer's Gulch, Searl, Black Creek, Boulder Creek, Maryland Creek, MC, and Willow Creek Allotments. Alternative B would retain all of these allotments. Alternatives C, D, E, and K would close all of these allotments. Alternative F would retain three of these allotments, and Alternative I would retain one of these allotments.

With respect to the alternatives, the more vacant allotments closed the less likely there would be conflicts with domestic sheep grazing, and thus less likelihood of disease transmission from domestic sheep to bighorn sheep. Actual impacts to each of the high priority herds would be dependent on future allotment-specific decisions under the 2002 Forest Plan. If any of the retained vacant allotments are stocked with sheep in the future, then the chance of disease transmitted to an individual herd will increase.

Affected environment – American peregrine falcon

The peregrine falcon is known to have worldwide distribution with representation on all major continents. This species was almost extinct in North America in the mid-1960s and was listed as endangered in 1970 (Endangered Species Conservation Act of 1969). Since that date, peregrine falcon populations have recovered to prelisting levels in many parts of North America. Controls and bans on the use of DDT-DDE, and conservation efforts through reintroduction (hack sites), have bolstered the population of peregrine falcons in many parts of the country. The species was delisted in 2000. U.S. Fish and Wildlife Service will be monitoring the species for the next five years to determine whether it will be relisted or not.

Peregrine falcons nest on high precipitous cliffs and river gorges, and forage over adjacent coniferous and riparian forests, and at times in other habitats. Peregrine nest sites can be found from 3,500 feet up to 11,500 feet. Migrants and winter residents mostly occur around reservoirs, rivers, and marshes, but have also been observed in grasslands and agricultural areas. The peregrine falcon prefers to nest in a shallow depression scraped in gravel or debris on high cliff ledges. It will also use old stick nests from ravens and hawks. Falcons need inaccessible high places for carrying on intricate courtship behavior and nesting activities. In Colorado, peregrine falcons are thought to be moderately widespread, occupying territories in 50 percent of the state. On the White River National Forest peregrine falcons have been observed on the Rifle, Sopris, Holy Cross, and Eagle ranger districts, and several nest sites are on adjacent private lands. Historic information suggests peregrines occurred on the forest, possibly nesting on some of the high precipitous cliffs and river canyons located on the forest. Recent survey information suggests that peregrine falcons nested on the forest in 2000.

Environmental consequences – American peregrine falcon

The main risk factor to peregrine falcons on the forest is disturbance during the reproductive period, mainly through recreational rock climbing. Another risk factor is a decrease in foraging habitat quality or quantity from management actions such as livestock grazing. Plan standards and guidelines direct management for the peregrine falcon on the forest, including the following:

- Restrict human activities and disturbances between March 15 and July 31 for nest sites, and July 1 through September 15 for hack sites.
- Discourage land use practices and development that adversely alter or eliminate the character of the hunting habitat or prey base within (10) miles and the immediate habitats within (1) mile of the nesting cliff.

Other standards and guidelines, such as direction for livestock management in riparian areas, will maintain or improve prey habitat for the peregrine falcon. These standards and guidelines apply to all alternatives. Approximately 3,000 acres of potential peregrine falcon cliff nesting habitats exist on the forest with more than 96 percent of the acreage in MA allocations that provide protection (only 4 percent of the nesting habitat occurs in MA allocations where high human use has the potential of affecting this species during the breeding season). Some disturbance to undocumented pairs may occur, but, because of the plan direction for known nesting pairs, there is a high likelihood that nesting pairs will persist on the forest and successfully reproduce under all alternatives. Though there may be site-specific impacts, the proposed actions of all alternatives will result in the peregrine falcon maintaining its existence and reproductive success on the forest.

WILDLIFE HABITAT: *INTERIOR FORESTS, CONNECTIVITY, AND ELK HABITAT MANAGEMENT*

INTRODUCTION

Habitat composition and configuration, along with human disturbances, affect wildlife species across the forest. Determining how two of the major impacts, vegetation management and travel management, will affect wildlife populations is the primary analysis used to compare alternatives. The key functions that are quantified and compared among alternatives within the analysis area (fourth-level watersheds) are interior forests, connectivity, and elk habitat management (habitat effectiveness, disturbance, and displacement).

INTERIOR FORESTS

The amount of edge or degree of edge contrast at the patch, class, and landscape levels are particularly important to wildlife-edge relationships (Morgan and Gates 1982, Strelke and Dickson 1980, Thomas et al. 1978, Thomas et al. 1979, and McGarigal and Marks 1995). Recent studies suggest that changes in vegetation have resulted in the population decline of several vertebrate species dependent upon forest interior stand conditions (Brittingham and Temple 1983, Kroodsma 1982, Robbins et al. 1989, Strelke and Dickson 1980, Yahner and Scott 1988, and McGarigal and Marks 1995). McGarigal and

Marks (1995) feel that interior species may be more sensitive to patch shape because the more complex the shape the larger the edge-to-patch ratio. Many of the effects of forest fragmentation on organisms are directly or indirectly related to edge effects. The effect of edge or isolation of habitat patches have been documented with red-back voles (Mills 1995), epiphytic lichens (Esseen and Renhorn 1998), small mammals of boreal mixed-wood forests (Bayne and Hobson 1998), and nest predation on ground or forest nesting passerines (King et al. 1998, Keyser et al. 1998). Terborgh (1988) inspired the “intermediate predator hypothesis” that finds small predators such as raccoons, squirrels, blue jays, crows, domestic dogs, and cats thriving well in patch-quilt habitats of second growth and fragmented eastern forests. Wolves, mountain lions, and raptors suppressed these predators when the eastern forests were less dissected and contained large tracts of continuous forests (Simberloff 1994).

Other authors (Saunders et al. 1991) have described edge effects in terms of meteorological conditions, where wind currents can be detected at a distance 100 times the height of the vegetation. Some investigators (Tinker et al. 1998, Reed et al. 1996) looked at the effect of roads on fragmentation, hence edge and patch size. Tinker et al. (1998) investigated the effects of forest fragmentation and clearcuts in national forests in Wyoming, while Kuitunen et al. (1998) looked at the influence of highways on bird density. Tinker et al. (1998) found in lodgepole pine forests on the Big Horn National Forest that clearcuts and roads simplified patch shapes at the landscape scale. They also found that lodgepole pine patches were more complex, with patch core area and mean patch size decreasing, and edge and patch density increasing, as a result of clearcuts and roads.

Species that are considered late-successional habitat specialists, such as the marten, can be dramatically affected by reductions in forest patch size. Species such as elk and coyote, which are considered habitat generalists, have the ability to easily adapt to these changed landscapes more effectively than a habitat specialist. Increased forest perforation, or reducing patch size and increasing edge, influences the success of many migratory birds that breed on NFS lands (Yahner and Scott 1988).

Affected environment – interior forests

The different vegetation types and structural stages influence the amount of edge habitat. A total of 304,547 acres of coniferous and deciduous interior forest habitat conditions exist on the forest. This represents 13 percent of all acres on the forest, and 27 percent of the acres covered in spruce-fir, Douglas fir, lodgepole pine, and aspen forest types.

The Upper and Lower Yampa River and Piceance-Yellow Creek watersheds (**Table 40**) represent less than 0.5 percent of the White River National Forest. None of the interior habitat contained within these watersheds are located within wilderness. These watersheds are typically at low elevations; hence they are dominated by deciduous interior habitat.

Table 40
Coniferous and deciduous forest interior habitat by watershed on the White River National Forest

Watershed	Interior habitat type	Outside Wilderness	Inside Wilderness	Total acres
Colorado River Headwaters	D	1,720	14	1,734
	C	7,312	12,207	19,519
Total		9,032	12,221	21,253
Blue River	D	199	32	231
	C	7,263	11,569	18,832
Total		7,462	11,601	19,063
Eagle River	D	861	49	910
	C	22,955	10,938	33,893
Total		23,816	10,987	34,803
Roaring Fork River	D	4,870	99	4,969
	C	29,410	34,191	63,601
Total		34,280	34,290	68,570
Colorado River Headwaters-Plateau	D	12,493	0	12,493
	C	16,398	0	16,398
Total		28,891	0	28,891
Upper Yampa River	D	184	0	184
	C	12	0	12
Total		196	0	196
Lower Yampa River	D	910	0	910
	C	736	0	736
Total		1,646	0	1,646
Upper White River	D	11,608	75	11,683
	C	16,194	42,247	58,441
Total		27,802	42,322	70,124
Piceance-Yellow Creek	D	0	0	0
	C	1	0	1
Total		1	0	1

Key: C = coniferous interior forest; D = deciduous (aspen) interior forest

The Eagle River, Roaring Fork River, and Upper White River watersheds contain 55 percent of the interior forest habitat on the White River National Forest. Of this interior forest habitat, 79 percent is contained within the Roaring Fork and Upper White River watersheds. Watersheds that are dominated by coniferous interior habitat are the Eagle River (16 percent), Roaring Fork River (30 percent) and Upper White River (28 percent).

In general, coniferous interior forest habitat conditions are well-distributed throughout all areas of the forest, except in the high mountain areas, where tundra, rock, and barren habitat conditions exist. In the Lower Yampa River, Upper White River, and northern portion of the Colorado River Headwaters-Plateau watersheds, deciduous (aspen) interior forest stands dominate the landscape. One notable exception occurs within the Colorado River Headwaters-Plateau watershed, south of the I-70 corridor, where a narrow elongated piece of the forest, the most western tip of the landscape, contains some contiguous blocks of coniferous interior forest. Following these contiguous blocks of coniferous interior habitat is a gap, then a fairly large contiguous block of deciduous (aspen) interior forest. Of all watersheds analyzed, the Roaring Fork River watershed has the poorest distribution of interior habitat on the forest, especially on the western half of the watershed. In this watershed, coniferous interior habitats dominate the eastern side of the watershed. Large areas within the center of this watershed are devoid of any interior habitat patches (coniferous or deciduous). The effects of the steep dissected mountains and land type associations strongly influence the composition and distribution of vegetation species, with rock and tundra dominating the landscape.

Patch Size Analysis. Analysis of patch size was completed with and without roads, railroads, and utility corridors. This was done to estimate the existing condition for patch sizes before and after travel and utility corridors were developed on the forest.

Forest patch size before roads, railroads, and utility corridors were developed.

Before roads were built, late-successional forest habitat patches of Douglas fir ranged from five to 49 acres (average mean patch size of 26 acres), spruce-fir from 10 to 252 acres (average mean patch size of 100 acres), lodgepole pine from 37 to 111 acres (average mean patch size of 69 acres), and deciduous (aspen) with a 2-94 acre variation in mean patch size (average mean patch size of 57 acres).

Forest patch size after roads, railroads, and utility corridors were developed. The average mean patch size of Douglas fir decreased by 4 acres, a 16 percent decrease, with spruce-fir decreasing by 36 percent to a 64-acre mean patch size, and lodgepole pine decreasing by 32 percent to a 47-acre mean patch size. In the deciduous (aspen) component, average mean patch size decreased by 34 percent to 38 acres.

In spruce-fir forest stands the greatest reduction in mean patch size occurred in the Colorado River Headwater, Eagle River, Roaring Fork River, Upper White River, and Blue River watersheds (**Table 41**). Mean patch size was reduced 46, 44, 40, 36, and 34 percent, respectively. Douglas-fir, though very limited on the Forest, had the greatest decrease in mean patch size within the Upper White River, Eagle River, and Blue River watersheds, with mean patch size decreasing by 24, 22, and 20 percent, respectively. Lodgepole pine forest stands had the greatest reduction in mean patch size within the Lower Yampa River, Upper White River, Roaring Fork River, and Eagle River watersheds. Mean patch sizes were reduced by 39, 38, 37 and 34 percent, respectively. Aspen forest stands had the greatest decrease in mean patch size within the Colorado River Headwater, Upper White River, Colorado River Headwater-Plateau, and Eagle River watersheds. Mean patch size decreased by 44, 41, 39 and 36 percent, respectively. Within the individual watersheds, the greatest decrease in mean patch size occurred in spruce-fir and aspen forest stands, with the exception of the Blue River and Roaring Fork River watersheds where lodgepole pine forest stands were also affected. In the Lower Yampa River watershed, only spruce-fir and lodgepole pine patch sizes were affected.

In general, the location and density of roads has had more impact on interior forests and patch sizes than timber harvest units and has had the greatest influence at the landscape scale. Roads that are evenly distributed across the watershed influence landscape patterns more than roads that are densely clustered together in specific areas.

Table 41
Changes in mean patch size from roads, railroads, and utility corridors

Watershed	Species	Before mean patch size (acres)	After mean patch size (acres)	percent patch size reduction
Colorado River Headwaters	DF	32	27	16
	SF	128	69	46
	ASP	54	30	44
	LP	49	40	18
Blue River	DF	15	12	20
	SF	64	42	34
	ASP	25	17	32
	LP	49	37	24
Eagle River	DF	25	22	22
	SF	101	57	44
	ASP	42	27	36
	LP	69	47	32
Roaring Fork River	DF	47	42	11
	SF	141	84	40
	ASP	79	52	34
	LP	82	52	37
Colorado River Headwaters-Plateau	DF	47	40	15
	SF	84	59	30
	ASP	94	57	39
	LP	37	30	19
Upper Yampa River	DF	0	0	0
	SF	22	20	9
	ASP	49	40	12
	LP	0	0	0
Lower Yampa River	DF	5	5	0
	SF	99	72	27
	ASP	79	64	19
	LP	86	52	39
Upper White River	DF	49	37	24
	SF	252	161	36
	ASP	91	54	41
	LP	111	69	38
Piceance-Yellow Creek	DF	0	0	0
	SF	10	10	0
	ASP	2	2	0
	LP	0	0	0

Environmental consequences – interior forests

All of the alternatives propose some level of actions that may impact interior forests and patch size. The main actions considered are timber management and road construction and reconstruction. Other actions may impact interior forests and patch size, such as utility corridors, ski areas, and developed recreation sites, but these impacts would be insignificant on patch size forest-wide (though they may have large impacts at the site-specific level).

Alternative F proposes the most acres of harvest at experienced budget levels in the first decade (19,000), which will have the greatest influence on patch size, followed by Alternatives B (12,000), K (10,000), D (9,000), and C, E and I (5,000). Overall, lodgepole pine and spruce-fir late-successional stand conditions will have the most timber harvest and greatest potential to reduce forest patch size (**Table 139**, FEIS Volume 1, Chapter 3, Topic 6—*Timber Management*).

Timber management activities probably will result in the highest likelihood of road construction and reconstruction since roads are necessary for harvest and other activities. Since Alternative F proposes the most timber harvest activities and targets mostly late-successional lodgepole pine and spruce-fir, along with some aspen forest stands in the first decade, this alternative may have more road construction and reconstruction than other alternatives. Overall patch size may decrease more under this alternative than any other. The possible effects on patch size from roads follow the levels of timber harvest (under the experienced budget level) with B, D, and K having the next highest possible impact on patch size. Although Alternatives E, I, and C may have an effect on patch size, the effect would likely be much less than Alternatives B, D, F, or K, because fewer acres occur in MAs that allow for timber harvest. Timber management activities will only be allowed in Alternative C and emphasized in Alternative K in areas that have previously been developed with harvest units and roads; therefore, these alternatives will likely have less impact on interior forests and patch sizes (the themes of all other alternatives do not have this restriction or emphasis, so they have more potential of implementing harvest and road construction in contiguous blocks of habitat in some areas than Alternatives C and K). Since less than three percent of the forested acres would be entered under any alternative, and not all those acres would be interior habitat, the impacts on the habitat of species requiring interior habitats would be minimal forest-wide. While there may be site-specific measurable changes, there would be no measurable differences between alternatives on populations of interior forest species.

Specific miles proposed for road construction are not part of this analysis (this will be addressed in the ongoing Travel Management Plan revision process). However, land areas will be allocated to summer motorized travel prescriptions based on MA allocations and ROS classes by alternative. The percent of the forest that allows summer motorized use ranges from 51 percent (Alternative F) to 27 percent (Alternative I). The likely relationship is that the more areas allocated for summer motorized use, the higher the road density in those areas. This does not necessarily mean that additional roads will be constructed in an area, but increases the likelihood of road construction. While there may be site-specific differences between alternatives from road development, the number of new roads developed would have little impact on interior habitat, so that none of the alternatives would likely measurably impact populations of interior forest species.

Affected environment – connectivity

Landscape habitat connectivity and habitat corridors are emerging issues in which little agreement has been reached among scientists about the effects from losing connectivity, quality of habitats needed, or size and width required. Habitats vary significantly across the nation, with most Pacific Northwest forests having large expanses of habitat that are generally well-connected and affected mostly by timber harvest. Many of these forest disturbances occur on fertile soils, so that the immediate impact is transient as stands revegetate, and then the cycle is reset to repeat itself.

In the southern Rocky Mountains, and more specifically, the central-southern Rocky Mountains, soil conditions, climate, and vegetation communities are quite different from northwest forests. Soils are not as fertile, habitats are patchy, naturally or human-made, and elevations are 2,000 to 4,000 feet higher, affecting growth, size, and diameter of forest species. Alpine tundra and rock occur at the highest elevations, so many of the forested ridges in northwest forests are not available as corridors in the central-southern Rocky Mountains. Valley bottoms occur at much higher elevations and are generally dominated by shrub communities, unlike the northwest forests, which are generally covered with a conifer component (see the landscape connectivity map in the map packet). Instead of the large expanses of vegetation that are well-connected on the landscape, the central-southern Rocky Mountains exhibit a pattern of vegetation that is naturally patchy.

Landscape connectivity provides the lifeline for many species moving or dispersing across the landscape that require forest or other vegetation cover to escape from potential predators. In a sense, landscape connectivity is considered important for maintaining the viability of species dependent on habitat connections.

Habitat patches can provide important connective links across the landscape. Many wildlife species such as marten, lynx, red squirrel, and southern red-backed voles rely on connected habitat patches for forage, shelter, nesting, dispersal, or travelways. The quality of habitat is strongly influenced by configuration and/or structural arrangement of the habitat. For certain species, human intrusion may reduce the usefulness of otherwise available habitat, especially during times of concentration, reproduction, and rearing of young. The distribution and connectivity of open areas across the landscape is an important feature for species such as bighorn sheep.

The habitat portion of the connectivity analysis indicates that narrow bands of coniferous forest connect the Gore Range (north of I-70) with the Tenmile Range (south of I-70), and the Gore Range with the Shrine Pass area (southwest of I-70), which indirectly links to the Sawatch Range (west-southwest of State Highway 24). Major highway systems such as the I-70 corridor strongly influence connectivity. As these highway systems are upgraded they increase the potential to further impede animal movement.

Forested and non-forested areas occupy 58 percent and 42 percent of the White River National Forest landscape, respectively. **Table 42** portrays the variation in forested and non-forested areas within the individual analysis areas.

Table 42
Forest and non-forest conditions by analysis area on the White River National Forest

Analysis area	Watershed HUC #	PATCH TYPE	
		% Forested	% Non- forested
<i>Colorado River Headwaters</i>	14010001	54	46
<i>Blue River</i>	14010002	56	44
<i>Eagle River</i>	14010003	65	35
<i>Roaring Fork River</i>	14010004	52	46
<i>Colorado Rivers Headwater - Plateau</i>	14010005	55	45
<i>Upper Yampa River</i>	14050001	63	37
<i>Lower Yampa River</i>	14050002	54	46
<i>Upper White River</i>	14050005	67	33
<i>Piceance-Yellow Creeks</i>	14050006	58	42
<i>Analysis area total (average)</i>		58	42

Connective habitat on the White River National Forest portrays a skewed distribution of floral species across the forest. Deciduous (aspen) forest components contributing to forest connectivity are most prominent in the southwest and northwest portions of the forest, with the conifer components contributing to more pronounced connectivity on the eastern edge of the Maroon Bells-Snowmass Wilderness (Roaring Fork River watershed). This band of coniferous forest runs northeast to the forest boundary, just north of the Eagles Nest Wilderness (Colorado River Headwaters watershed).

Shrub components contributing to connectivity are scattered throughout the forest and are more pronounced on the lower-elevation sites of the forest, or valley basins. However, there are three areas on the landscape where shrubs comprise a large share of the forest. The first two areas occur in the southern and eastern portions of the White River Plateau (Colorado River Headwater and Colorado River Headwater-Plateau watersheds) and the northern portion of the Battlement Mesa (Colorado River Headwater-Plateau watershed). The last area where shrubs dominate is the headwater area of the Roaring Fork River watershed, especially along the southern periphery of the forest boundary.

Other places in which open forest conditions exist are lands that are barren, or lands that have forest roads, railroads, and utility corridors, or where development or private land exist. Private lands are those occurring within and outside of the forest boundary. Both types of private land influence the dispersal or movement of animals across the landscape. This is clearly evident along major, federal, state, and county roads where high mortality occurs as the surrounding landscape and infrastructures develop.

Environmental effects – connectivity

Recreation sites. Forest infrastructure, such as developed recreation complexes (MA 8.21), ski areas (MA 8.25), and aerial transportation corridors (MA 8.31), contribute to the natural and human-caused vegetation conditions across the landscape that influences habitat connectivity. The effects can be habitat loss or alteration or can be more subtle, where forest and non-forested habitats are unused because of human disturbance. In landscapes where habitat occurs in large contiguous blocks, the human disturbance factor probably plays a subordinate role in affecting animal movement and migration. However, on landscapes in which forest cover is restricted to narrow elevation bands along the mountain slopes, such as those forest conditions on the White River National Forest, the location and use of these facilities can play a role in changing or impeding the movement or migration of animals.

Allocated acres for these facilities vary by alternative (**Table 14**, FEIS Volume 1, Chapter 2—*The Alternatives*). Although not every acre will be developed, the amount of human use occurring on these land allocations may affect how some animals migrate or disperse.

Historically, not all these uses occurred within the same season. Generally, uses associated with developed recreation facilities occur during the late spring, summer, and fall months; whereas others, such as ski areas, only had significant use patterns during the winter season. However, this is changing on the White River National Forest. The ski area land allocation no longer has uses projected for just the winter months. Instead, the objectives of this MA are to have facilities in place to serve recreational uses through all four seasons.

Singly, one could surmise that Alternative B might have the greatest influence on connectivity because it allocates the most land for ski areas. This is the only alternative in which five proposed ski areas (Adams Rib, Rifle, Coal Basin, and two in Summit County) are present. Thus any increase in the 8.25 MA in the other alternatives occurs within or near existing ski areas. One could also argue that Alternative E provides the most land for developed recreational facilities and, based on projected recreational use patterns, could play a role in changing how animals move or migrate. Neither conclusion would be inaccurate, but they do not truly portray all of the effects that might occur from these proposed land allocations. Collectively, the location of these land allocations plays a role in changing how animals migrate and disperse across what were once habitats with low levels of human disturbance. This does not imply that vegetation structure and composition is static and that under normal successional pathways, created by disturbance events, issues related to habitat connectivity did not exist. The difference is that vegetation conditions in the past were transient, always changing over time. With the advent of forest planning and the need to allocate land for mandated and public uses, the conditions imposed on the landscape are more long-term and permanent for certain allocations such as ski areas or utility corridors. Therefore, the effects on habitat connectivity do not ‘move around’ on the landscape as disturbance events happen. Instead, the landscape is being permanently imprinted, resulting in a reduction in the amount of area available for animals to easily move or disperse.

In looking collectively at these three proposed land allocations, the condition described above changes by alternative. Alternatives B, E, and F, or portions thereof, provide conditions most likely to impede dispersal or movement of animals across certain portions of the landscape. Alternatives C, D, I, and K maintain conditions more conducive to animal movement.

Designated utility corridors. Utility corridors typically create long linear landscapes of early seral conditions, if forested vegetation is involved. However, depending on the visual sensitivity of an area, these corridors may have forest vegetation in a natural or near-natural state, except for areas where transmission line towers are present. Maintenance of power lines and towers may require the need for an access road. In these cases, the potential for expanding uses (recreational) beyond the intended purpose increases. Use of these access roads can be managed by the forest to restrict or eliminate all public access, except for administrative purposes.

Transportation systems (forest roads). The location and use of roads impacts the use of landscapes for connectivity by wildlife (see discussion in General Wildlife). Overall, the highest road densities within the forest boundary are generally associated with private land. In these areas, whether or not they are developed, the highest road densities proliferate onto adjacent forest lands, and then diminish as they get further away from the source. Some localized areas on federal lands have higher road densities (greater than 2 miles/square mile), and are generally associated with developed recreation, ski areas, or areas in which there is repeated entry for commodity extraction (timber harvest). Many areas on the forest are easily accessed from paved county, state, and federal highway systems. This easy access makes some of the road connector points more prone to higher road densities.

Landscape linkages. Certain areas have been identified for wildlife movement, migration and dispersal. These areas include Corridors Connecting Core Areas (MA 3.55) and Forested Landscape Linkages (MA 5.5) Both of these MAs were designed to facilitate movement between core areas, forested landscapes and large areas of refuge. Acres vary by alternative (combined MAs), ranging from 5,000 acres in Alternative B to 86,000 acres in Alternative I. Generally, the more acres in these MAs, the more likely movement of wildlife across the forest will occur.

CONCERN AREAS

Four *concern areas* arise from the connectivity analysis that possibly influences how animals use certain portions of the landscape. Some of these areas are key forested connections possibly linking species to the south and north of the forest. Many localized movement patterns are also affected by some of the proposed MAs within the different alternatives. Due to the complexity of issues associated with these four areas it is impossible to separate impacts to specific resource areas.

Concern Area A. The first area (A) is located near Burnt Mountain (Eagle Mountain to Sterner Gulch) where Alternatives B, C and E propose expansion of MA 8.25 between the Snowmass and Buttermilk ski areas (see the connectivity habitat map). The Snowmass EIS (USDA Forest Service 1993c) noted that all alternatives would have some effect on elk calving; summer, transition, and winter range; and migration corridors. All indications suggest that as private lands are developed, habitats on National Forest

System lands will become increasingly critical for elk calving (USDA Forest Service 1993c). Conditions have not changed much from the 1993 assessment except that private lands to the east and south continue to develop. Alternatives B, C, and E have the greatest impact to concern area A, with alternatives D, F, I and K proposing lesser amounts.

Concern Area B. The second concern area, B, occurs between Avon and Frisco, along the I-70 corridor. Alternatives B, C, E, F, and K propose expansion of the 8.25 management prescription in this concern area (**Table 96**, FEIS Volume 1, Chapter 3, Topic 3, Part 2—*Ski Areas*), and Alternatives C, E, and F propose a new land management prescription, 8.31, for aerial transportation corridors (**Table 101**, FEIS Volume 1, Chapter 3, Topic 3, Part 3—*Aerial transportation corridors*). This new prescription accommodates proposals to link Beaver Creek Ski Area to Avon and to Minturn, Vail Ski Area to the Bolts Lake area (along State Highway 24) and to the Vail Pass rest area, and Breckenridge Ski Area to Copper Mountain Ski Area and the town of Frisco (depending on alternative). In all, ski area expansion and aerial transportation corridors will influence vegetation conditions between Avon and Frisco, and hence animal movement. Several species have been discussed in past ski area expansions and some of the proposed alternatives may directly influence the permeability of the landscape for wolverine, lynx, elk, and deer. Alternatives B, C, E, and F may have the highest impact to concern area (B) while Alternatives D, I, and K are likely to have fewer impacts.

Concern Area C. The third concern area, C, is located between the Keystone and Arapahoe Basin ski areas. This area abuts the Arapaho-Roosevelt National Forest near the “land bridge” from Loveland Pass to Geneva Peak. Several issues arise in this area, including the continued expansion of commercial and residential properties within the town of Keystone along with a continual increase in ski area development along the upper portion of the North Fork of the Snake River drainage. All three conditions continue to erode a narrow forested band of conifers along this area. East of the North Fork of the Snake River drainage (on the Arapaho-Roosevelt National Forest), very little forested habitat exists. The Arapaho-Roosevelt National Forest classified this area along the Continental Divide, between Loveland and Evergreen, as an open cover corridor (USDA Forest Service 1997b). This same area also includes the land bridge, which crosses over the Eisenhower Memorial Tunnel, and this is the only such land area crossing the I-70 corridor from Denver to Grand Junction. In addition, the Arapaho-Roosevelt National Forest recently approved an upgraded lift system to the top of the land bridge on the eastern side of the Continental Divide. Even though the elevation of the land bridge is well above treeline, the upgrade of this lift system had required mitigation measures imposed to reduce the amount of human activity, thereby potentially reducing the disturbance from this activity and resulting, possibly, in animals using this area to migrate. Alternatives D, I, and K propose the least amount of area in MA 8.25 and no acres of MA 8.31 management prescriptions in this area, providing a better solution to landscape connectivity along this highly fragmented and developed forested connection. This is followed by Alternatives B and C, with Alternatives E and F proposing activities within the forested corridor with an expanded MA 8.25 and MA 8.31.

Concern Area D. The final concern area, D, is located on the southeast corner of the White River Plateau and is dissected by the Glenwood Canyon complex, I-70 corridor, Colorado River, railroad, and utility corridors. Geological features in the canyon are very

broken and dissected, and it is only apparent on the rim edges of the plateau that dense forests begin to dominate the landscape. Very few safe animal crossings exist within this area. The update of the highway system in the early 1990s did not account for movement of animals in and across the canyon. Other than in Alternative B, the MA described for the canyon is in MA 4.4. In Alternative B, the existing land allocation is covered by MA 1.31. The proposed management prescriptions will not change the current state of this landscape in any of the alternatives. Only a retrofit of the I-70 highway system could help rectify the current condition.

Effects on concern areas from utility corridors

The utility corridor MA prescription varies little by alternative across the forest, except for Alternative B (**Table 82**, FEIS Volume 1, Chapter 3, Topic 2, Part 3—*Special use authorizations*). Three utility corridors are located in concern area B, which may impact landscape connectivity within this concern area when access (other than administrative use) or early vegetation conditions are promoted and maintained. These impacts are minimized since two of the corridors are along Interstate 70.

No utility corridor land allocation exists in concern areas A, C, or D. However, there is an underground utility access in concern area D that when put in would be required to be consistent with the goals of MA 1.31 and MA 4.4. Since identification of utility corridors will result in fewer separate locations of utility lines as compared to no utility corridors, Alternative B may have more impact on wildlife connectivity than the other alternatives in the concern areas.

Effects on concern areas from landscape linkages

MA 3.55 and 5.5 that are located in the concern areas will likely help facilitate wildlife movement through those areas. None of the alternatives have either of these MAs allocated in or adjacent to Concern Areas A or D. These MAs occur in or adjacent to Concern Area B in all alternatives. Acres of these allocations in or adjacent to Concern Area B vary between alternatives (B-5,000; E-7,000; C and F-9,000; I-20,000; D-23,000; K-30,000). Some of the alternatives have acres allocated to these MAs within or adjacent to Concern Area C, which vary by alternative (B, E and I-none; C-2,000; F-4,000; D-18,000; K-19,000). Generally, the more acres within or adjacent to the a concern areas, the more likely wildlife movement will occur in those areas.

Affected environment– Elk habitat management

Overall in Colorado, before 1820, game species are thought to have been quite plentiful. However, market hunting and hide seekers took their toll on the game resources of Colorado between the 1840s and 1900. Elk, whose population was once estimated to be around 20,000 animals on the White River Plateau before 1880, were reduced to a few hundred animals by the early part of the 1900s. Today, current populations are thought to be at or slightly above the levels reported before 1900. Generally, elk are fairly well dispersed throughout the forest depending on habitat quality and season.

Environmental consequences – Elk habitat management

Probably the main issue with elk management is the effective use of habitat on the forest by elk. In order to minimize conflicts with other resource users on the forest and adjacent lands, effective management of elk requires adequate security cover and forage. The amount of winter range under federal ownership is an extremely important factor to consider for maintaining elk populations on the forest during extreme weather conditions. Road density and utilization, vegetation management, and recreation management are some of the major activities that may increase or decrease effective use of habitat by elk. Analyzing the differences in allocations specifically for elk management and the habitat effectiveness index compared elk habitat management.

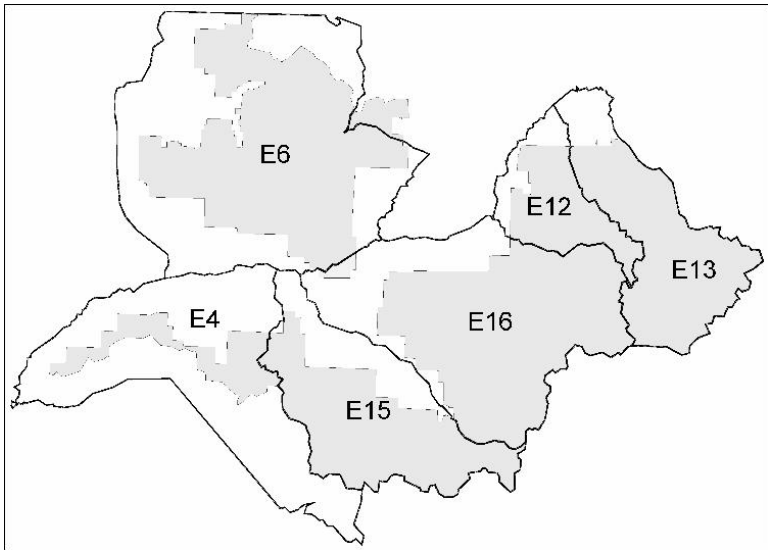
Elk management allocations. Two MAs are designed to specifically manage for elk. MA 5.41 provides direction in managing for deer and elk winter range. MA 5.43 provides direction in managing for elk throughout the year, including during calving and migration, winter and summer. These MAs provide direction on seasonal restrictions and forage and cover habitat maintenance and improvement. Emphasizing management for calving, migration, and winter and summer habitat for elk provides the greatest advantage in dispersing elk throughout the forest, and maintaining elk longer on the forest during the fall hunting seasons and in severe winters. These allocations differ between alternatives (**Table 43**). The likelihood that elk will disperse throughout the landscape varies between alternative by the sum of the acres of MA 5.41 and MA 5.43. For example, Alternatives D and K will provide more opportunity to disperse elk throughout the landscape than the other alternatives. Thus implementation of Alternatives D or K will likely result in fewer conflicts between resource users on and off the forest than will implementation of the other alternatives.

Table 43
Acres dedicated for elk management on the White River National Forest (in acres)

MA	ALTERNATIVE						
	B	C	D	E	F	I	K
5.41	134,000	137,000	202,000	98,000	69,000	180,000	177,000
5.43	16,000	112,000	187,000	83,000	53,000	37,000	212,000
Total	150,000	249,000	389,000	181,000	122,000	217,000	389,000

Elk habitat effectiveness index (HEI). The use of habitat effectiveness indices provides forest managers with a means of comparing management actions across an array of alternatives (Wisdom et al. 1986). The HEI for elk on the forest is estimated to be at 0.45, varying from 0.28 to 0.62 within the individual *Data Analysis Units* (DAUs). DAUs reflect the approximate areas in which most animals are born, grow, and die with as little ingress or egress from other herds as possible. Even though a naturally patchy distribution of habitat conditions exist across the forest, effective habitat for elk can be improved in harvest areas by reducing the road density, thus providing for more usable habitat in the area of the road closures. **Figure 16** shows the location of these DAUs.

Figure 16
Elk data analysis units on the White River National Forest



This model assumes that any of the four habitat variables (cover quality, forage quality, density of roads open to motorized vehicles, and the size and spacing of forage and cover areas) may act as a limiting factor when habitat effectiveness for that variable drops below 0.20 (Wisdom et al. 1986). HEIs that fall below 0.20 need to be viewed as concern areas that are in need of immediate improvement for elk management. **Table 44** displays the range of current habitat effectiveness index scores by DAU on the White River National Forest.

Table 44
Index of current elk habitat effectiveness indices by DAU

DAU	E6 – White River	E12 – Piney River	E13 – Williams Fork River	E14 – Grand Mesa NW & SW	E15 – Avalanche Creek	E16 – Fryingpan River	Average HEI value
<i>Current HEI</i>	0.62	0.47	0.45	0.28	0.49	0.39	0.45

In the White River DAU Unit (E-6), it is highly likely that the HEI for all alternatives will be greater than 0.45 since existing HEI is at 0.62 (planned activities will likely not alter road density or cover values sufficient to reduce the HEI to 0.45). HEI is greater than 0.60, which, along with the size of this DAU, might explain why this DAU is so successful in producing large numbers of elk. Most of the elk winter range identified in this DAU occur on private land, or are in other federal ownership (BLM).

DAU management units Piney River (E-12), Williams Fork (E-13), and Avalanche Creek (E-15) will likely maintain HEI at or above 0.45 since this is the standard for the forest. The DAUs that are below .45 (Fryingpan River DAU (E-16) and Grand Mesa NW & SW DAU (E-14)) are currently below the plan standard, but proposed actions in the future will not result in the HEI in these DAUs decreasing further.

The Grand Mesa NW & SW DAU (E-14) is the third largest DAU on the forest, but a limited number of these acres (16 percent) are National Forest System lands. Elk population estimates rank second only to the White River DAU (E-6). Some possible reasons for such low habitat effectiveness index values are the scattered and diverse vegetation component existing in this area and higher open road densities. These two factors, along with the limited amount of elk security habitat, might explain why the HEI in this DAU is so low. The HEI does not fall below the concern threshold described by Wisdom et al. (1986) as needing immediate attention, but does identify the need for more site-specific investigation and provide a starting point with one area that might warrant some restoration.

Overall, all of the alternatives will likely meet or exceed the average habitat effectiveness index values' Forest-wide standard of 0.45. This will maintain the current habitat effectiveness for elk on the forest in all alternatives. Increase in the HEI for some DAUs is possible after implementation of the Travel Management Plan, and with site-specific project planning and implementation.

POTENTIAL FOR WOLF REINTRODUCTION ON THE WHITE RIVER NATIONAL FOREST

There is great interest and concern in the potential reintroduction of the grey wolf (*Canis lupus*) to Colorado. Special interest groups such as Sinapu have petitioned state legislators to actively seek the reintroduction of wolves into the Greater Southern Rocky Mountain Ecosystem (Edward 1999). However, the livestock industry does not share the same enthusiasm for wolf reintroduction in Colorado. Moreover, reintroduction is beyond the scope of any single forest plan and beyond the authority of the Forest Service to determine. It is appropriate, however, to address how forest plan alternatives may affect the potential for possible reintroduction of wolves.

A feasibility study by the U.S. Fish and Wildlife Service (Bennett 1994) of the biological and human dimensions of wolf reintroduction across 11 national forests and adjacent areas suggested that future wolf recovery in Colorado on federal and private lands would have to be evaluated as one unit. The resulting complex consists of about 38,000 square miles of public land, of which about 9,578 square miles are roadless (Bennett 1994). Sixteen counties in the mountain and plateau regions were identified as historically having the greatest number of wolves. Rio Blanco and Garfield Counties are in that group of 16 (Bennett 1994). Historic wolf observations were greatest in the upper reaches of the

White River Basin. Bennett's 1994 evaluation of the White River Potential Wolf Recovery Area indicated a potential to support between 85 and 170 wolves. The study rated the White River Potential Wolf Recovery Area as good and probably more than acceptable for the reintroduction of wolves. One concern surfaced—the large number of sheep and cattle permitted to graze on NFS lands in this area. Bennett highlighted the need to resolve this issue in any future wolf recovery plan.

Another study that looked specifically at modeling wolf reintroduction in the Flat Tops Wilderness (Kindler 1994) overestimated the elevation at which elk can be found during a normal winter. Kindler indicated an elevational limit of 10,460 feet, which, under normal winter conditions, would be under 10 feet of snow. Snow depths of three feet or greater begin to impede elk movement; that snow depth generally occurs around 9,000 feet during an average winter (Kuyumjian personal communication). For deer, an elevation of around 7,500 feet is more accurate. Kindler's modeling effort also overestimated the amount of deer and elk winter range available on National Forest System lands, neglecting the fact that the majority of big game winter range occurs on BLM and private lands, potentially creating more conflicts. Therefore, the assumption that wolves would exist entirely on public lands without moving onto private lands is inaccurate. Looking at the Flat Tops area of approximately 22 square miles as an individual reintroduction unit is in conflict with Bennett's feasibility study, in which he recommends that the seven contiguous national forests and adjacent lands be considered as one reintroduction unit.

Bennett's 1999 cooperative assessment of the southern Rocky Mountain ecosystem depicts the White River National Forest falling anywhere from 41-70 in the composite score of wolf suitability. Edward's composite model includes winter and summer food availability, road density, land status, and roadless or protected areas as the basis for determining wolf suitability.

The potential for successful wolf reintroduction on the White River National Forest portion of a larger statewide system will not be affected by any of the alternatives proposed within the revision of the forest plan. None of the alternatives will significantly affect deer and elk populations, a primary prey resource for wolves.

Part 3, Section 2

Aquatic resources

Introduction

Abstract

Aquatic habitat on the forest is generally in good condition. Impacts on aquatic systems generally come from roads, mining, grazing, recreational developments including ski areas, and water diversions. Whirling disease has affected recreational fishing in some of the larger systems. Game fish have been stocked on the forest extensively and have been the primary cause of the decline of the native Colorado River cutthroat trout (CRCT). None of the remaining cutthroat populations is considered viable at this time. Twenty-seven areas on the forest could support a viable population of Colorado River cutthroat trout. Management of these areas varies by alternative. Each area would require an aggressive restoration effort to establish a viable population. Impacts on aquatic species from forest activities come primarily from roads and other development, whether for recreation or resource extraction. Specific standards and guidelines have been developed for Colorado River cutthroat trout, western boreal toads, and northern leopard frogs because of the dangerously low population levels of these species and our concern for their viability.

Summary

The White River National Forest has 3,400 miles of perennial streams and 13,900 acres of lakes. These aquatic habitats are home to at least 4 amphibians and 15 species of fish, including 8 gamefish. One, the Colorado River cutthroat trout (CRCT), is in severe decline rangewide. Because water is a limited resource in the region, society places many demands on the aquatic environment. The Forest Service's goal is to balance these human demands with the needs of aquatic resources and the biological communities they support. The revised forest plan provides guidance for managing aquatic resources to provide recreational benefits and to maintain biological integrity.

Key indicators

- Management risk to existing CRCT populations
- Number of watersheds which provide suitable habitat and good potential to establish viable populations of CRCT
- Access and amenities for recreational fishing

Legal and administrative framework

- The **Endangered Species Act** (1973) provides direction to federal agencies to conserve endangered and threatened species.
- The **Wild and Scenic Rivers Act** (1968) provides for preservation of rivers with outstandingly remarkable values in free-flowing condition. These values include fisheries.
- **Executive Order 12962**, Recreational Fisheries, provides direction to federal agencies to provide quality recreational fishing opportunities through habitat restoration, access, and education.

The **Forest Service Manual** and **Forest Service Handbook**, section 2600, provide direction and techniques for managing fishery habitat, cooperating with states and

other federal agencies, conducting habitat inventories, restoring degraded habitat and protecting aquatic resources.

Affected environment

INTRODUCTION

The White River National Forest lies in the headwaters of the Upper Colorado River. It contains 3,400 miles of perennial streams, 4,200 miles of intermittent streams, and 13,900 acres of lakes and reservoirs. Associated with these waters are more than 75,000 acres of riparian communities, which play a key role in maintaining many species found in the central Rocky Mountains.

The forest is situated within nine subbasins (fourth level Hydrologic Unit Codes, or HUCs): the Blue River, Eagle River, Roaring Fork River, Colorado River Headwaters, Colorado River Plateau, Upper White River, Upper Yampa, Lower Yampa, and Piceance-Yellow. The forest manages only small portions of the upper headwaters of these last three, and they contain no fisheries that are significant for recreation or native species viability. They will not be discussed at length here, although a physical description for them and a map reference can be found in the Watersheds section, Topic 1, Part 1, Section 2.

The White River National Forest is home to seven native fish species, including Colorado River cutthroat trout (CRCT) and mountain whitefish, which are game species. The five non-game native species are speckled dace, mottled sculpin, bluehead sucker, roundtail chub, and flannelmouth sucker (these last two may not occur on the forest, but definitely occur immediately downstream). Rainbow, brown, brook, and lake trout and kokanee salmon have been introduced and are established game species. Four species of endangered fish occur in the Colorado River downstream of the White River National Forest: razorback sucker, Colorado pikeminnow, humpback chub, and bonytail. The forest contains a variety of habitats including large rivers, mountain streams, natural lakes, and man-made reservoirs. Some perennial streams and lakes are naturally barren of fish; many of these have been stocked and now support self-sustaining populations.

The Colorado River cutthroat trout is a Forest Service Region 2 sensitive species. The CRCT historically occupied portions of the Colorado River drainage in Colorado, Wyoming, Utah, Arizona, and New Mexico. Although it is now restricted to headwater streams and lakes, its original distribution probably included portions of larger rivers, such as the Green, Yampa, White, Colorado, and San Juan rivers. CRCT now occupies less than one percent of its historical range. Stocking of non-native trout species has been the main factor in the decline of CRCT. Brook trout often outcompete and replace CRCT in streams where both occur. Rainbow trout and other subspecies of cutthroat trout readily hybridize with CRCT and many populations have been lost through this genetic contamination.

*Physical
and biotic*

There are 2,356 miles of roads on the White River National Forest. Each of these roads has the potential to contribute sediment to the stream network. Reducing connected disturbed areas is the best way to reduce sedimentation to the streams. Stream crossings are one type of connected disturbance. There are approximately 5,230 stream crossings on the forest. Road access, specifically at stream crossings, also increases the potential for stocking of non-native trout by anglers, higher fishing pressure, and the spread of whirling disease. There are 537 miles of roads and 240 stream crossings in CRCT watersheds. Average road density is 0.65 miles/square mile.

Fish habitat on the forest is generally in good condition. There are a few streams that cannot support healthy fish populations because of severely degraded water quality from past mining activity, mostly in the Blue River Subbasin. Livestock grazing has degraded some localized areas of streams. Streams within ski areas have been rerouted, armored, and otherwise altered. Water is diverted from streams for snowmaking, domestic uses, and irrigation. Most of the domestic and irrigation diversions occur along the edges of the forest and have little effect on National Forest System lands, although there are also a few very large transbasin diversions. Lakes have excellent water quality and habitat.

Whirling disease is a parasitic infection of fish. It has been discovered in most of the state's hatcheries and is known to occur in the wild. The full extent of the disease in the region has not been determined, but population declines have been documented in some large streams (Colorado River, Roaring Fork River, and Fryingpan River). Rainbow trout populations are in serious decline in many areas on and adjacent to the forest. Brown trout, which exhibit a much lower infection rate, and mountain whitefish, believed to be immune, are becoming more dominant in several popular fisheries.

Stocking of infected fish has been the primary means of spreading the disease, and is now prohibited in most areas on the Western Slope. Although state fish hatcheries now take precautions against stocking infected fish, anglers occasionally carry fish short distances to other sections of a stream or to different streams nearby, and this activity can spread the disease. The parasite can also live on waders, in mud on vehicles, and on other equipment. Stream crossings increase the risk of incidental spread.

Many of the high mountain lakes within the White River National Forest's wilderness areas have been stocked with fish by the CDOW and occasionally private citizens to enhance recreation opportunities. Stocking has been done since the settlement era, often with species that are not indigenous, such as rainbow and brook trout. Introduced non-natives may out-compete native trout in many streams or may hybridize to the extent that only a few genetically pure native populations remain. In addition to the effects on specific species, the introduction of non-native species can disturb predator-prey relationships and alter nutrient cycles.

In order for Colorado River cutthroat trout (CRCT) to sustain healthy populations they must be isolated from other trout species. Generally, isolated populations occur above waterfalls or steep cascades which prevent upstream migration of non-native fish. There are 62 known CRCT populations on the forest; 28 populations are isolated above a secure barrier and 18 are isolated above a barrier that is not secure. Nine of the isolated populations are mixed with other trout species, and there is incomplete information for six populations. Four streams have an insecure population below a secure population.

Numerous lake populations also occur. Many streams and lakes on the forest have not been surveyed for CRCT.

Although there are 28 secure populations, they occupy only 140 kilometers of streams for an average of 5 kilometers per population. Population viability is based on the ability of a population to withstand stochastic events such as fires, major storms, or landslides. Small populations are at higher risk from such events and require more restrictive protection measures such as catch and release. A draft viability model for CRCT has been developed. The viability target for any given population is 10,000 total trout. A population of that size is believed to be adequate to persist for 100 years. It is estimated that 30 kilometers of connected perennial streams are needed to support a population of this size. An average of two such populations in each subbasin (fourth level Hydrologic Unit Code) would satisfy the requirement under the National Forest Management Act (NFMA) for maintaining well-distributed populations. The only population in the region which meets the criteria is in Wyoming. We analyzed the subwatersheds (6th level Hydrologic Unit Code) on the forest to determine which ones contain sufficient habitat to support a viable population.

There are 27 subwatersheds on the forest that have at least 30 kilometers of perennial streams with predominately public ownership and suitable habitat. They are distributed across the six subbasins (fourth level hydrologic units) as shown in **Table 45**. This table displays the total number of subwatersheds in each subbasin, the number of subwatersheds having populations (some have several populations isolated from each other), the number that could support a viable population, and the number of subwatersheds that are large enough to support a viable population and that currently contain cutthroat trout in part of the subwatershed. The number of subwatersheds includes some on private and Bureau of Land Management lands. There are additional subwatersheds on private and Bureau of Land Management within the Colorado River Headwaters and Upper White River subbasins which may have also have potential to support viable populations. They are not analyzed in depth in this report, but it is important to note that not all opportunities lie on National Forest System lands.

Table 45
Cutthroat distribution by subwatershed (6th field HUC)

Subbasin (4 th level HUC)	# of subwatersheds	# with CRCT populations	# with potential for a viable population	# of potential viable subwatersheds currently with CRCT
Blue River	56	9	5	3
Colorado River Headwaters ¹	49	4	6	2
Colorado River Plateau ²	38	6	3	2
Eagle River	75	11	3	2
Roaring Fork River	90	13	5	4
Upper White River	30	7	5	2
Total	347	49	27	15

Notes:

1. Corresponds to the Upper Colorado River Unit (see Watersheds section for description)
2. Corresponds to the Lower Colorado River Unit (see Watersheds section for description)

***Recreational
Fishing***

The White River National Forest includes portions of three state-designated Gold Medal trout fisheries: Gore Creek, the Fryingpan River, and the Blue River. The White River is not designated as Gold Medal but provides superb fishing. All the streams are important to recreational anglers, commercial outfitters, and local businesses. There are nearly 400,000 annual recreational fishing visits to the forest. The Colorado Division of Wildlife has primary responsibility for managing fish populations on the forest. Over the past 20 years they have actively stocked catchable and smaller fish throughout the forest, greatly enhancing recreational fishing opportunities.

The forest provides a wide variety of recreational fishing experiences from lakes that experience a high visitor density to small secluded streams. There is a high angler density on the Fryingpan River and Gore Creek. Because of fragmented public ownership and access, recreational fishing levels on the White and Blue Rivers are lower. The Forest Service, private landowners, and the State of Colorado are working cooperatively to increase public access while maintaining quality fisheries. Accessible fishing piers, boardwalks, trails, parking areas, and informational signs have been constructed to enhance the recreational fishing experience in the region.

Colorado River cutthroat trout are among the easiest trout to catch with standard angling methods. Because many of the remaining CRCT populations are small, fishing pressure can be a factor in population management. The Colorado Division of Wildlife has placed catch-and-release regulations on many of the CRCT populations on the forest. Because most of the CRCT streams are small, they do not support a substantial portion of the recreational fishing on the forest. They do, however, provide unique opportunities to catch native trout.

***Downstream
endangered fish***

Four species of endangered fish occur in the Colorado River downstream of the White River National Forest: razorback sucker, Colorado pikeminnow, humpback chub, and bonytail. These species are warmwater fish and were never believed to be present on the forest. Critical habitat has been designated downstream of the forest in both the White River and the Colorado River. Reasons for the decline include habitat loss due to dam construction and subsequent loss or alteration of natural flows, along with modified physiochemical regimes, channelization, water quality degradation, introduction of non-native species, and other human caused disturbances (U.S. Fish and Wildlife Service 1999). The White River National Forest provides a substantial portion of the water for the critical habitat on the Colorado River known as the 15 Mile Reach. Forest management activities can affect these species by altering the quality, quantity, or timing of water leaving the forest. Any depletion in the amount of water leaving the forest has a detrimental effect on these fish species.

Amphibians

Four species of amphibians occupy aquatic habitats on the forest: tiger salamander, northern leopard frog, western chorus frog, and boreal western toad. The tiger salamander, northern leopard frog, and boreal western toad are all currently listed as sensitive species by the Rocky Mountain Region of the Forest Service. The sensitive species list is currently being revised. Tiger salamanders and chorus frogs are common across the forest, but leopard frogs and boreal toads both are rare.

Only two confirmed populations of leopard frogs exist on the White River National Forest. The frogs are more common at lower elevations and south of the forest. Several isolated populations of boreal toads still occur on the forest, but they have disappeared

**Resource
protection
measures**

from most areas. The State of Colorado lists boreal toads as endangered, and the U.S. Fish and Wildlife Service lists the species as a Category 1 candidate species.

Aquatic species on the Forest depend on maintaining the quality and integrity of our streams, lakes, and wetlands, as well as protecting them from biological vectors such as disease or exotic species. Management on the White River National Forest will provide protection of aquatic, riparian, and wetland resources by implementing the following measures:

- Follow the *Watershed Conservation Practices*, which provide standards for all management activities to protect soil, aquatic resources, and riparian areas. Each standard specifies design criteria that describe in more detail how an activity will be conducted to protect soil productivity, stream channels, and water quality. The Watershed Conservation Practices will limit impacts to stream health and help maintain the chemical, physical, and biological integrity of White River National Forest waters. Their use complies with nonpoint source pollution control regulations and NFMA.
- Perform site-specific analyses of proposed management activities and assess the overall impacts of past and proposed activities in terms of stream and riparian health. In watersheds in which the human-cause or natural risks are high, watershed improvement or extraordinary mitigation measures may be used to offset the impacts of the proposed project. See Appendix J for watershed risk ratings.
- Maintain sufficient flows for streamflow dependent resources such as fish and wildlife habitats, threatened and endangered species, outdoor recreation uses such as rafting, and aesthetics. Acquire water necessary for administrative uses such as campgrounds, ranger stations, administrative sites, work centers, livestock, and wildlife watering (Glasser 1996).
- Where forest-wide direction is not adequate to maintain desired habitat or populations for some species, then specific protection measures were added (such as for cutthroat trout, boreal toad, and leopard frog).

Environmental consequences

GENERAL EFFECTS

*Physical
and biotic*

The impacts of the alternatives on aquatic resources vary, due mostly to differing motorized and non-motorized land allocations, stream crossings, and recreation developments. Alternatives F and E propose the most area allocated to management area prescriptions that allow motorized access (54 and 48 percent, respectively). Alternatives C, I, and K (41, 29, and 35 percent, respectively) all have lower motorized acreage than Alternatives B and D (45 and 46 percent, respectively).

DIRECT AND INDIRECT EFFECTS ON COLORADO RIVER CUTTHROAT TROUT

No viable populations (as described above) of CRCT currently exist on the forest or within Colorado. Restoration projects to establish these viable populations would require elimination of competing non-native species from the system above a physical barrier that prevents non-native fish from reentering the area. The Forest Service has no legal authority to manipulate fish populations directly, only the authority to manage the habitat that supports these populations. The Colorado Division of Wildlife has authority for direct population management, but the Forest Service will be an active partner in these projects. Land allocations in the forest plan do influence which watersheds provide good opportunities for population restoration and enhancement, since it is more difficult to establish populations in areas with higher levels of recreational use or development. However, once a viable population is established, it would be able to withstand the stresses of high-use recreation.

There are 27 subwatersheds distributed among the six subbasins with the basic features necessary to support a viable population. The number that would be good candidates for restoration varies from 15 in Alternative E to 24 in Alternative D. Site-specific analyses and project design would further refine the number that are good candidates and would eventually lead to prioritization of projects. **Table 46** shows how the subwatersheds are distributed among the subbasin. All alternatives average more than two populations per subbasin.

Table 46
Comparison of potential viable populations by alternative

Subbasin	Maximum	ALTERNATIVE						
		B	C	D	E	F	I	K
<i>Blue River</i>	5	3	3	3	3	3	3	3
<i>Colorado River Headwaters</i>	6	4	3	6	3	3	3	5
<i>Colorado Plateau</i>	3	1	3	3	1	0	2	3
<i>Eagle River</i>	3	3	3	3	3	3	3	3
<i>Roaring Fork</i>	5	2	2	5	2	5	5	3
<i>Upper White</i>	5	3	3	4	3	4	3	4
Total	27	16	17	24	15	18	19	21

Table 46 displays the number of watersheds that are good candidates for establishment of viable populations based on land allocations by alternative. Decisions in the forest plan

can help to maintain or enhance favorable habitat conditions. However, the forest plan cannot compel the restoration of actual fish populations at any location because this is at the discretion of the Colorado Division of Wildlife (CDOW). The Forest Service and CDOW have signed a Memorandum of Agreement to work together to make the decisions involving National Forest System lands, and are also signatories to the Conservation Agreement and Strategy for Colorado River Cutthroat Trout. The Conservation Agreement includes the goal of reestablishing metapopulations.

Several streams on the forest have been found eligible for wild and scenic river designation. One of these is Cross Creek in the Holy Cross Wilderness. Cross Creek currently has a CRCT population and is one of the streams that has potential for the establishment of a viable population in all alternatives. The wild and scenic eligibility was in large part based on the CRCT population.

Of the 22 existing populations that are secure, 12 have little or no opportunity for expansion because of barriers already at the mouth or because of private ownership or severe habitat degradation downstream. These 12 populations occupy almost 70 kilometers of perennial streams and range from 2 to 11 kilometers for an average of 5.8 kilometers per population, although some do include a few acres of lakes. These small streams cannot support populations large enough to ensure long-term viability without extremely conservative habitat and population management. These populations are important remnants and are valuable as sources of fish and as repositories of genetic diversity.

Management area allocations that pose greater risk to Colorado River cutthroat trout are those that concentrate disturbance such as recreation use or roads on existing populations. Areas contributing to the allowable sale quantity (ASQ) were used as a surrogate for roads since most new road building is associated with timber sales, in addition to the road building associated with developed or concentrated recreation. **Table 47** compares the number of known cutthroat populations at low, moderate, or high activity or disturbance levels due to management area prescription. Populations with no concentrated recreation or development that were not in a management area emphasizing timber production (contributing to the ASQ) were considered at a low activity level. Populations predominantly in areas of low activity (see above) but with some areas in or near management areas with concentrated recreation, development, or timber production, were considered at moderate activity level. Populations predominantly in management areas that allow or encourage concentrated recreation, development, or timber production were considered at high activity level. Alternatives E and I had the most populations in low activity level management areas, while Alternative F had the most populations in high activity level management areas.

Table 47
Activity level around Colorado River cutthroat trout populations based on management area prescription

Ranked Alternative	Number of populations at a low activity level	Number of populations at a moderate activity level	Number of populations at a high activity level
E	46	8	8
I	45	10	7
C	34	10	18
K	27	15	20
D	28	10	24
B	29	7	26
F	24	4	33

Recreational Fishing

Access to Gold Medal fishing on the White River National Forest does not vary by alternative. Motorized access to smaller streams would be reduced in Alternatives C, D, I, and K, but a wide range of experiences will be maintained under all alternatives. Alternative C emphasizes recreational fishing more than the others; more parking areas, fishing piers, and informational signs would be built. In the short term, Alternatives D and K emphasize native fish (Colorado River cutthroat trout and mountain whitefish) over popular non-native species (brook and rainbow trout). In the long-term, the emphasis in Alternative D and K should lead to stable healthy populations of native gamefish in addition to the non-natives and would provide the greatest variety of recreational fishing experiences. Alternative E and I would provide more opportunities for guided fishing trips.

High-use recreational fishing is not desirable in areas in which new viable CRCT populations are being established because the risk of disease and non-native fish reintroduction is high, and fishing pressure can harm the small founding populations. In the long term these watersheds will be able to support fishing pressure.

Downstream endangered fish

Land management activities that have the potential to alter the quantity, quality, or timing of water leaving the White River National Forest have the potential to affect the endangered fish species occurring downstream of the forest. Small, nearly undetectable increases in water yield are predicted to be associated with timber harvest and prescribed fire (See **Table 29**, FEIS Chapter 3—*Watersheds* section). This increase ranges from 0.1 percent with Alternatives E and K to 0.3 percent from Alternatives D and F. These increases are only likely to be realized during wet years.

Increasing the acreage allocated to the 8.25 ski area management prescription provides the basis for these resorts to expand. As new terrain is developed, it is likely that more snowmaking would occur, altering quantity and timing of flow leaving National Forest System lands. Area allocated to ski areas is summarized in **Table 3**, Chapter 2.

Alternatives B and E contain the greatest amount of land allocated to ski areas while Alternatives D and I contain the least.

Amphibians All four of the amphibian species on the forest depend on wetlands or wet areas during at least part of their lifecycle. These are the limiting habitats on the forest. Alternatives with the highest amounts of ground disturbance are more likely to negatively affect these species. Alternatives F, E, and B would have the highest disturbance. The standards and guidelines in this plan provide protection for wetlands and riparian habitats, and additional specific standards and guidelines have been developed to protect boreal toads and leopard frogs.

DIRECT AND INDIRECT EFFECTS

Effects on aquatic resources from watershed management

Watershed management projects are designed to restore the physical components of healthy aquatic systems. They improve water quality, channel stability, and riparian condition and reduce sedimentation. These have positive benefits for aquatic resources. In rare cases, stream banks must be stabilized to stop erosion that threatens infrastructure. Watershed management activities do not significantly vary by alternative.

Effects on aquatic resources from grazing and noxious weeds

Livestock grazing can cause localized impacts on streams, but the standards and guidelines (including Watershed Conservation Practices) in the forest plan help protect streams. Further protection can be developed during site-specific analysis. Noxious weed treatments use pesticides, which could cause localized fish kills if spilled in streams. These pesticides are safe if used according to the label directions. Removal of noxious weeds and subsequent reestablishment of native vegetation is a benefit for aquatic systems.

The vacant allotment decision tied to this plan will not change existing livestock management but allows for future changes in management. In some cases, partial use of a vacant allotment can be used to solve existing management problems and provide small benefits. A site-specific analysis will be conducted before restocking any vacant allotments that are retained. Twenty-five of the vacant allotments are known to have Colorado River cutthroat trout within them or immediately downstream. Vacant allotments that are closed will not be restocked, which is a benefit to cutthroat populations within these allotments. Alternative E would close the most vacant allotments containing cutthroat, and Alternative B would not close any (see **Table 48**).

Effects on aquatic resources from travelways and travel management

Roads and other travelways probably have more impact on aquatic resources than any other activity on the forest. Roads contribute sediment to streams by the mechanisms described in the Watershed Section (Topic 1, Section 1, Part 2). These sediments, including road sand, affect aquatic resources by filling interstitial spaces between gravels and cobbles, which reduces macroinvertebrate densities, spawning success, and habitat for small fishes. When sedimentation becomes very excessive, pools can fill, reducing rearing habitat for trout and other larger fishes. Streams are sometimes straightened or channelized to accommodate floodplain roads and riparian vegetation may be removed to provide safe sight distances for road users. Road crossings can create barriers for fish and

other aquatic organisms. Roads and trails provide access for recreational fishing, but also increase the risk of disease spread, such as whirling disease, and non-native species introduction. While the draft forest plan and DEIS included a site-specific travel management plan and alternatives, the FEIS does not. The forest travel plan will be a separate decision after further review and analysis. However, programmatic travel management direction is included the 2002 Forest Plan, Chapter 2, Section 5—Administrative, *Travel System Infrastructure*. Based on levels of resource use and differences in management prescription allocations between alternatives, Alternative F is expected to be associated with the highest road mileage.

Effects on aquatic resources from recreation management

As described above, high recreational use limits the potential for establishment of viable populations of Colorado River cutthroat trout because of risk from disease spread, non-native trout species, and fishing pressure. Fishing is a recreational activity, and amenities provided around high-use fishing areas enhance the visitor experience. Alternatives E and C have the most recreation emphasis.

Effects on aquatic resources from ski areas

Most ski areas rely on snowmaking to provide early season skiing and guarantee timely resort opening dates. Snowmaking requires water withdrawals in the fall and winter and thus negatively affects spawning and overwintering habitat, especially for brook and brown trout, which spawn in fall. Streams within ski areas are often rerouted or armored to handle runoff efficiently and make the terrain more skiable. Riparian areas are frequently cut to make wider runs. These are permanent changes to the landscape that decrease habitat quality and quantity. Alternatives B and E allocate the most land for ski area development (see **Table 3**, Chapter 2).

Effects on aquatic resources from wilderness management

Forest Service policy on fish stocking in wilderness requires that wilderness management objectives must be met. Conflicts exist between managing wilderness to protect natural processes and to provide opportunities for recreation. In all alternatives, activities for fish and wildlife management in wilderness will be conducted according to the policies and guidelines set in the *Memorandum of Understanding of the International Association of Fish and Wildlife Agencies*.

Effects on aquatic resources from timber management

Timber harvesting causes some ground disturbance, which can lead to sedimentation of streams. Standards and guidelines generally protect streams from these impacts, and site-specific analysis can determine additional needed protections. The road construction required for timber management is the greatest impact on streams because of increased access and the expansion of connected disturbed areas. Harvesting in the riparian corridor can reduce the amount of large woody debris, but guidelines require that beneficial woody debris remain in place. Alternative F has the highest amount of potential timber harvesting.

Table 3-48
Number of vacant allotments containing Colorado River cutthroat trout proposed for retention by alternative

<i>Treatment</i>	<i>ALTERNATIVE</i>						
	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
<i>Close</i>	0	14	11	22	7	16	12
<i>Partial Closure</i>	0	3	7	0	2	1	4
<i>Retain</i>	25	8	7	3	16	8	9

CUMULATIVE EFFECTS

The cumulative effects are similar in all alternatives. Most of the activities with the potential to negatively affect fisheries are beyond the scope of the forest plan and outside of Forest Service control. The cumulative effects for aquatic resources considers activities on lands within the forest boundary as well as the private and other public lands between the two major divisions of the forest.

Fish habitat on the White River National Forest is generally in good condition. Past mining activities have degraded water quality in several streams, most of which will not recover in the foreseeable future. Railroads were built along some streams at the lower ends of the forest boundary. These have all been closed or converted to roadways. Major highways on the forest run parallel to streams (for example, Straight Creek, Gore Creek, and the North Fork of the Snake River). Sand and gravel used on the roads during winter does wash into the streams. Cattle grazing is ongoing, but at a much lower intensity than what occurred in the past.

Water is diverted from the White River National Forest to the Front Range from the Roaring Fork River, Eagle River, and Blue River drainages. The Roaring Fork drainage is still in good condition and supports healthy fisheries. In the Eagle and Blue River drainages, water diversions exacerbate water quality problems by reducing dilution. Ruedi Reservoir on the Fryingpan River is one of several western slope reservoirs that provides water to the Colorado River. As a participant in the Upper Colorado River Endangered Fish Recovery Program, the Bureau of Reclamation releases water from Ruedi in the summer and fall to augment flows in the 15 Mile Reach (the stretch of the Colorado River starting at the confluence with the Gunnison River and extending 15 miles upstream). These releases cause short-term reductions in the fishability of the river, but they provide benefits for channel maintenance and interstitial habitat. Dillon Reservoir stores water for Denver. The reservoir could be drained if needed to provide domestic water for Denver; as the population of Denver increases, such a scenario becomes more likely. Dillon Reservoir is a high-elevation, oligotrophic lake and does not sustain a productive fishery.

Stocking of non-native fish began around 1900. Introduction of brook, brown, and rainbow trout greatly boosted recreational fisheries and at the same time caused the downfall of the native cutthroat trout. Stocking has declined in recent years because of whirling disease and a new emphasis on wild trout management. As whirling disease is eradicated from some of the larger hatcheries, stocking will increase from its current low point, but is unlikely to reach historical highs. Daily creel limits have been reduced to compensate for lack of hatchery fish. Reduced stocking and the decline of rainbow trout due to whirling disease are evident in several rivers around the forest. Anglers are

beginning to move farther into the forest to fish sustainable brook trout populations in lakes and smaller creeks. This trend is likely to continue.

The popularity of trout fishing has remained relatively stable over the past several years. The number of anglers will continue to increase with population. Cooperative agreements involving the Colorado Division of Wildlife, Colorado Department of Transportation, Bureau of Land Management, Forest Service, other state and federal agencies, conservation groups, and private landowners are making progress in providing more access to high-quality fisheries. These efforts should be sufficient to meet increasing demands.

Amphibians are receiving more attention, and although the cause for their global decline is still not known, protection of critical wetland habitats is increasing. The new standards in this plan provide for significant wetland protection on the forest, but private land development will continue. Inventories for boreal western toad are becoming more intense and widespread. Reintroduction efforts are proceeding in Wyoming, and researchers are learning more about the needs of this species.

Overall, physical habitats on the forest will remain in good condition. A greater focus on recreational fishing will lead to more amenities and better access. Stocking will increase from its current low, but will not reach historical levels. Restoration of native species will be a priority. Water diversions will continue and probably expand to meet increased Front Range populations.



Topic 1, Part 3, Section 3

Forested vegetation

Introduction

Abstract Forested vegetation is a primary component of biodiversity and serves as habitat for a wide range of wildlife and plant species across the White River National Forest. The ecosystem level approach to conserving biodiversity is accomplished by managing the overall composition and structure of vegetation that provides habitats for the majority of the species commonly found on the forest. The information presented in this section is important for assessing future management options to maintain the ecosystem components required by forest-dependent species.

Introduction Forested vegetation is an important ecological component of the White River National Forest. Approximately two-thirds of the total acreage of the forest is composed of forested cover types. The major considerations concerning forested vegetation are similar to those discussed in the general biodiversity section earlier in this chapter, including natural processes, human disturbances, and variability, as they relate to landscape pattern and old-growth and late successional forests.

Key indicators

- Landscape pattern for forested cover types:
 - 1) Acres of forested cover types
 - 2) Forest cover type structural stage distribution
 - 3) Patch characteristics.
- Acres and juxtaposition of old-growth and late successional forests by aggregated cover type.

Legal and administrative framework See the legal and administrative framework in the biodiversity section. This framework also applies to forested vegetation.

Landscape pattern

Affected environment

In this assessment, landscape pattern is described in terms of three elements: vegetation *cover types*, vegetation *structural stages*, and the characteristics of individual *patches* (their size, arrangement, and the amount of edge present).

Vegetation cover types About 65 percent of the White River National Forest is forested, with shrubland, grassland, and unvegetated areas making up the remainder (see vegetation cover types map in the map packet). More than a fourth of the forest is occupied by Engelmann spruce-subalpine fir. When areas that have been subject to concentrated vegetation management are compared to reference areas, both exhibit a wide variability in patch size, the amount of edge, and the average core (interior) patch size.

Few significant changes can be detected when past silvicultural treatments are considered. Late successional spruce-fir stands in managed areas appear to be smaller than in reference areas (areas in which recent timber management activity is not thought to have had significant impacts on forested vegetation), but silvicultural treatments do not fully explain these differences. The average patch size is actually larger in managed areas of late successional aspen and lodgepole pine, the two cover classes in which even-aged treatment methods, which should have reduced patch size, are most commonly used.

Table 49 displays the cover types (the major overstory tree species) of the White River National Forest. The percentage of each type on the national forest is compared to what is found in the two ecological sections and the province (see Appendix E) of which the forest is a part. This shows that some cover types are relatively more abundant on the forest, some less so.

Table 49
Cover types of the White River National Forest compared to the sections and province

<i>Cover Type</i>	<i>Acres</i>	<i>% of Forest</i>	<i>% of this Cover Type in Province</i>	<i>% of this Cover Type in Two</i>
Douglas-fir	69,700	3.1	1.9	14.1
Ponderosa pine	300	<0.1	<0.1	<0.1
Lodgepole pine	256,600	11.2	2.6	8.6
Spruce-fir	650,700	28.5	7.4	25.2
Oakbrush/mountain shrub	181,800	8	11.3	18.3
Pinyon-juniper	15,100	0.7	0.2	1.3
Hardwoods (predominately aspen)	426,000	18.7	8.4	18.4
Other forest types ¹	3,900	0.2	N/A	N/A
Non-forested ²	668,500	29.3	2.9	9.7
Water	9,800	0.4	2.9	23.5
Total	2,282,400	100	3.5	11.9

¹ Includes blue spruce (0.01%) and limber pine (<0.01%)

² Includes willow, Krummholz, grasslands, rock, alpine, and non-open water wetlands

Source: Common Vegetation Unit database and National Hierarchy of Ecological Units layer

Table 49 indicates, the White River National Forest makes up only 3.5 percent of the province but accounts for more than 7 percent of its spruce-fir, 11 percent of its oakbrush and shrub, and 8 percent of its aspen. Similarly, the forest make up only 12 percent of the two sections but contains 25 percent of their spruce-fir, 18 percent of their oakbrush and shrub, and 18 percent of their aspen. Because the forest has ‘more than its share’ of spruce-fir, aspen and oakbrush, it is important how the forest manages these types. Poorly

represented cover types in comparison with the province and two sections are ponderosa pine and pinyon-juniper. The following discussion generally focuses on spruce-fir and aspen because of their predominance on the White River National Forest.

Structural stages

Forest structural stages (the developmental stages of tree stands in terms of tree size, age, and canopy closure) are used to describe wildlife habitats as well as visual resources. **Table 50** shows the structural stages of aspen, Douglas-fir, lodgepole pine, and spruce-fir on the forest. Cottonwood, blue spruce, limber pine, pinyon-juniper, and ponderosa pine were excluded because of their limited acreages.

In the table, structural stages are identified by number and letter, indicating growth stage and canopy closure respectively. Because of database limitations, structural stages 1 and 2 have been combined into 'structural class' 1; structural stages 3B and 3C into 'structural class' 3; and structural stages 4C and 5 into 'structural class' 5.

Table 50
Structural stages by tree species, in acres and percent of the White River National Forest

Structural Stage ¹	Structural Class	Aspen		Douglas-fir		Lodgepole		Spruce-fir		Totals	
		Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
1 and 2	1	33,200	8	1,300	2	5,900	3	47,300	8	87,700	7
3A ²	2	36,000	9	7,900	11	8,900	4	48,000	8	100,800	8
3B	3	105,000	25	8,600	12	38,100	17	68,100	11	219,800	17
3C	3	145,600	34	10,400	15	78,900	35	80,200	13	315,100	24
4A	4	7,100	2	8,000	12	4,500	2	49,200	8	68,800	5
4B	5	39,900	9	14,800	21	20,900	9	148,300	24	223,900	17
4C and 5	5	58,200	14	18,800	27	68,700	30	169,300	28	315,000	24
Total		425,000		69,800		225,900		610,400		1,331,100	

¹ structural stage 1 = grass/forb; 2 = shrub/seedling; 3 = sapling/pole; 4 = mature; 5 = old growth

² A = canopy closure of 0–40%; B = canopy closure of 40–70%; C = canopy closure of 70+%

Table 50 shows that:

- Approximately 60 percent of the aspen is in the middle size classes (class 3, sapling/ pole) with relatively dense canopy closure. Increment-bore aging of many of these stands indicate that they are mature stands that regenerated during the settlement era from 1870 to 1910. The historical range of variability (HRV) assessment indicates that more acres were regenerated during this period than would have been expected under normal disturbances. This has led to a more uniform age class for aspen than would generally be expected to occur.

- Douglas-fir stands are evenly distributed throughout the size classes with a slight weighting toward mature stands.
- There are limited stands of younger-aged lodgepole pine. The HRV assessment indicates that many acres of lodgepole pine were regenerated during the period from 1870 to 1910 as a result of human-induced disturbances. This has led to a more uniform age class for lodgepole pine than would generally be expected to occur under natural disturbance regimes.
- Engelmann spruce-subalpine fir stands are predominantly mature (60 percent), typical of this cover type because of the relatively long life of spruce and its tolerance for shade or closed-canopy conditions.

Overall, about half of forested land on the White River National Forest is in a mature structural stage (4 or 5). This relative abundance of tree stands of advanced age and closed canopies reflects the abundance of spruce-fir, the long life of this type, and the effect of some 80 years of fire suppression, which has limited the creation of openings and the regeneration of stands.

Actual age information for the forest stands on the forest is limited. However, structural stage information can be used as a reasonable substitute for age. What age class information is available is shown in **Figure 17**, which shows the distribution of ages for aspen, lodgepole pine, and spruce-fir (RM-RIS database). This information is more accurate for stands of lodgepole pine and aspen, in which trees can be expected to be within a few years of each other in age. In spruce-fir stands, the data indicate an average age of stands; there can be a difference of hundreds of years between the ages of individual trees within the stand.

Figure 17
Age-class distribution of aspen, lodgepole pine, and spruce-fir stands

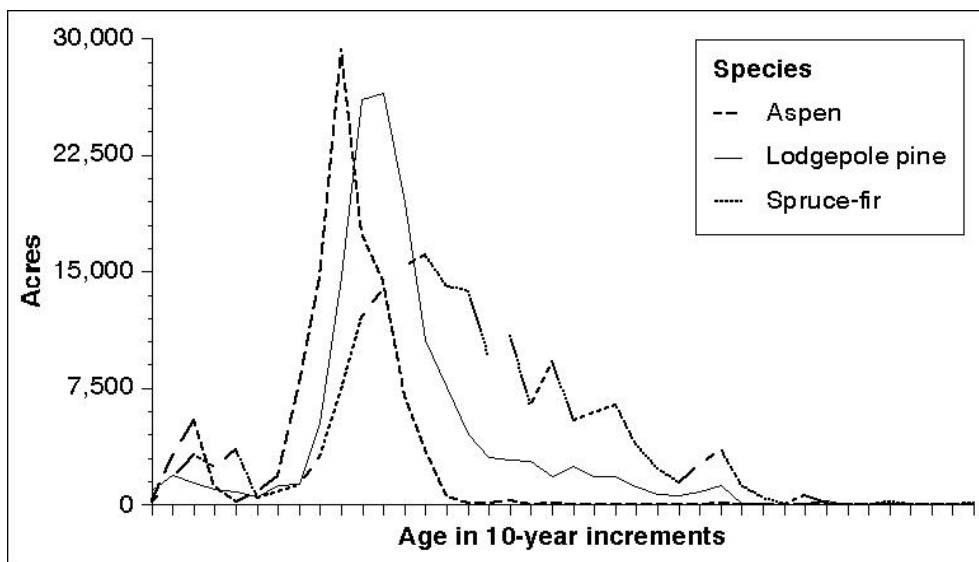


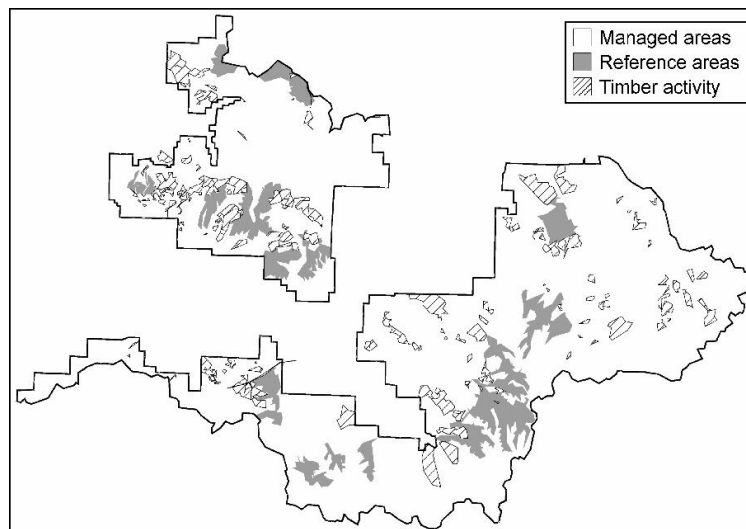
Figure 17 shows that a large portion of the forest was regenerated between 100 and 130 years ago, corresponding to settlement of the region after 1870, when extensive areas were cleared by logging and when many large forest fires occurred.

Patch characteristics

A computer model (FRAGSTATS) assessment of existing forest landscape pattern, prepared for this EIS, focused on changes to patch characteristics resulting from recent (that is, the past 50 years) forest management actions. Areas with concentrated past timber harvest areas were mapped as broad forest areas (called *activity polygons*) and included actual cutting units as well as surrounding lands. These areas are shown in **Figure 18**. (Actual cutting units make up about 15 percent of the total acreage within the activity polygons). The analysis incorporated those portions of the forest in which activity polygons were concentrated, comprising approximately 40 percent of the activity polygon acreage and past timber harvest activity. These areas are referred to as *managed areas*.

The polygons identified as *managed areas* for this analysis were chosen based on the belief that they would give the most intensive information concerning human-induced changes to forested ecosystems on the White River National Forest. Timber harvest activity within these polygons is the most concentrated in relation to the rest of the forest. Timber harvest activity areas not included in *managed area* polygons occur in scattered, widely dispersed areas of the forest. Often only one or two sale units were found within an entire drainage. Inclusion of these areas into the analysis would have resulted in less overall precision, because any impacts would be diluted as a result of the high level of natural variability in the background matrix. It is felt that the chosen methodology has resulted in the most accurate analysis of potential impacts to forested stands.

Figure 18
Analysis polygons showing timber harvest activity in managed and reference areas, based on FRAGSTATS model



In this assessment, managed areas are compared to *reference areas*. Reference areas are defined as those areas in which recent timber management activity is not thought to have had significant impacts on forested vegetation. During the initial European settlement of Western Colorado in the late 19th century, many landscapes were significantly altered (see FEIS Volume 2, Appendix D—*Historic Range of Variability*, for a more complete

discussion of these historical changes). For this assessment, it was not possible to isolate reference areas in which early settlement did not play a role. Efforts were made to select reference areas with the least amount of recent management activity, such as wilderness or areas with low road densities. From the early part of the 20th century until about 1950, little active management of the forest occurred except for fire suppression. Although this assessment was designed to take forest vegetation management practices of the past 50 years into account, it is unknown how impacts from the early settlement period affect the analysis. This assessment is meant to display the impacts of relatively recent forest management rather than the impacts from early settlement.

Although roads affect landscape structure, this analysis focused on the impacts on forest structure associated with vegetation management alone, without respect to roads. Additional information on road impacts on vegetation can be found in the forested vegetation section of Appendix D; information on impacts on wildlife habitat values can be found in the wildlife section.

Approximately 33 percent of the White River National Forest is designated wilderness, and an additional 28 percent is currently inventoried as roadless. This 60 percent of the forest has not been historically affected by roading and associated activities. An evaluation of the amount of the major cover types found within wilderness and categories was completed. This assessment indicated that aspen (55 percent), lodgepole pine (54 percent), and spruce-fir (68 percent) cover types occur in wilderness and roadless areas in approximately equal representation as they would be expected to occur under random distribution. This means that between one half and two thirds of each of these types have been relatively unaffected by the past impacts of road construction or use on the White River National Forest. Willow and other shrublands are underrepresented in wilderness and roadless areas of the forest, which may have made them more vulnerable to impacts from roading and associated activities.

Other White River National Forest management activities, such as ski area development and oil and gas exploration, affect landscape structure. These activities generally are localized rather than distributed across the general forest landscape. Impacts from these activities are discussed in the direct and indirect effects section.

Land Type Associations (LTAs) were chosen as the primary unit for this analysis. LTAs are ecological classification units described in more detail in FEIS Volume 4, Appendix E. LTA areas of concentrated vegetation management were identified and mapped. Adjacent, similar LTAs without past vegetation management were set up as reference areas.

Figure 18, earlier in this section, shows the 13 managed polygons that were analyzed across the White River National Forest using the FRAGSTATS model. They ranged in size from 2,000 acres to 27,000 acres (a total of 122,900 acres, or 5 percent of the national forest). These were compared to 16 reference polygons, which ranged in size from 4,500 acres to 71,000 acres (a total of 238,100 acres, or 10 percent of the forest).

Four different assessments were developed and analyzed through the FRAGSTATS model; they are summarized below. Details of these assessments can be found in FEIS Volume 4, Appendix B.

In the following section, discussions of wildlife/habitat relationships are limited to the vegetation communities on which they depend. Further information on wildlife, management indicator species, and related communities can be found in the wildlife section.

The four assessments

1. **Late successional spruce-fir**—Managed and reference spruce-fir structural class 5 patches were examined.
2. **Late successional vs. early to mid-successional**—For each vegetation cover type, structural class 5 patches were compared to combined structural classes 1–4.
3. **Structural stages**—All cover types were grouped together and the five individual structural stages compared.
4. **Mid- and late successional vs. early successional**—For each cover type, combined structural classes 4 and 5 patches were compared to combined structural classes 1–3 patches.

Each of these analyses is described in terms of the following elements:

- **Patch size**—The average size of individual patches within each of the classes being analyzed. Patch size is important because a wide range of plant and animal species depends on certain minimum patch sizes for suitable habitat conditions. Patches that are smaller than their minimum habitat requirement may not meet the life history requirements of these species, or may make them more susceptible to predation.
- **Edge density**—The number of feet of edge perimeter per class per acre. Edge density is important because certain wildlife and plant species are sensitive to habitat conditions associated with the edge between two structural classes. Some species are positively influenced by edge and seek out edge habitats, while others avoid edge habitats and prefer interior habitats.
- **Average core patch size**—The size of interior forest patches, or forest habitats in which relatively uniform conditions exist, unaffected by the influences associated with edges. Some animal and plant species find optimum habitat conditions in interior forest patches.
- **Summary**—a brief interpretation of the results and management implications where appropriate.

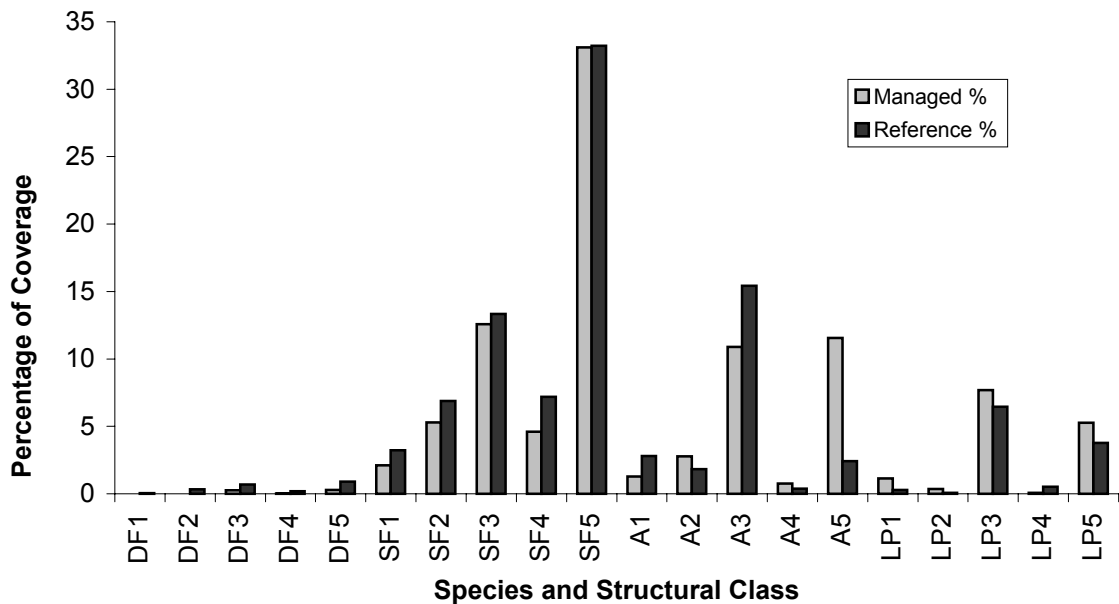
Late successional spruce-fir

The first assessment initially looked at all structural classes for all major forested cover types, plus grassland/shrubland and non-vegetated types. After initial review of the data the analysis focused on the late successional spruce-fir class.

Only the four major forested cover classes—Douglas-fir, spruce-fir, aspen, and lodgepole pine—were analyzed in detail. **Figure 19** illustrates these data. However, three forested categories make up 60 percent of the forested acres: sapling/pole class aspen (13 percent of the national forest); sapling/pole class spruce-fir (13 percent of the forest); and late successional spruce-fir (33 percent of the forest). Because past forest timber harvest activity has focused heavily on late successional spruce-fir, the findings for that one class are presented here.

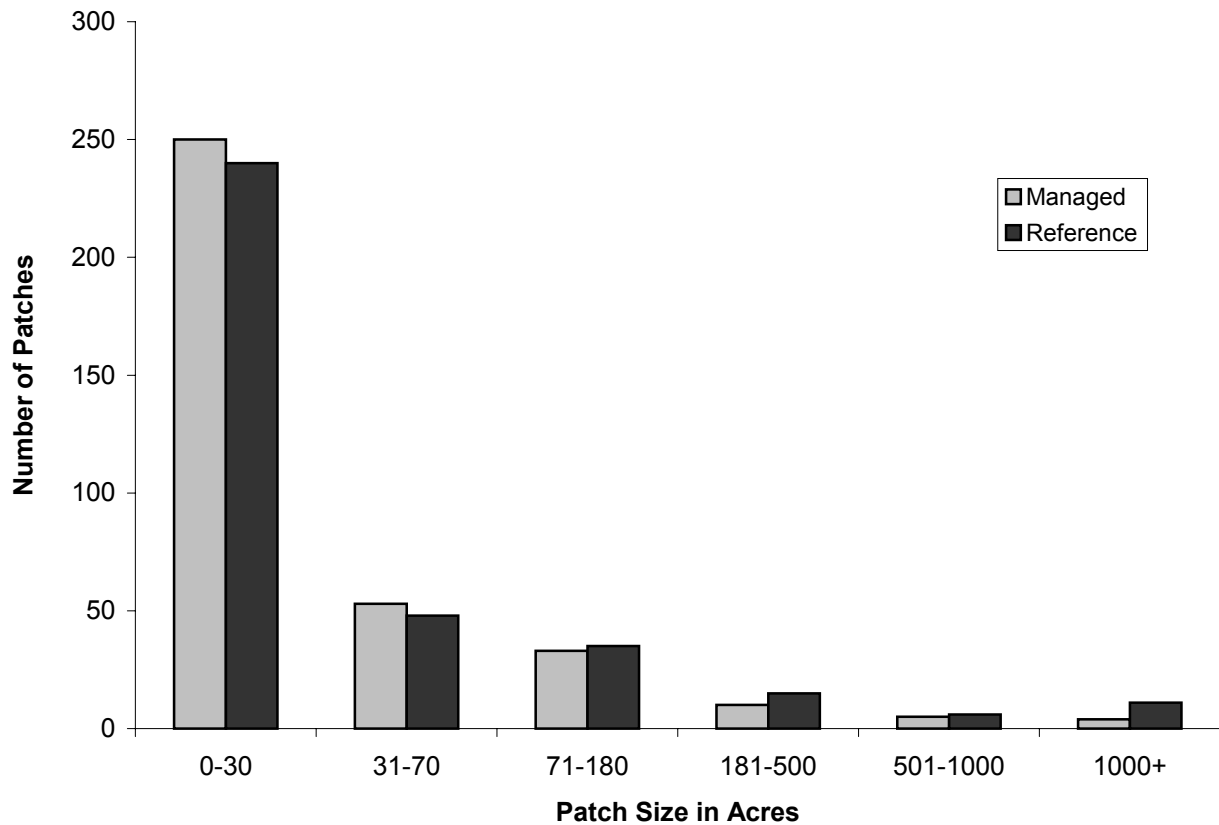
Patch size Two comparisons of the number of patches between the managed and reference landscapes were completed. The first comparison held the total numbers of patches constant at 355 between managed and reference landscapes in varying sized landscapes. The comparison of the number of patches in the reference and managed areas is displayed in **Figure 20**. The major difference is in patches larger than 1,000 acres, only four of which occurred in the managed landscapes while 11 would be expected based on the reference frequencies. All other patch categories were observed in approximately the same quantities as expected from the reference frequencies. Management activities on the forest may have resulted in reducing the number of very large patches (larger than 1,000 acres) but have not significantly affected the ratios of patch size classes between managed and reference landscapes.

Figure 19
Coverage by cover type and structural class



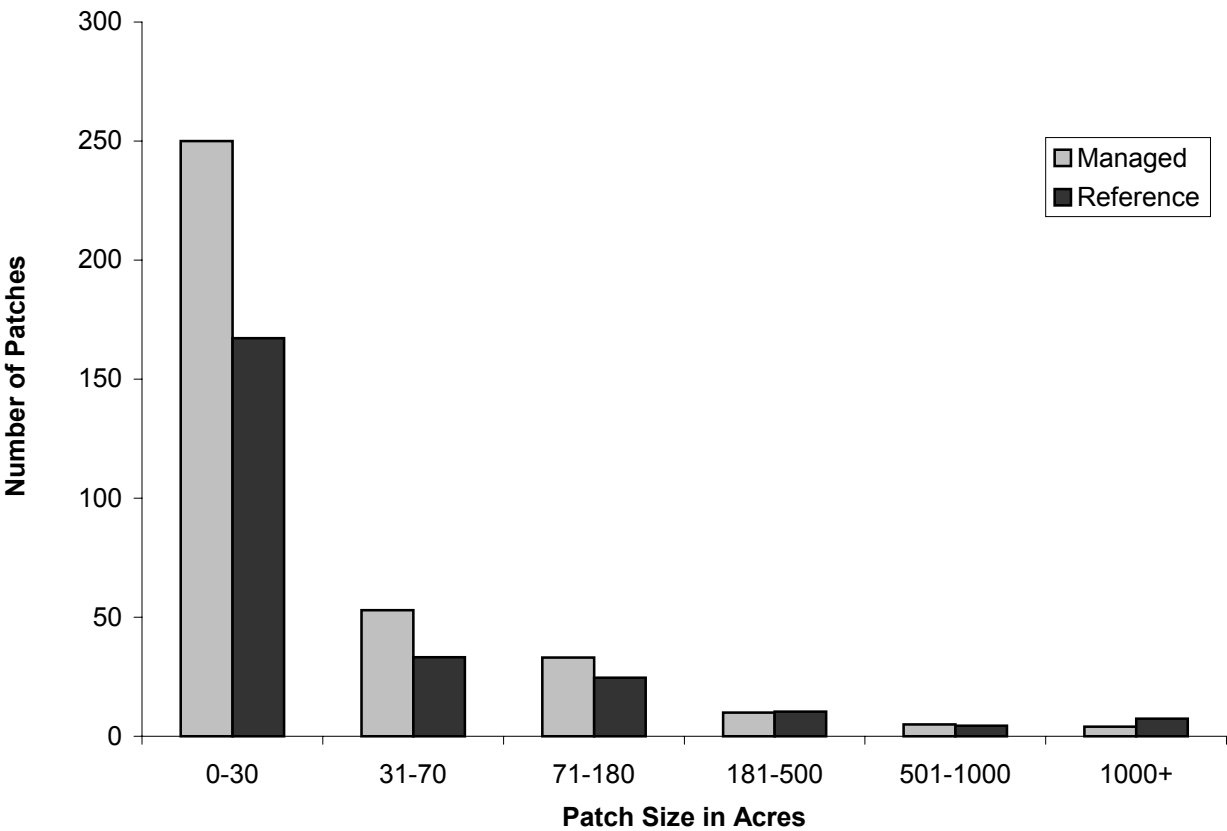
KEY: DF = Douglas Fir, SF = Spruce Fir, A = Aspen, LP = Lodgepole Pine, O = Other Species

Figure 20
Late successional spruce-fir, managed and reference, patch number standardized



The second method of assessment looked at the resultant number of patches when managed and reference landscapes were held constant at 26,020 acres. This is displayed in **Figure 21**. This assessment also indicates that fewer patches larger than 1,000 acres occurred in the managed landscapes, while more patches in the ranges of 0–30 and 31–70 acres were found in the managed landscapes than were expected based on reference frequencies.

Figure 21
Late successional spruce-fir, managed and reference, total acreage standardized



Edge density The late successional spruce-fir assessment did not include edge density.

Average patch core size The average core patch size for managed polygons was 30 acres, with the reference average being 51 acres. The variability in both sets of polygons was very high.

One additional comparison made under this analysis was the average distance between late successional stands. Again, variability was very high for both managed and reference polygons, but late successional stands in the managed polygons averaged seven percent closer together than for reference stands. Some studies have shown that as fragmentation of forested areas begins, the average distance between stands is initially smaller but the distance increases as fragmentation progresses.

Summary Approximately 1,900 acres of spruce-fir within the managed polygons (four percent of the total spruce-fir acreage) have been managed through even-aged silvicultural systems that have shifted structural class 5 stands to a different class.

An additional 8,700 acres (18 percent) have been managed through silvicultural treatments that maintain multi-storied stands, including shelterwood prep cut or sanitation salvage. These treatments normally would not change the structural class of the stand until the overstory removal cut occurs. The wide variability in the patch class data may mask impacts associated with past management activities to an unknown amount.

The current state of the spruce-fir patches indicates that the past 50 years of management may have created more small patches in the size classes of 0–30 and 31–70 acres while reducing the number of stands larger than 1,000 acres. These impacts would be most noticeable on those portions of the national forest that have been subjected to the most intensive forest management activities. Although forest management has occurred in scattered areas across the White River National Forest, the most concentrated activities have occurred on approximately five percent of the forest.

The average core patch size appears to be less in the managed polygons than in the reference areas. This could affect species that depend on large areas of interior forest to meet their life history needs. The average core patch size for each age class in the managed area is well within the variability of core patch size for the reference stands.

Species dependent on late successional spruce-fir stands would have to travel slightly less distance between suitable stands in the managed polygons than in the reference areas. This change in average distance may be a function of the wide variability in the measured areas, or it may be a function of the beginning stages of fragmentation due to the effects of forest management activities.

Late successional vs. early to mid-successional

In this assessment, late successional stands (class 5) were compared to all earlier-successional stands (classes 1- 4). This provides information about potential impacts on species that use late successional forest habitats and interior forests.

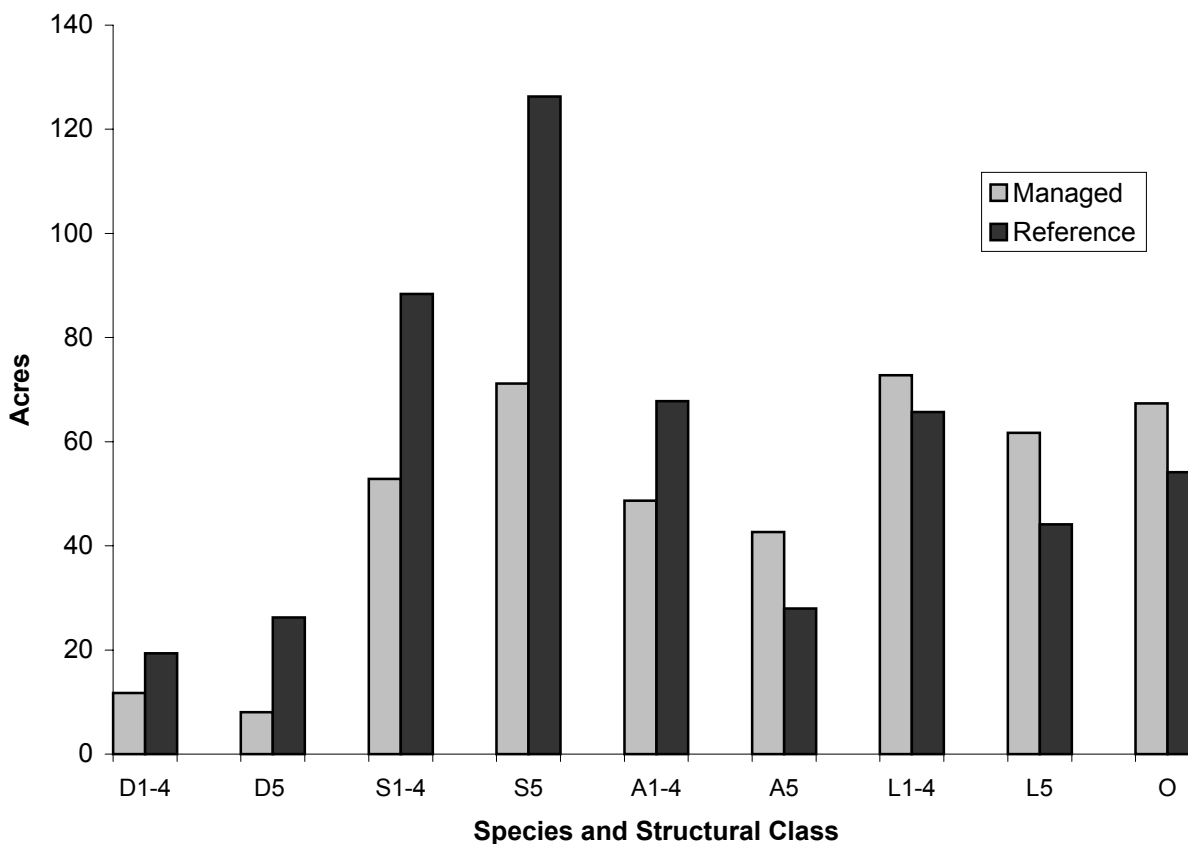
Patch size

Results of this assessment are displayed in **Figure 22**. In Douglas-fir and spruce-fir, the average patch size was smaller for managed polygons than for reference polygons. No difference was expected in the average patch size based on the past silvicultural treatments that have been used in these cover types. The average patch size was larger in both the managed aspen and the lodgepole pine structural class 5 categories. This was not expected because these classes are where past even-aged management has been concentrated. It was expected that average patch size would be reduced in these structural classes because of the small size of the average even-aged cutting unit—9 acres for aspen and 11 acres for lodgepole pine. It appears that the wide range of natural variability in patch sizes masks any impacts that have occurred in these cover types due to past forest management activities.

Edge density

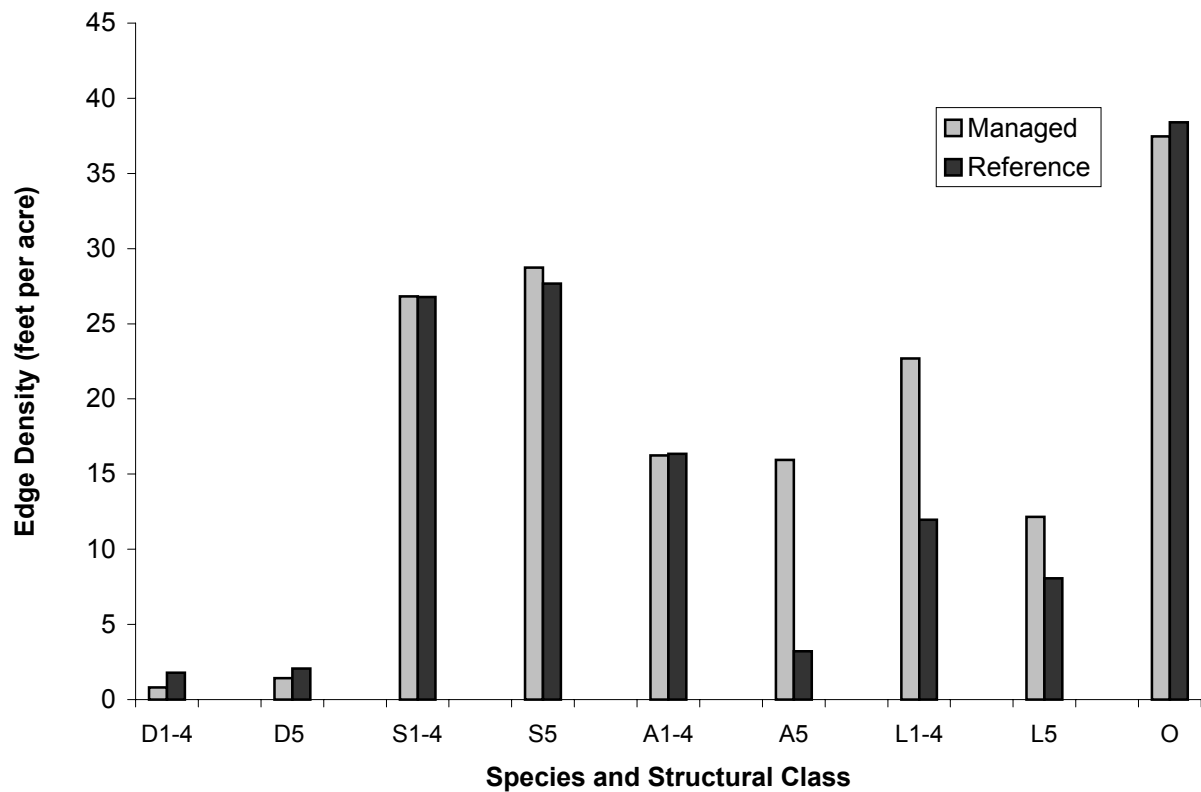
Edge densities were similar in all categories except for late successional aspen and lodgepole pine, in which managed areas exhibited higher densities of edge than in reference areas (**Figure 23**). Aspen and lodgepole pine are the two cover types in which even-aged management is the silvicultural norm. The larger patch sizes in these two categories coupled with past silvicultural practices combine to create more edge.

Figure 22
Average patch size, late successional



KEY: *DF* = Douglas Fir, *SF* = Spruce Fir, *A* = Aspen, *LP* = Lodgepole Pine, *O* = Other Species

Figure 23
Edge density, late successional



KEY: D = Douglas Fir, S = Spruce Fir, A = Aspen, L = Lodgepole Pine, O = Other Species

Average core patch size

The results of this assessment are linked to the average patch size results described above. Late successional aspen and lodgepole pine were the two categories in which average core patch size was larger in the managed polygons than in reference polygons. It was not expected that these two categories would display this result based on the types of management that have been applied within these cover types, but the results are consistent with the average patch size results. The variability was very high for all forest types.

Summary

It was not expected that late successional Douglas-fir or spruce-fir would exhibit marked changes between managed and reference stands as a consequence of past timber harvest activities. However, the average patch size in spruce-fir was approximately 55 acres (44 percent) smaller in managed areas. The average patch in Douglas-fir was 18 acres (70 percent) smaller. Silvicultural practices that maintain multi-storied stands with small, interspersed, even-aged groups are the most commonly used treatments in the spruce-fir categories.

Within the managed areas, approximately 4 percent of the late successional spruce-fir has been treated with shelterwood prep cuts or individual tree selections. An additional 15 percent of the treatments have been sanitation salvage treatments focusing on dead spruce. Shelterwood prep cut, individual tree selection, and sanitation salvage treatments normally do not change a structural class 5 stand to another category. Approximately 1,900 acres (4 percent) of the late successional spruce-fir has been treated using silvicultural treatments that normally would change a class 5 stand to a different category. Only five acres of Douglas-fir have been managed with even-aged silvicultural treatments that would change late successional stands to other categories.

The small scale of these activities within the larger analysis areas do not readily explain the smaller patch sizes for these cover types. The smaller patch size average in managed areas may be a factor of the management that has occurred, a function of the wide existing variability of the stands, or a combination of both.

The late successional aspen and lodgepole pine classes were expected to exhibit a reduction in average patch size in managed areas due to past clearcutting. However, for both cover types, the average managed patch size was larger than the reference patch size. Edge densities and average core patches both showed similar conflicting results to the average patch size assessment. The wide variability in patch size in both managed and reference stands coupled with the relatively low level of active management likely mask any major impacts from timber management activities.

Edge density results were similar in all classes except late-successional aspen and both classes of lodgepole pine, where managed areas had a higher amount of edge than reference areas.

The average core patch size results followed the general results of the average patch size assessment. It is difficult to develop management implications based on the conflicting results concerning cover types and past silvicultural treatments.

Structural stages

In this assessment the structural classes were assessed by grouped tree species. This assessment was applied to determine potential effects on habitats used by wildlife species dependent on structural components rather than on specific tree species.

Patch size Average patch size was larger in the reference polygons in all structural classes except for the non-forested cover types, where patch size was larger in the managed polygons (**Figure 24**)

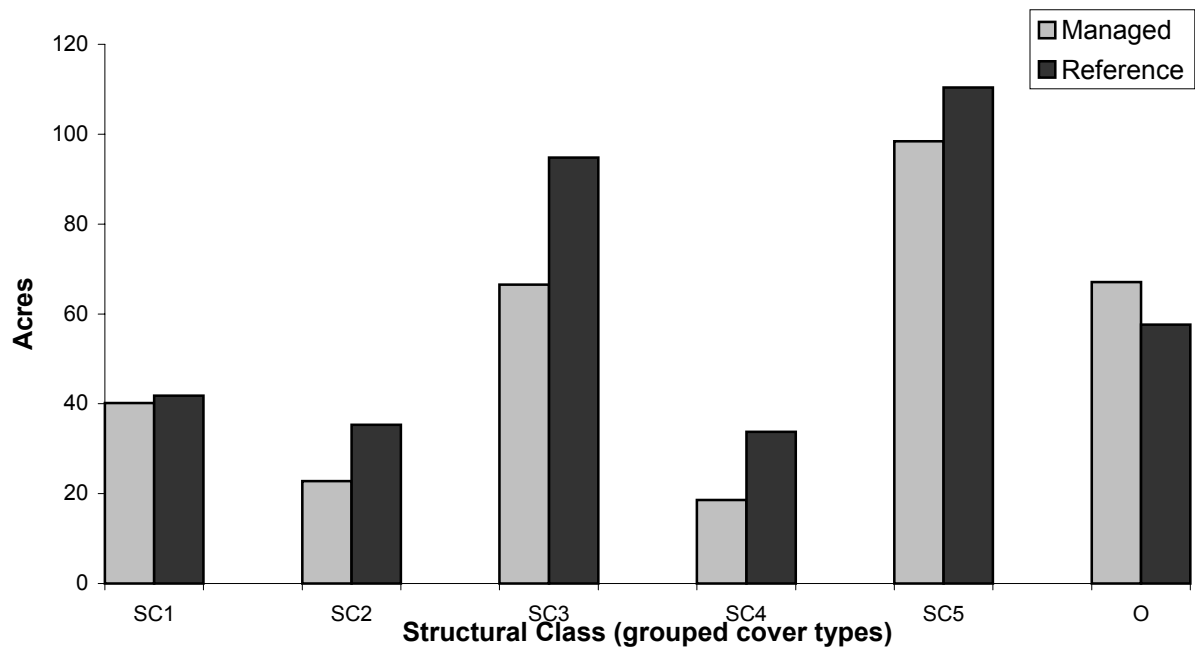
Edge density No major differences in edge density could be detected for this scenario (**Figure 25**).

Average core patch size Average core patch size was larger in all reference classes except in the non-forested class. This corresponds with the average patch size results.

Summary Grouping of all forested cover types by structural stage provides an analysis of potential impacts on species that focuses on tree size and density rather than on individual tree species. In all cases the average patch size and corresponding average core size were larger in the reference areas than in the managed areas. In structural class 5 (late successional) the average patch size in managed areas was 98 acres, while it was 110 in reference areas. The existing variability in all landscapes was very wide,

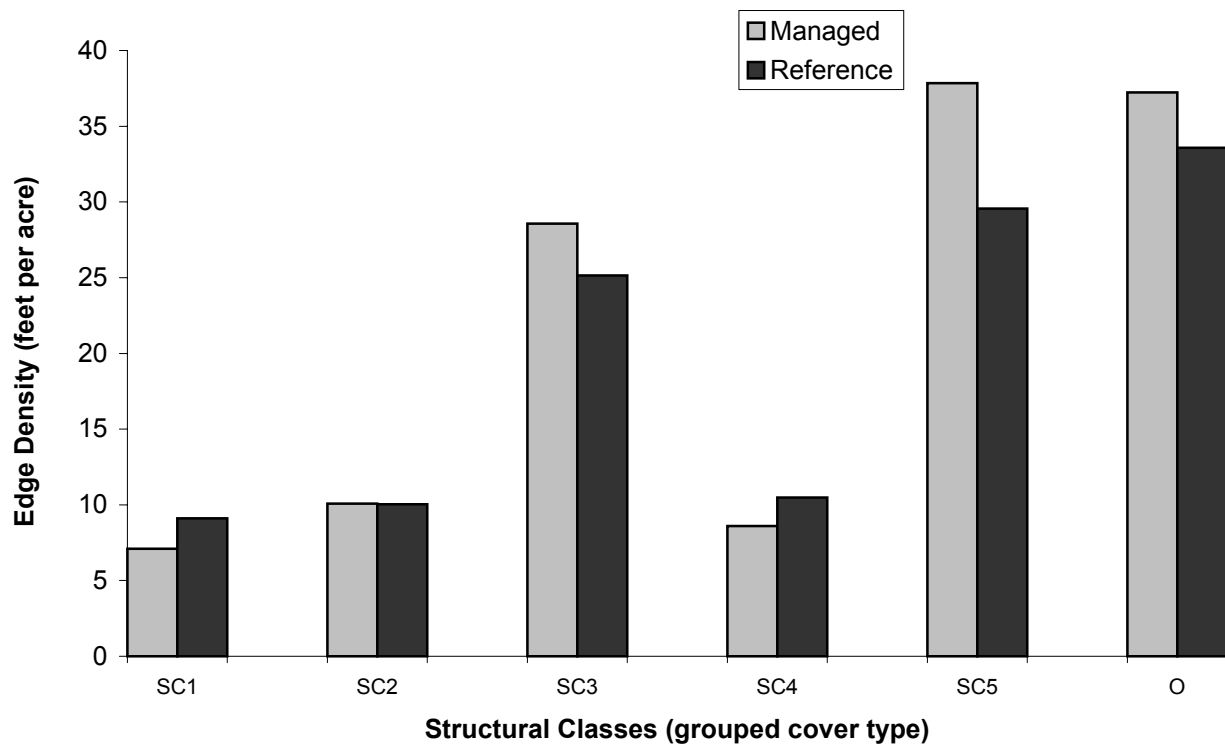
making analysis of small differences difficult.

Figure 24
Average patch size, structural classes



KEY: SC = Structural Class , O = Other

Figure 25
Edge densities, structural classes



The difference between average patch size in managed and reference classes was the least in structural classes 1 and 5, which was not expected. Anticipated management-induced changes (the creation of more small patches) were expected to show up the most in these 2 classes. Variability was very high in all classes. Again, it appears that the existing wide variability of patches coupled with low past activity levels are masking any major changes that may exist as a result of management activities.

The results of past management activities were expected to show higher edge densities in classes 1 and 5 in the managed polygons because of the creation of sharp edges and smaller patches associated with clearcuts. There were slightly higher densities in structural classes 3 and 5 in the managed polygons, while classes 1 and 4 had slightly lower edge densities in the managed areas.

No clear conclusions concerning the impacts of past management to structural stage conditions could be reached through this analysis.

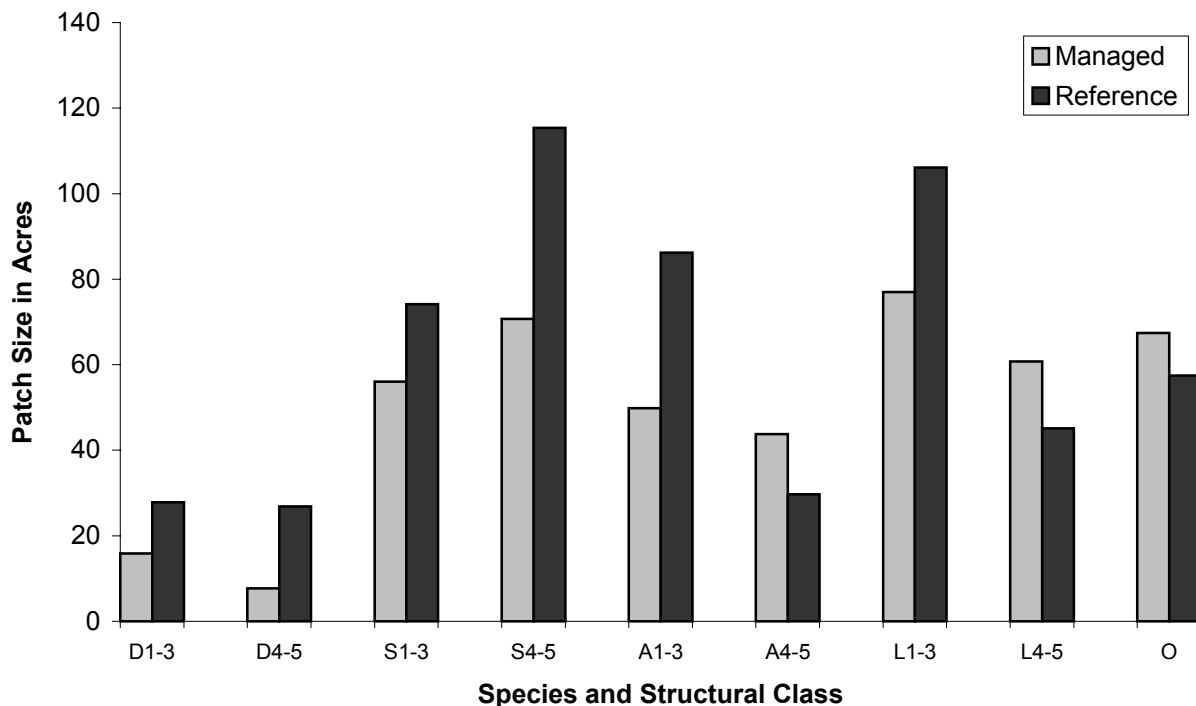
Young vs. mature forests

In this assessment, grouped structural classes 1–3 were compared to the grouped 4–5 classes. This assessment was designed to look at potential impacts on habitats for species that are specific to either young or mature age classes.

Patch size

The major difference in this assessment and the late successional assessment was the inclusion of structural class 4 with the late successional class (5). Results remained similar to those found in the late successional assessment, with average patch size larger in all reference polygons except for mature aspen and lodgepole pine (**Figure 26**). Patch size variability remained very large.

Figure 26
Average patch size, young vs. mature

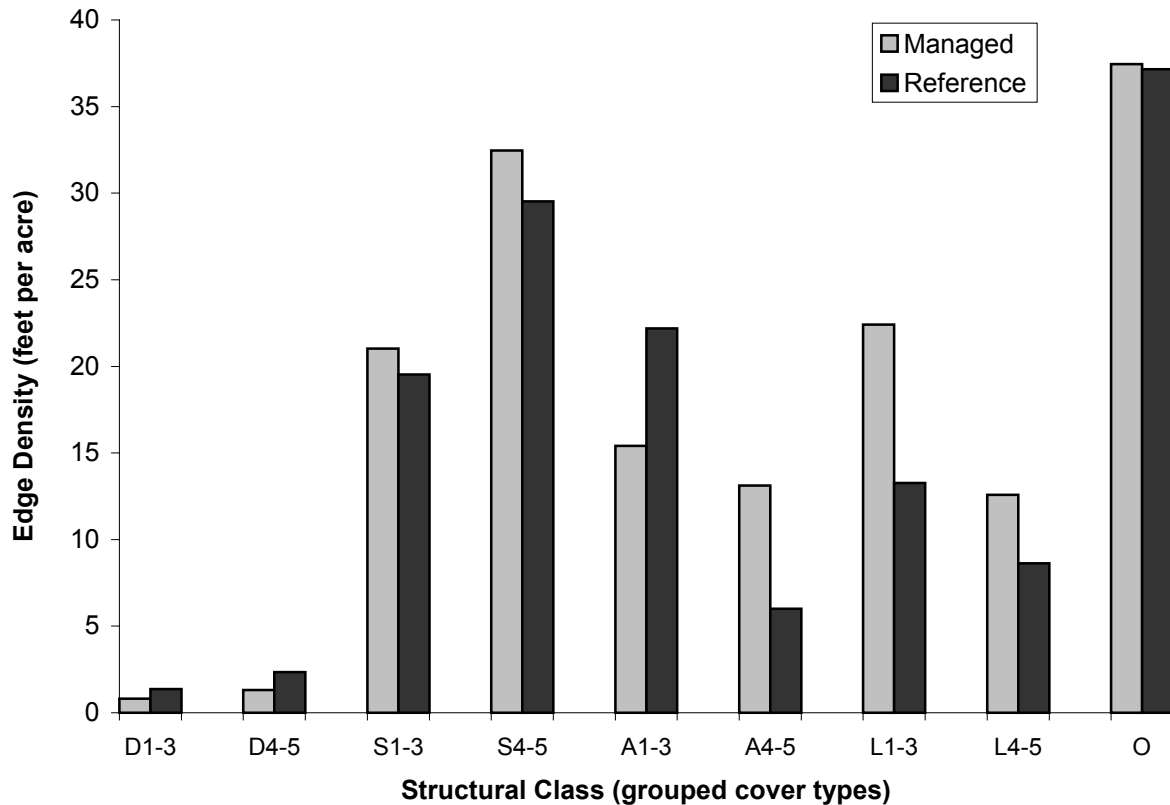


KEY: DF = Douglas Fir, SF = Spruce Fir, A = Aspen, LP = Lodgepole Pine, O = Other Species

Edge density

Edge densities were variable; both managed classes of Douglas-fir and the younger managed class of aspen had a lower edge density than the reference class, while the reference polygons had lower edge densities than managed in all other classes (**Figure 27**).

Figure 27
Edge density, young vs. mature



KEY: D = Douglas Fir, S = Spruce Fir, A = Aspen, L = Lodgepole Pine, O = Other Species

Average core patch size

The average core patch size results were similar to those under patch size, with larger core patches in the managed mature aspen and lodgepole pine classes. All other managed classes had smaller average core patch sizes than in the reference polygons.

Summary

Results of this assessment were similar to the results from the late successional assessment. Managed mature aspen and lodgepole pine classes exhibited larger average patch sizes than reference areas, contrary to what was expected. Edge densities and core patch sizes followed the late successional assessment. Variability in patch size and edge densities was also high in this assessment. Similar management implications exist for this assessment as for the late successional assessment (see the late successional summary earlier in this chapter).

Environmental consequences

GENERAL EFFECTS

Although the four assessments focused on the effects on patch characteristics from past timber harvest activity, the following discussion will describe other factors that influence cover types, structural stages, and patch characteristics. All alternatives provide a variety of management activities that improve forest health conditions. However, because of agency policies and budget and social constraints, none of the alternatives would result in significant changes in the existing situation. In all alternatives, the majority of the forest will continue to be influenced primarily by natural processes and existing agency policies, including fire suppression.

Cover types

Forest-wide, during the planning period (the next 10–15 years), most of the forested cover types on the White River National Forest are expected to move through natural succession and become older in all alternatives. In the next 50 years, some lodgepole pine stands will slowly be replaced by shade-tolerant spruce-fir. As insect outbreaks take their toll on mature lodgepole stands, these stands will become more susceptible to the recruitment of other species. Approximately 42 percent of the aspen on the national forest has the potential to be self-sustaining (based on soil types). Most of these stands are expected to maintain themselves as aspen over the planning period. In the absence of major disturbance events, successional aspen (the remaining 58 percent found on soil types not expected to maintain aspen in the long term) will slowly be replaced by other species, mainly spruce-fir. The effects of this successional change will be largely unnoticeable over the life of the plan. In the absence of major natural disturbance events such as fire or insect outbreaks, most of the spruce-fir cover type is expected to maintain itself as spruce-fir. Increased insect activity may increase the number of standing dead trees in some portions of the forest.

Structural stages

In areas of active even-aged timber management, some late successional stands will be converted to younger seral stages. Uneven-aged silvicultural treatment will maintain late successional stands in structural class 4 or 5 until the seed cut or overstory removal cut occurs. At that point, the managed areas will be converted to a more open or younger structural stage. Stands not actively managed will continue to progress through natural succession. Impacts from timber harvest will continue to be relatively minor across the forest because of the limited acreage planned for active management for all alternatives. Most forest cover type acreage will continue to be influenced primarily through natural disturbance events.

Shifts in structural stages and climax species within cover types will vary among the alternatives depending upon the amount of natural and human induced disturbance that occurs. Alternatives F, B, K, and D allow the highest level of timber harvest, ski area expansion, and associated road construction, which may change structural stages. Alternatives I, E, and C have the least of these activities, and structural stages are expected to change the least in these alternatives. In all alternatives, the most change in structural stage is expected as forest stands continue to age naturally. Some aspen and lodgepole pine stands will slowly revert to spruce-fir through normal succession. Fire events, both prescribed and natural, will convert some areas to younger structural stages, but these events are not expected to convert major acreages over the planning period.

Patch characteristics	About a third of the White River National Forest is designated wilderness. In these areas the major changes to patch characteristics will occur as the result of natural disturbance agents such as fire, insects, and disease. Recently, emphasis has been placed on allowing fire to play a more natural role in wilderness than in the past. Human-induced active management in these areas will not change patch characteristics of cover types, average patch size, or the amount of edge. In all alternatives, about a third of the national forest is allocated to management area prescriptions that allow or promote various levels of active management to accomplish resource goals and objectives. In these actively managed portions of the forest, the following general effects on landscape patterns are anticipated:
Average patch size	Average patch sizes may be the most affected by alternatives that promote timber harvest, road construction, and ski area development. Alternatives F, B, and K allow the highest level of these specific developments (accounting for less than 0.1 percent annual acreage of the national forest in each of these alternatives), which may change patch sizes in forested stands. Alternatives D, I, C, and E all promote lower levels of activities that would result in changes to average patch size.
Edge densities	Increases in edge densities are expected to increase the most in alternatives F, B, and K, which promote timber harvests, road construction, and ski areas. Alternatives C, D, and I will result in the least amount of change to edge densities because of the low level of management activities.
Average core patch size	Average patch size influences the average size of core habitat. The results are expected to be the same as under average patch size, above.

DIRECT AND INDIRECT EFFECTS

Effects on landscape pattern from mineral exploration and extraction (leasable)

Impacts will result from the construction and maintenance of roads and well pads during development and extraction. No new lands will be made available or be authorized for leasing under any alternative. In Alternative B, 823,700 acres are administratively unavailable for leasable mineral entry in order to match management area prescription objectives. Alternative F has 827,000 acres unavailable, Alternative D has 874,200 acres unavailable, Alternative K has 908,600 acres, Alternative C has 921,000 acres, Alternative E has 933,600 acres, and Alternative I has 1,027,500 acres administrative unavailable. The cumulative impacts of these increases in protection on lands made administratively unavailable are not expected to result in significantly different forest cover types, structural stages, or patch characteristics forest-wide

Cover types—Some forested stands will be converted to non-forested areas as roads and well pads are constructed. Minor changes in the acreage of cover types will occur under all alternatives. Well pads and road surfaces will be maintained as unvegetated over the life of the development. When these areas are decommissioned and reclaimed, they will be reseeded to native species, which will eventually result in reestablishing forested vegetation in these areas.

Structural stages. Some late successional forest stands may be changed to non-forested areas during the development of roads and well pads. Forest-wide, this is not expected to significantly change the percentages of structural stages for any cover type.

Patch characteristics. Leasable mineral development will result in smaller patch size and more edge in the developed areas. These areas are expected to be restricted in size and generally will occur in lower-elevation areas, often in non-forested cover types.

Effects on landscape pattern from mineral exploration and extraction (locatable)

Development of access roads and ground-disturbing mineral exploration may affect some forest stands. The potential for intensive development of locatable minerals is considered to be low in all alternatives. The highest number of acres of mineral withdrawal occurs in Alternatives E and I, followed by Alternatives C and D. Alternative B has the fewest acres withdrawn. No significant changes to forest-wide cover types, structural stages, or patch characteristics are expected in any alternative.

Effects on landscape pattern from wildlife management

Prescribed burns in the shrubland and grassland cover types would be the most commonly planned activity to benefit wildlife species that might affect landscape pattern will be. These burns will revert older-aged shrublands and grasslands to early seral vegetation. These cover types historically developed with periodic fire and it is expected that impacts will be similar to those that would occur under natural fire events. Little wildlife enhancement management activity is planned that will affect forested cover types, structural stages, or patch characteristics.

Effects on landscape pattern from TES habitat management

Most management activities for threatened, endangered, or sensitive (TES) species that might affect patch characteristics will occur in management area 5.5, in which timber management and prescribed fire will be used to modify aspen and lodgepole pine stands to meet the habitat needs of lynx. The alternatives with the fewest acres allocated to this management area are Alternatives B (5,300 acres), E (13,000 acres), C (30,300 acres), and F (40,000 acres). Alternative I has 50,900 acres, Alternative D has 79,500 acres, and Alternative K has 84,000. Annual planned treatment acres (combined timber management and prescribed fire) are not available specific to management areas on the Forest. It is believed that impacts will correspond to the overall acreage of the management areas where those activities are allowed. Therefore, Alternatives B, E, C and F will have the least amount of potential impacts, while Alternatives D and K will have the most. Because of the relatively small amount of land planned for fuels or timber management treatments forest-wide and relatively few projects designed to replicate historical range of variability (HRV) conditions in Management Area 5.5 (forest landscape linkages), no significant changes to forest-wide cover types, structural stages, or patch characteristics are expected under any alternative.

Cover types. No changes to cover types are expected to occur under any alternatives.

Structural stages. TES management activities will move some late successional lodgepole pine and aspen stands into early successional stages.

Patch characteristics. To meet desired conditions identified in the management area description, management activities will strive to replicate HRV patch characteristics, including patch sizes and the maintenance of dead and downed woody material. This may entail larger patch sizes for individual cuts or burns and will reduce overall changes to average patch size and edge densities.

Effects on landscape pattern from fire management

Most prescribed fire will be used to achieve fuels management goals, primarily in non-forested cover types. Fuels treatments in forested areas generally are accomplished through timber harvest activities. The least amount of fuel treatment is in Alternative F (3,800 acres per year), next are Alternatives I and E, then B, and D, and the highest is in Alternatives C and K (6,200 acres per year). Fire suppression efforts will be similar in each management areas in all alternatives and will concentrate on protection of private lands and high-value natural resources (See Table 74). The acreage allocated to specific management areas varies by alternative and suppression efforts will reflect those allocations. Prescribed fire to accomplish wildlife or threatened, endangered, and sensitive species goals are discussed under those sections of this chapter.

Cover types. No significant changes in cover types are expected under any alternative. Some fires in conifer may regenerate as aspen, but these changes are expected to be small in acreage.

Structural stages. Prescribed fire for fuels reduction in forested stands will result in moving some stands from late successional to early successional stages.

Patch characteristics. Prescribed fire will result in changes in patch size and edge based on the size and prescription of the fire.

Effects on landscape pattern from travel management

The majority of the impacts on forest vegetation from travel management will result from vegetation alterations during the construction and reconstruction of roads and trails to meet travel objectives. Activities planned under Alternatives F and B result in the most miles of annual road construction, followed by Alternatives D, K, and E, while Alternatives I and C have the least new miles. Overall, Alternatives C and I result in the most miles of annual road closures followed by Alternatives D, E, and B, while Alternative F closes the fewest miles annually.

The total miles of roads and trails are the best measure of the effects of travel management on landscape pattern. However, figures for actual miles of roads expected under each alternative are not available. Total miles of open system roads are expected to be reduced in all alternatives over the current situation. Comparing the amount of the national forest managed for non-motorized vs. motorized opportunities provides an approximation of the possible portion of the forest where road building might be expected to occur. Approximately one-third of the White River National Forest is designated wilderness. Additional areas on the forest are allocated to management prescriptions that are managed for roadless characteristics and non-motorized uses through management prescriptions standards and guidelines or Recreation Opportunity Spectrum (ROS) classifications that do not permit motorized uses. Alternative F has the least total acreage devoted to these non-motorized classifications (1,018,200 acres, 46 percent of the national forest). This is followed by Alternatives E, D, B, and C.

Alternative K has 1,490,000 acres (65 percent of the national forest) allocated to non-motorized classes, and Alternative I has the most of all alternatives with more than 1.6 million acres (71 percent of the national forest) in non-motorized classifications.

Cover types. Some forested stands will be converted and maintained as non-forested areas. More miles of road are expected to be closed and obliterated than new miles of road construction in all alternatives. The obliterated roads will generally be allowed to progress through natural succession and most will eventually return to their original cover types.

Structural stages. Some forested stands will be converted and maintained as structural stage 1 or as non-vegetated areas. More miles of road are scheduled for closure and obliteration than for new road construction in all alternatives. The obliterated roads will generally be allowed to progress through natural succession.

Patch characteristics. The construction/reconstruction of new roads will result in reducing average patch size and the creation of new edge. The decommissioning and obliteration of existing roads will result in slight increases in patch size and the reduction of edge over the long term. More miles of roads will be decommissioned than newly constructed in all alternatives, resulting in a positive, long-term gain in patch size and loss of edge. These effects will be long-term effects and the results will not be effective in reducing edge and increasing patch size over the life of the plan.

Effects on landscape pattern from utility corridors

The development of utility corridors is expected to be fairly uniform in all alternatives. Some forested stands will be converted and maintained as early structural stage vegetation during this development. This activity will reduce the overall amount of forest cover type, increase the amount of younger structural stands, reduce stand patch size, and add new sharply defined edges between the utility rights-of-way and adjacent areas. Because of the small acreage allocated to this use, forest-wide impacts are expected to be minor in all alternatives.

Effects on landscape pattern from recreation management

The main effects on patch characteristics will result from trail construction and reconstruction activities, which have the potential to affect some forest stands. Patch sizes will be reduced and new edge will be created. Reconstruction activities may or may not further affect stands, while new construction work will include both forested and non-forested areas. Site-specific information concerning potential new miles of trails is not available, so it is not possible to estimate the total effects on forested stands. Impacts are anticipated to be minor in all alternatives for cover types, structural stages, and patch characteristics.

Effects on landscape pattern from ski areas

Timber removal for skiing will affect some forested stands. Existing vegetation will be removed to construct ski trails, lift lines and towers, roads, and buildings, and to bury utilities. In all alternatives, these activities are confined to the allocated area, and not all acres within the management area boundary will be modified. Approximately 45% of the existing land included within the ski area permit boundaries has been developed for downhill skiing. Effects on forested stands from skiing development are fewer when

development occurs above treeline; in non-forested areas, including many back bowls and avalanche paths; and between rock outcroppings.

Although some impacts to forested stands are expected to continue as ski areas continue to develop within existing permit boundaries, these areas have already experienced the majority of the development expected to occur on these lands. The most significant impacts will occur within areas allocated for future expansion. Alternative D has the least potential for these types of significant impacts with no acres allocated for potential expansion, Alternative I has 300 acres of potential expansion, K has 8,600 acres, C has 14,700 acres, F has 25,300 acres, E has 40,800 acres and B has 50,000 acres. Based on existing developments on ski areas on the WRNF, approximately 45% of the acres proposed for potential expansion would be developed for downhill skiing in each alternative. Although impacts on areas within permit boundaries may be significant, the forest-wide impact on cover types, structural stages, and patch size and edge density will be difficult to measure because of the relatively few acres allocated to this prescription and the existing wide variability of these parameters across the forest.

Cover types. Some conversion of one vegetation type to another is expected to occur because of ski area potential expansion development in Alternatives B, E, F, C, and K (in order of magnitude of development, most to least). In Alternatives D and I, ski area expansion development is not expected to increase significantly over current conditions. The modified areas will be managed over the long term as non-forested areas that will permanently change those cover type.

Structural stages. The modified areas will be managed over the long term as non-forested areas that will permanently move those stands into structural stage 1.

Patch characteristics. Development may decrease average patch size and increase edge in managed areas.

Effects on landscape pattern from aerial transportation corridors

Effects on cover types, structural stages, and patch characteristics will be similar to those associated with utility corridors. Alternatives B, D, K, and I have no land allocated to aerial transportation corridors. Alternative C has 400 acres, Alternative F has 1,400 acres, and Alternative E has the most, 2,800 acres (less than 1 percent of the forest). Although impacts on areas within the actual development area may be significant, the forest-wide impacts will be difficult to measure because of the relatively few acres allocated to this prescription.

Effects on landscape pattern from recommended wilderness, research natural areas, special interest areas (minimal use) or wild rivers special interest areas (minimal use)

Patch characteristic in these areas will be shaped primarily through the forces of natural disturbance activities, such as fire, insects and disease, and windstorms. Active management will be minimal in all the categories listed. The least amount of land allocated to these special areas is in Alternative B, 13,600 acres (0.6 percent of the White River National Forest). More acres are allocated in Alternative F, then Alternatives E, K, D, C; the most acreage allocated is in Alternative I, 362,000 acres (16 percent of the national forest). It is impossible to predict the amount of change that will occur because of natural events, but it is anticipated that levels of change will correspond to the acreage allocated.

Effects on landscape pattern from special interest areas (use or interpretation), scenic byways, or scenic and recreational rivers

These designations are not expected to cause significant changes to cover types, structural stages, or patch characteristic for any alternative. Natural disturbance events will continue to be the most significant change agent in these areas, but active management to limit the impacts of these disturbances (such as fire suppression) may play a major role to meet the area objectives. Alternative B has the smallest acreage allocated to these prescriptions, 5,300 acres; Alternative K has 22,800 acres; Alternatives C, D, E, and F all have between 25,200 to 36,600 acres; and Alternative I has the most, with 44,200 acres.

Effects on landscape pattern from timber management

The largest impacts on forest stands will occur in the structural stage ratios and in patch characteristics during even-aged management treatments, such as clearcuts. Alternatives F, B, K, and D promote the highest levels of even-aged silviculture. Alternative F would result in 1,100 acres of annual even-aged aspen and lodgepole pine management (less than 0.1 percent of the forest-wide aspen and lodgepole pine, and less than 0.2 percent of the suitable base aspen and lodgepole pine in that alternative). Alternative B has 705 acres, Alternative K has 600 acres, and Alternative D has 500 acres, while Alternative E has the fewest, 300 annual acres (less than 0.02 percent of the forest-wide aspen and lodgepole pine, and less than 0.2 percent of the suitable base aspen and lodgepole pine in that alternative).

Cover types. No significant changes to cover type acreages are anticipated under any alternative.

Structural stages. In all alternatives, the majority of the forested acres on the White River National Forest will be managed through natural disturbance processes rather than through active silvicultural treatments. Within suitable timber lands, spruce-fir will continue to be managed mainly under the preparatory cuts of shelterwood silvicultural systems. These silvicultural treatments are not expected to change the structural stage of spruce-fir for any alternative. The highest impact on structural stage is expected to result from clearcut silvicultural treatments in the aspen and lodgepole pine cover types within the suitable base acreage. Because of the small acreage planned for active even-aged treatments (less than 0.08 percent of the forested acres harvested per year in all

alternatives), forest-wide stands will continue to age, and acreages for structural stages 4 and 5 are expected to increase in all alternatives. Without large-scale natural disturbance events, structural stages 1 and 2 will continue to make up relatively low percentages for all cover types across the forest.

Patch characteristics. Given the low percentage of past and future planned timber harvest activity on the White River National Forest, the existing patchiness of the forest, and the wide variability of existing patch sizes in both managed and reference landscapes, it is not expected that major forest-wide changes to average patch size will occur under any alternative. The greatest impact on average patch size is expected to result from clearcut silvicultural treatments in the aspen and lodgepole pine cover types within the suitable base acreage. The historical average patch sizes for aspen and lodgepole pine clearcuts on the forest are 9 acres for aspen and 11 acres for lodgepole pine. If the forest follows historical cutting patterns regarding patch sizes, average patch sizes for late successional and early successional aspen and lodgepole pine may be reduced in heavily managed areas of the suitable timber base. Spruce-fir will continue to be managed mainly under the preparatory cuts of shelterwood silvicultural systems, and the average patch size is not expected to change significantly for any alternative. Integrating the results of the patch characteristic analysis into project planning will minimize the potential for significant changes to forest-wide patch size distribution.

CUMULATIVE EFFECTS

The cumulative effects for forest vegetation considers lands within the White River National Forest boundary and the private and BLM land between the major divisions of the forest. Much of the forested vegetation within the cumulative impacts assessment area occurs on the White River National Forest. Much of the private land within the assessment area has been intensively developed over the past 100 years. Early settlement included mining, ranching, farming and townsite development. With the continued development of private lands surrounding the forest, impacts on vegetation on these lands are expected to be more significant than on the forest.

Approximately 1/3 of the forest is designated wilderness and an additional 1/4 is within inventoried roadless areas. Historically, on the remainder of the forest, the major impacts to forested lands has occurred due to the development of recreation facilities such as ski areas, roading, and timber harvest. Within the forest boundary, the greatest overall future impacts to patch characteristic are expected to occur in Alternative F because of the amount of road building, timber harvest activity, and ski area development. Next would be Alternatives B, K, and D, followed by Alternatives I, E, and C. Annually, less than 0.1 percent of the total forested land area will be affected by active management activities under any alternative. The BLM lands within the assessment area have historically been managed similar to NFS lands and this type of management is expected to continue. The limited amount of active management on these BLM lands is not expected to significantly affect overall patch characteristics within the assessment area over the life of the plan.

Cover types. Private land development often results in cover type conversions from native vegetation to lawns and concrete, while most Forest Service management activities maintain existing cover types. The greatest amount of change to cover types over the cumulative assessment area is expected to occur on private lands adjacent to the forest.

Structural stages. Private landowners are not subject to the same restrictions concerning logging practices as are federal land managers. It is anticipated that changes to structural stages on private timber lands may be more significant than for the forest, based on percentage change by ownership. The overall effect of this management within the assessment area is expected to be minor due to the relatively small acreage of forested land in private ownership.

Patch characteristics. Patch size and edge will increase more significantly on private lands subjected to logging than on the forest. The overall effect of this management is expected to be minor due to the relatively small acreage of forested land in private ownership.

Old-growth and late successional forests

Affected environment

Introduction There is growing concern about the status of old-growth forests and the need for such areas to supply critical habitats for wildlife. The age at which old growth develops and the structural attributes that characterize old growth varies by forest cover type, climate, site conditions, and past disturbance. According to Mehl (in Kaufmann, Moir, and Bassett 1992) old growth typically is distinguished from younger growth by several of the following stand attributes:

- Large trees for species and site,
- Variation in tree sizes and spacing,
- Standing and down dead trees,
- Decadence in the form of broken or deformed tops or bole and root decay,
- Multiple canopy layers,
- Gaps in the tree canopy and understory patchiness.

Late successional forests are defined as structural stages 4B, 4C, and 5 (see **Table 3-17**). These generally are older-aged stands with large trees and at least 40 percent canopy closure. Late successional descriptions include old growth but also include other mature forests. Although a stand may contain some trees that meet the criteria for old growth, the stand as a whole may not be representative of an old-growth ecosystem. Many of the vertebrate species that use old-growth forests also find suitable habitat in late successional forests that do not meet the technical definition of old growth. These late successional forests may contain the structural components of dead and downed woody material, tree size, understory development, and other characteristics that meet the functional needs of a species in question, but they may be younger than the definition needed to qualify as old growth.

An example would be a mature spruce-fir forest that has replaced a lodgepole pine forest. Such a forest would be classed as late successional. Although spruce-fir is the dominant overstory, downed material from the lodgepole, as well as standing remnants, may be present in abundance.

Old growth is thought to be the preferred habitat for specialized mosses, fungi, microbes, and some higher plants, but the White River National Forest has not identified any species of vertebrate that is an old-growth obligate. Many of species on the national forest found in old growth also are commonly found in late successional forest habitats. Old-growth forests have not been identified as being a habitat-limiting factor for any wildlife species on any major areas of the national forest.

The level of old growth present in the landscape often is perceived to be the result of not interfering with natural processes. In some cases, however, human influence can produce more old growth, such as when fire control interrupts natural fire regimes. Conversely, natural disturbances such as insect epidemics may curtail old growth by killing all of the large trees in a stand.

The White River National Forest recently completed an inventory of old-growth areas that focused on conifer types and also documented stands that do not currently meet the description of old growth but have the potential to become old-growth forests within 100 years. These stands were identified as ‘recruitment old growth’. This old-growth data, along with the acreage of recruitment old growth and late-successional forest, is shown in **Table 51**.

The development of old-growth characteristics depends on environmental site conditions including slope, aspect, and elevation. An aspect evaluation of the old-growth conifer on the White River National Forest indicates that north aspects are more favorable for the development of the characteristics that meet the Region 2 description of old growth (56 percent of all the old-growth stands occur within the 135 compass degrees between northwest and northeast). These aspects normally result in cooler and moister conditions more favorable to the development of large trees. Conversely, only 19 percent of the old growth occurs in the 135 degrees facing south, which would be warmer and drier.

Table 51
Inventory of old growth

<i>Species</i>	<i>Acres</i>	<i>Acres of Late Successional</i>	<i>%</i>	<i>Acres of Old Growth</i>	<i>%</i>	<i>Acres of Recruitment Old Growth</i>	<i>%</i>
Douglas-fir	69,488	33,579	48	1,296	2	2,647	2
Lodgepole pine	256,535	20,701	8	8,760	3	9,857	4
Spruce-fir	652,659	357,697	55	67,390	10	26,089	4
Total	978,682	411,977	42	77,446	8	38,593	4

Environmental consequences

GENERAL EFFECTS

Inventoried old growth has been identified and will be protected under all alternatives. These stands have been withdrawn from the suitable timber base and ASQ calculations. Under all alternatives a high percentage of the White River National Forest is in allocations that limit the types of management activities allowed. Coupled with the low level of active management planned for the remaining portions of the national forest, it is expected that an increased number of acres of late successional forests will develop old-growth conditions through the life of the forest plan.

In all alternatives, the majority of changes to late successional forest acreages will occur because of natural disturbance events. In all alternatives, nearly two-thirds of the national forest will remain in wilderness or in other management allocations in which active management is restricted. The low level of management activities that do occur on the other third of the forest will change some late successional forested stands to early seral stages. These changes will be short-term in nature and, in most cases, will then progress through natural successional pathways. All alternatives plan annually fewer than 1,100

acres of even-aged timber management activities that would significantly affect structural. This is approximately 0.07 percent of the forested acres on the White River National Forest. Ski area developments that result in changing cover types (such as ski runs in forested areas) and new road developments are the major areas in which natural successional pathways will not be allowed to progress.

Forest wide, standards provide protection from active management activities for a percentage of late successional stands to assure the maintenance of habitat conditions for late successional dependent species.

DIRECT AND INDIRECT EFFECTS

Effects on late successional forests from mineral exploration and extraction (leasable)

Impacts may result from the construction and maintenance of roads and well pads during development and extraction. This development may result in some late successional stands being affected in the developed areas. Development areas are expected to be restricted in size and generally will occur in lower-elevation areas, which often are in non-forested cover types. No new lands will be made available for leasing under any alternative. In Alternative B, 823,700 acres are administratively unavailable for leasable mineral entry in order to match management area prescription objectives. Alternative F has 827,000 acres unavailable, Alternative D has 874,200 acres unavailable, Alternative K has 908,600 acres, Alternative C has 921,000 acres, Alternative E has 933,600 acres, and Alternative I has 1,027,500 acres administrative unavailable. The cumulative impacts of these increases in protection on lands made administratively unavailable are not expected to result in significant differences in late successional or old growth acreage forest-wide..

Effects on late successional forests from mineral exploration and extraction (locatable)

Development of access roads and ground-disturbing mineral exploration may affect some late successional forest stands. The potential for intensive development of locatable minerals is considered to be low for all alternatives. In Alternative B, 859,100 acres are withdrawn from locatable mineral entry in order to match management area prescription objectives. Alternative F has 866,100 acres withdrawn, Alternative D has 919,900 acres withdrawn, Alternative K has 955,200 acres withdrawn, Alternative C has 969,200 acres withdrawn, Alternative E has 1,019,500, and Alternative I has 1,068,300 acres withdrawn. No significant changes to forest-wide late successional acreage or distribution are expected for any alternative.

Effects on late successional forests from management of TES species

The major impacts to late successional forest from threatened, endangered, and sensitive (TES) species management activities will occur in management area 5.5, in which timber management or prescribed fire will be used to modify forested stands to meet habitat needs for lynx. These activities will move some late successional lodgepole pine and aspen stands into early successional stages. Spruce-fir is not expected to be actively managed in these areas for lynx at this time. The alternatives with the fewest acres allocated to this management area are B (5,300 acres), E (13,000 acres), C (30,300

acres), and F (40,400 acres). Alternative I has 50,900 acres, D has 79,500 acres, and K has 84,000. Planned treatment acres (a mix of timber management and prescribed fire) are not available specific to management areas on the forest. It is believed that impacts will correspond to the overall acreage of the management areas where those activities are allowed. Therefore, Alternatives B, E, C and F will have the least amount of potential impacts, while Alternatives D and K will have the most. Because of the relatively small amount of land planned for fuels or timber management treatments forest-wide, and relative few projects designed to replicate historical range of variability (HRV) conditions in Management Area 5.5 (forested landscape linkages), no significant changes to forest-wide cover types, structural stages, or patch characteristics are expected under any alternative.

Effects on late successional forests from fire management

Fire suppression efforts will be similar in each management areas in all alternatives and will concentrate on protection of private lands and high-value natural resources (See table 3-42). The acreage allocated to specific management areas varies by alternative and suppression efforts will reflect those allocations. This will result in continued aging of most stands across the forest. Stands in the middle seral stages will continue to move into late successional categories in all alternatives. The minor acreage of fuels treatment targeting late successional forests are not expected to significantly affect forest-wide acreage of late successional forests under any alternative. The least amount of fuel treatment is in Alternative F (3,800 acres per year), next are Alternatives I and E, then B, and D, and the highest is in Alternatives C and K (6,200 acres per year). Fire suppression efforts will be similar in each management areas in all alternatives and will concentrate on protection of private lands and high-value natural resources (See Table 74). The acreage allocated to specific management areas varies by alternative and suppression efforts will reflect those allocations.

Effects on late successional forests from travel management

Most impacts on forested vegetation from travel management will result from vegetation alterations during the construction and reconstruction of roads and trails to meet travel objectives.

The total miles of roads and trails are the best measure of the effects of travel management on landscape pattern. However, figures for actual miles of roads expected under each alternative are not available. Total miles of open system roads are expected to be reduced in all alternatives over the current situation. Comparing the amount of the forest managed for non-motorized vs. motorized opportunities provides an approximation of the possible portion of the forest where road building might be expected to occur. Approximately one-third of the White River National Forest is designated wilderness. Additional areas on the forest are allocated to management prescriptions that are managed for roadless characteristics and non-motorized uses through management prescriptions standards and guidelines or Recreation Opportunity Spectrum (ROS) classifications that do not permit motorized uses. Alternative F has the least total acreage devoted to these non-motorized classifications (1,018,200 acres, 46 percent of the national forest). This is followed by Alternatives E, D, B, and C. Alternative K has 1,490,000 acres (65 percent of the forest) allocated to non-motorized classes, and

Alternative I has the most of all alternatives, with more than 1.6 million acres (71 percent of the forest) of non-motorized classifications.

Activities planned under Alternatives F and B are expected to result in the most miles of annual road construction, followed by Alternatives D, K, and E, while Alternatives I and C will have the fewest new miles. Overall, Alternatives C and I should result in the most miles of annual road closures followed by Alternatives D, E, and B, while Alternative F should result in closing the least number of miles annually.

Effects on late successional forests from utility corridors

Utility corridor development is expected to be constant across the alternatives and will have some impacts on late successional forest stands during the development periods.

Effects on late successional forests from ski areas

Timber removal for the development of new runs and associated facilities is expected to affect some late successional forest stands. These stands will be converted and managed as early seral stands through the life of the plan. Effects on late-successional stands from development for skiing are less when development occurs above treeline; in non-forested areas, including many back bowls and avalanche paths, and between rock outcroppings. Although some impacts to late successional forested stands are expected to continue as ski areas continue to develop within existing permit boundaries, these areas have already experienced the majority of the development expected to occur on these lands. The most significant impacts will occur within areas allocated for future expansion. Alternative D has the least potential for these types of significant impacts with no acres allocated for potential expansion, Alternative I has 300 acres of potential expansion, K has 8,600 acres, C has 14,700 acres, F has 25,300 acres, E has 40,800 acres and B has 50,000 acres. Based on existing developments in ski areas on the forest, approximately 45% of these acres proposed for potential expansion would be developed for downhill skiing in each alternative. Not all acres within a ski area allocation will be developed and not all development that does occur will affect late successional forests. Although impacts on some late successional forest areas within permit boundaries may be significant, the forest-wide impact on late successional forests will be minor.

Effects on late successional forests from aerial transportation corridors

These areas will be established and managed to provide alternative transportation routes to move people to, from, and between key locations at ski areas. Effects from this activity will be similar to the development of utility corridors; however, aerial transportation corridors would require a higher level of maintenance and more frequent visitation. Ground-disturbing activities, including trampling with foot or vehicle traffic, would be higher than for utility corridors. Alternatives B, D, K, and I have no land allocated to this use, Alternative C has 400 acres, Alternative F has 1,400, and Alternative E has the most, 2,800 acres (less than 1 percent of the national forest). Because of the small acreage involved in all alternatives, the forest-wide percentage of late successional forest is not expected to change significantly.

Effects on late successional forests from recommended wilderness, RNAs, SIAs (minimal use), or wild rivers

Active management will be minimal in all these categories, resulting in the continued aging of most stands across the White River National Forest. More stands in the middle seral stages will move into late successional categories. The least amount of land allocated to these special areas is in Alternative B, 13,600 acres (0.6 percent of the national forest). More acres are allocated in Alternative F, followed by Alternatives E, D, K, and C, with the highest level in Alternative I, 351,600 acres (16 percent of the forest).

Effects on late successional forests from SIAs (use or interpretation), scenic byways, or scenic and recreational rivers

These designations are not expected to cause significant changes to late successional forests in any alternative. Natural disturbance events will continue to be the most significant change agent in these areas, but active management to limit the impacts of these disturbances, such as fire suppression, may play a major role to meet the area objectives. Alternative B has the least acreage allocated to these prescriptions, 5,300 acres; Alternative K has 22,800 acres; Alternatives C, D, E, and F all have between 25,200 to 36,600 acres; and Alternative I has 44,200 acres.

Effects on late successional forests from timber management

The largest potential impact on late successional forest acreage from timber management is expected to result from clearcut silvicultural treatments in the aspen and lodgepole pine cover types within the suitable base. Alternatives F, B, K, and D promote the highest levels of even-aged silviculture. Alternative F would result in 1,087 acres of annual even-aged aspen and lodgepole pine management (less than 0.1 percent of the forest-wide aspen and lodgepole pine, and less than 0.2 percent of the suitable base aspen and lodgepole pine in that alternative). Alternative B has 705 acres, Alternative K has 606 acres, and Alternative D has 540 acres, while Alternative E has the least, 274 annual acres (less than 0.02 percent of the forest-wide aspen and lodgepole pine and less than 0.2 percent of the suitable base aspen and lodgepole pine in that alternative). Spruce-fir will continue to be managed mainly under the preparatory cuts of shelterwood silvicultural systems, which generally will result in those stands remaining as late successional. Late successional characteristics would not change until the overstory removal cut. No overstory cuts, which would change the structural class, are projected to occur within the spruce-fir type within the first decade in any alternative.

CUMULATIVE EFFECTS

The cumulative effects for old-growth and late successional forests considers lands within the White River National Forest boundary and the private and BLM land between the major divisions of the forest. The overwhelming majority of old growth and late successional forests within the cumulative impacts assessment area occur on the White River National Forest. Although there is limited acreage of late successional forest in private ownership, it is expected that percentage changes to this age class will be greater on private lands due to continued development of these areas. The limited amount of old growth and late successional forest acreage on BLM land is not expected to change significantly due to active management. Overall, little impact on the total acreage or distribution of old growth or late successional forest within the assessment area is

anticipated because of actions on private or BLM lands due to the limited acreage of this forest type on those lands.

Historically, larger trees have been selected for during timber harvest operations. This has resulted in old growth and late successional forests generally being targeted for harvest. However, the limited amount of timber harvest coupled with the intensive fire suppression efforts that have occurred on the WR over the past 60 years have led to an overall aging of the forests rather than conversion to younger forests.

Spruce fir forests of Colorado historically contained a high percentage of old growth and late successional age classes. Currently over 50% of the spruce fir on the forest falls within the late successional and old growth categories. It is anticipated that this percentage will increase throughout the life of the plan.

Aspen and lodgepole pine forests are generally disturbance-related, seral species, but can develop late successional and old growth conditions. Historically, these species were found in higher abundance on the forest following significant disturbances, such as fire, windstorms, or insect epidemics. Currently 25% of the aspen and 40% of the lodgepole pine on the WR is late successional. This percentage is expected to increase for both species over the life of the plan.

On National Forest System lands, current direction is to avoid active vegetation management in inventoried old-growth stands, and old growth is projected to increase throughout the forest in all alternatives. Even within the suitable base acreage (where the majority of timber management will occur), the amount of late successional and old growth acreage is expected to increase in all alternatives. Less than 0.1 percent of the forested acres will be annually managed through prescriptions that have the potential to change structural stage. The remaining 99.9 percent of the forested lands will continue to age unless they are affected by natural disturbance events.

On portions of the national forest in which forested vegetation is less heavily managed, the percentage increase in late successional forest acreage is expected to be even more rapid. The only portions of the national forest in which late successional acreages may not significantly increase are aspen and lodgepole pine areas with concentrated, active vegetation management, or where large-scale natural disturbances occur. The slowest increase in late successional forests will occur in those alternatives that have the highest level of disturbance activities. The alternative with the highest acreage of human activities is Alternative F, followed by Alternatives B, K, and D. Alternatives C, E, and I have the least amount of activities and should have the most increase in late successional and old growth forests.

Part 3, Section 4

Non-forested vegetation

Introduction

Abstract About 27 percent of the White River National Forest consists of non-forested vegetation, including grasslands, forblands, shrublands, alpine, and non-forested riparian areas. Ninety-eight percent of the uplands and 95 percent of riparian areas currently are in or are moving toward desired future condition. Condition is expected to improve across all alternatives as long as the spread of noxious weeds is curtailed.

Summary Rangeland vegetation consists of several kinds of low-growing plants such as grasses, grass-like plants, forbs, and shrubs. Rangelands are a major component of the ecosystems of the White River National Forest. These lands include but are not limited to grasslands, forblands, shrublands, open-canopy coniferous forests, and associated riparian areas. Well-managed rangelands provide forage and cover for wildlife and forage for livestock, as well as water, recreation, and other resources. Species composition throughout the non-forested habitats is within the historical range of variability with the exception of the presence of Kentucky bluegrass and noxious weeds.

Key indicators

- Rangeland health and condition.

Legal and administrative framework

- The **Multiple-Use Sustained-Yield Act** (1960) provides that national forests are established and administered for several purposes, including range. This act also authorizes the Secretary of Agriculture to develop the surface renewable resources of the National Forest System for multiple uses and sustained yield of the services and products to be obtained from these lands, without impairment of the land's productivity.
- The **Federal Land Policy and Management Act** (1976) states that public lands will be managed in a manner that will provide food and habitat for fish, wildlife, and domestic animals.
- The **Public Rangelands Improvement Act** (1978) recognizes the need to correct unsatisfactory conditions on public rangelands by increasing funding for maintenance and management of these lands.

Affected environment

Introduction Non-forested vegetation covers about 27 percent of the White River National Forest (see the vegetation cover types map in the map packet). This vegetation can be described in terms of plant associations that are identified by the dominant climax species present in each. Hess and Wasser (1982) identified 45 habitat types on the forest. Sixteen of these are grassland and forbland habitat types and 10 are shrubland habitat types. These plant associations later were updated and translated as part of *Plant Associations of Region 2, Edition 4* (Johnston 1987). **Table 52** lists these non-forested plant associations in terms of the life zones in which they occur.

Table 52
Non-forested plant associations on the White River National Forest

Montane (forested types with understory vegetation)	Foothills (shrublands with understory vegetation)
Aspen / Thurber fescue Aspen / snowberry Aspen / serviceberry / chokecherry Aspen / serviceberry / chokecherry Aspen / meadow rue Aspen / cow parsnip Aspen / elk sedge Aspen / ligusticum Ponderosa / elk sedge Lodgepole / elk sedge Alpine fir/Englemann spruce/elk sedge	Serviceberry / elk sedge Serviceberry / snowberry / sage Sagebrush / arrow-leaf balsamroot Gamble oak / serviceberry Gamble oak / chokecherry Gamble oak / snowberry Wheeler bluegrass / Letterman needlegrass
Subalpine	Alpine
Bluebunch wheatgrass / Sandberg bluegrass Idaho fescue / slender wheatgrass Idaho fescue / sticky geranium Thurber fescue / Idaho fescue Thurber fescue / American vetch / Aspen peavine Timber oatgrass / varileaf cinquefoil Beaked sedge / water sedge Porter ligusticum / American vetch / aspen peavine Mountain big sagebrush / Idaho fescue Mountain big sagebrush / Thurber fescue Plainleaf willow / marsh marigold	Tufted hairgrass / marsh Marigold Tufted hairgrass / alpine Avens Mountain dryad / curly sedge Plainleaf willow / cliff sedge Arctic willow / alpine avens Greyleaf & barrenground willow / tufted hairgrass Greyleaf willow / alpine avens Alpine avens / alpine bistort Kobresia / alpine avens Alpine avens / curly sedge Dwarf clover / Rocky Mountain nailwort

Grasslands and forblands Grasslands and forblands cover about 20 percent of the forest. Grass and grass-like species commonly found in many of the grasslands below timberline include Thurber fescue, Idaho fescue, Kentucky bluegrass, mountain brome, tufted hairgrass, poa species, sedges, and three-awns. Forbs commonly found as a part of the grassland plant community include geranium, yarrow, beard-tongue, black-eyed Susan, wild buckwheat, dandelion, false dandelion, daisy, goldenrod, larkspur, paintbrush, sneezeweed, milk vetch, lupine, and American vetch.

Successional stages of mountain grassland vegetation are similar to other grasslands, except for the species of plants present. As grasslands mature they pass through a series of seral stages measured by changes in species composition. As a general rule, after disturbances, grasslands progress from bare ground to a forb-dominated community, then to a forb/grass mix, then to a grass-dominated climax community. These stages correspond in general to those described by Sampson (1919) as: (1) early weed, (2) late weed, (3) mixed grass and weed, and (4) climax herbaceous. This sequence, however, depends on the species composition and seed abundance at the time of the disturbance and the presence of non-native invasive species.

Shrublands Shrublands comprise about seven percent of the forest. All types, except willow and Krummholz, occupy low elevations and are relatively dominant although sometimes found interspersed with species of trees. **Table 53** displays current knowledge.

Table 53
Shrublands of the White River National Forest (GIS CVU database)

<i>Vegetation</i>	<i>Acres</i>	<i>% of Total</i>
Mountain mahogany	6,061	3
Rabbitbrush	107	<1
Sagebrush	42,473	23
Serviceberry	25,917	14
Snowberry	27,989	15
Willow	21,440	12
Unclassified shrublands*	57,771	32
Total	181,758	100

*predominantly Gambel oak

The 1984 Forest Plan indicated that 75 percent of the shrub type on the forest was in a mature age class. This is trending toward being out of the historical range of variability. In the past 11 years, about 44,000 acres (24 percent of total shrublands) have been treated, mainly by prescribed fire, and have been changed from mature age classes to immature age classes.

Alpine ecosystems

Alpine ecosystems cover about 10 percent of the forest. Grasses and associated species commonly found include kobresia, trisetum, sedges, and bluegrasses. Forbs commonly found in alpine areas include alpine sandwort, alpine avens, pygmy bistort, blueleaf potentilla, and moss pink. Alpine shrubs include Greyleaf willow, plainleaf willow and arctic willow, while Krummholz spruce and fir are the trees found in these zones. Alpine soils are almost always thin, cold, and old; soil-formation processes are slow to very slow. Soil productivity is low. Even though most alpine soils have high proportions of organic matter (Bamberg and Major 1965), these soils have low fertility (Thilenius 1975), largely because of the low soil and air temperatures and the effective drought situation (little water available in liquid form to plants). Soil moisture is the most important factor controlling plant distribution, and the moisture depends on snowdrift patterns, which vary extremely over small distances (Thilenius 1975). Seed production, germination, and seedling establishment are sporadic under natural conditions (Paulsen 1975).

There is significant instability of alpine surfaces, even in the absence of disturbance. Vegetation plays a major role in providing the stability of surfaces and succession that exists in those ecosystems (Tieszen and Archer 1979). Since growth is slow in the plants that provide stability, alpine ecosystems are very sensitive to disturbances that alter vegetation cover.

The alpine belts have a harsh environment, where ecosystems are delicately balanced, slow growing, highly susceptible to damage, and where recovery from disturbance varies from slow to impossible (Johnston and Brown 1979).

Riparian vegetation Riparian vegetation (Table 54) covers less than five percent of the White River National Forest. Riparian vegetation is defined as plant communities dependent upon or tolerant to the presence of free and unbound water near the ground surface. Dominant cover types include trees, shrubs, forbs, grasses, and sedges. Riparian vegetation is of great importance for maintaining water quality and quantity, stabilizing stream banks, and providing habitat for fish and wildlife species.

Table 54
Riparian vegetation by dominant cover type on the White River NF (GIS WETVEG)

<i>Species</i>	<i>Acres</i>	<i>% of Total</i>	<i>Species</i>	<i>Acres</i>	<i>% of Total</i>
Aspen	5,291	5	Forbs/grass	2,103	2
Cottonwood	1,796	2	Forbs/sedge/grass	703	<1
Spruce-fir	7,185	7	Forb/willow	14,614	13
Lodgepole pine	3,859	3	Sedge/grass	3,742	3
Blue spruce	178	<1	Sedge/willow	35,830	33
Douglas fir	35	<1	Willow	32,944	30
Mixed shrubs	1,344	1			
			Total Acres	109,624	

Rangeland production **Total production** is the amount of vegetation that can be expected to grow annually on well-managed rangelands or woodlands that are supporting the potential natural plant community. It includes the current year's growth of grasses and forbs as well as leaves, twigs, and fruits of woody vegetation. Information used to determine total production was taken from Natural Resource Conservation Service's Soil Surveys and Range Analysis data. Production levels are measured in air-dried weight. The total production for the forest was calculated by multiplying the acres within each forage producing habitat type by the vegetation produced per acre per year within that habitat type. Forage production values by habitat types are shown in Appendix B. Total pounds of vegetation produced annually is estimated at 1.7 billion. Under current allowable use guidelines (45 percent), approximately 763 million pounds of forage produced annually is available for wildlife and domestic livestock. Under current management, domestic livestock use approximately 107 million pounds annually (13 percent of the available forage), and elk and deer use approximately 220 million pounds (28 percent of the available forage).

Rangeland health **Rangeland health** is defined as the degree to which the integrity of the soil and the ecological processes of rangeland ecosystems are sustained. The capacity of rangelands to produce forage and satisfy values on a sustained basis depends on internal self-sustaining ecological processes such as soil development, nutrient cycling, energy flow, and the structure and dynamics of plant and animal communities (National Research Council 1994).

Rangeland condition Rangeland condition can be described by combining vegetation management status with trend determinations. Vegetation management status is the relative degree to which present plant community resembles the desired plant community for that ecological site. Trend is the direction of change in vegetation and/or soil over time. Trend is described as toward, static, or away from objectives. A rangeland is considered to be in satisfactory condition when the desired future condition is being met or short-term objectives are being achieved to move the rangeland toward the desired future condition (USDA Forest Service 1996)(*Rangeland Analysis and Management Training Guide — Region 2, 1996*). A rangeland is considered to be in unsatisfactory condition when desired future condition is not being met or short-term objectives to maintain a rangeland in or move it toward the desired condition are not being met.

Rangeland condition is reported annually by placing all acres of rangeland vegetation within existing allotments into one of three categories. The categories are: (1) meeting forest plan objectives, (2) moving toward forest plan objectives, and (3) not meeting or moving toward forest plan objectives. Verified acres are those acres for which utilization or trend information has been gathered. As monitoring and analysis are accomplished, the number of acres in each category is expected to change. Rangeland conditions in 1997 are shown in **Table 55**.

Table 55
Rangeland condition

	Suitable Rangeland		Riparian Area	
	Acres	%	Acres	%
Monitored in FY 97	168,812	18	3,113	13
Satisfactory Condition				
<i>(meeting forest plan objectives)</i>				
Verified	149,670	15	1,039	4
Estimated	639,928	67	18,343	75
Satisfactory Condition				
<i>(moving toward forest plan objectives)</i>				
Verified	28,924	3	243	>1
Estimated	108,969	11	3,572	15
Unsatisfactory Condition*				
<i>(not meeting and not moving</i>				
<i>toward Forest Plan objectives)</i>				
Verified	2,815	0.3	232	>1
Estimated	14,800	1.6	918	>4
Undetermined Status	5,183	>1	60	>1
Total	950,289		24,407	

Source: Forest Service Range Management Information System (FSRAMIS) database

*These numbers do not reflect the detrimental impact of noxious weeds on rangeland condition (see noxious weeds section).

Nearly one million acres within current grazing allotments are considered to be capable for livestock grazing. Approximately 83 percent of these acres are within a desired vegetation condition; 15 percent of the acres currently are moving toward the desired vegetation condition. Less than 2 percent of the acres currently are not within a desired condition and are not improving at this time. These acres may be brought to the desired condition through full implementation of existing standards and guidelines

When considering riparian vegetation alone, about 79 percent of these acres are estimated to be within a desired vegetation condition. An additional 16 percent of the acres currently are moving toward the desired condition. About 4 percent currently is not within a desired condition and is not improving at this time.

Almost one-half million acres of the forest are not included within grazing allotments. Inventories have not been completed on these acres to determine the number of acres that might be capable of sustaining grazing by domestic livestock. The health of the non-forested vegetation on those areas has not been inventoried. The extent to which these areas are infested with noxious weeds or overutilized by big game species is unknown.

FUTURE TRENDS

The overall health of the rangelands is in an upward trend. Factors contributing to this upward trend include implementation of watershed conservation practices, forage utilization guidelines, riparian standards and guidelines and improved grazing management strategies, and the decline in livestock numbers from the excessive numbers of the 1890–1930 era.

Current trends in elk populations, motorized recreational use, lack of fire, and increases in noxious weeds may have an adverse effect on overall rangeland health by compacting soils, overusing vegetation, and changing species composition. Without a concerted effort to manage these factors (especially noxious weeds), rangeland health can be expected to experience a serious decline within the life of the 2002 Forest Plan.

Environmental consequences

GENERAL EFFECTS

To determine the effects of various management activities on non-forested vegetation, one must assess the effects on soil stability, watershed function, nutrient cycling, and energy flow. Activities having the greatest influence on these factors include those that affect the physical, chemical, or biological properties of the soil, and/or the distribution of nutrients and energy within the ecosystem and through time. Activities that can influence vegetation include: degree, duration and timing of grazing and browsing by domestic livestock and wildlife; changes in forest and brush canopy closure; the intensity and frequency of fire; and the occurrence and density of noxious weeds. Activities affecting soil structure include earth disturbance and soil compaction resulting from (a) construction and use of roads, trails, developed and dispersed recreation sites, and other improvements; (b) use of off-road vehicle; and (c) heavy trampling by domestic livestock, recreational stock, and wildlife.

By definition, riparian vegetation is dependant on or tolerant of the presence of free and unbound water near the ground surface. Therefore, management activities that affect the hydrology function of riparian areas and the surrounding watershed have the greatest potential to affect riparian vegetation. Activities throughout the watershed can affect the timing, intensity, and quality of water reaching the riparian area. Condition of the stream channel and riparian vegetation influences the timing, intensity, and quality of water moving through the riparian area.

Standards and design criteria in the Region 2 Watershed Conservation Practices Handbook and forest-wide standards and guidelines are designed to protect soil, aquatic and riparian ecosystems. These standards and guidelines are constant across all alternatives.

In alpine ecosystems, vegetation plays a major role in providing for the stability of surfaces and succession that exists in those ecosystems (Tieszen and Archer 1979). Since growth is slow in the plants that provide stability, alpine ecosystems are very sensitive to disturbances that alter vegetation cover. Disturbance of the soil surface in many cases leads to greater instability (Tieszen and Archer 1974).

DIRECT AND INDIRECT EFFECTS

Effects on non-forested vegetation from soil and watershed management

Rangeland health and condition should continue to improve through application of forest-wide standard and guidelines and watershed conservation practices. Maintenance of ground cover, soil organic matter, soil structure, and plant vigor will help to maintain or improve nutrient and energy flow. These standards and guidelines are consistent across all alternatives.

Effects on non-forested vegetation from aquatic species, riparian, and wetlands management

Forest-wide standards and guidelines emphasize management and protection of riparian areas and wetlands. Land treatments would be managed to conserve site moisture and protect long-term stream health. Management of stream crossings, dispersed recreation, ground cover, soil structure, forage utilization, vegetative regrowth, streambank trampling, and use of woody vegetation will have a positive effect on the density and vigor of vegetation within riparian areas. These actions will maintain, improve, or restore riparian and wetland functions, including energy dissipation, sediment capture, groundwater recharge, and stream bank stability. These standards and guidelines do not vary by alternative.

Effects on non-forested vegetation from wildlife habitat management

The primary methods used to improve wildlife habitat of the White River National Forest include prescribed fire and timber harvest and, to a lesser degree, construction of water developments and fertilization. **Table 22** provides information pertaining to the number of acres proposed for treatment with fire by alternative. The forest will coordinate with the Colorado Division of Wildlife in setting elk herd objectives and levels of habitat management.

Effects on non-forested vegetation from management of TES species

Non-forested habitat types identified as important to endangered, threatened and sensitive species will be managed to protect, conserve and restore those species. Management activities may be restricted or emphasized based on the needs of the species under consideration. These activities will be site specific and do not vary among alternatives.

Effects on non-forested vegetation from domestic livestock grazing

Most native rangelands have evolved with periodic disturbance, such as fire and grazing by native ungulates. The evolution of herbivores and edible plants occurred together. Selective pressures over thousands of years favored plants that developed resistance to browsing, grazing, and trampling.

Grazing animals affect plant communities in several interrelated ways, including plant defoliation, nutrient removal and redistribution through excreta, and mechanical impact on soil and plant material through trampling.

The short-term or immediate effect of grazing on a plant can (1) be detrimental, that is, reduce plant vigor or even kill the plant; (2) be beneficial, that is, increase size or growth rate; or (3) have no apparent beneficial or negative effect. Grazing by large herbivores in the short run often is of little importance in the process of vegetation change, unless grazing is so excessive that the grazed plants cannot restore themselves (Valentine 1990). The long-term effect of grazing would largely depend not only on the adaptation of the plant to local environmental factors but also on the relative effects of grazing on associated plants and plant species. Most plants can withstand some loss of foliage and still maintain their position in the plant community. Grazing removes the aerial portion of the plant, allowing sunlight to reach the meristem, where growth occurs.

Perennial plants store enough food to last more than one year. Thus, even if a plant is defoliated for a year or two, as by grazing, it generally will not die. As the plant produces leaf surface, photosynthetic processes begin to replace depleted carbohydrate reserves, thus generally making herbaceous plants highly resistant to grazing pressures. However, overutilization of forage species over an extended period of time results in those plants eventually depleting their food reserves (stored carbohydrates). In the long term, those forage species highly desired by herbivores (thus first to be overutilized) would be replaced by other species less desired by herbivores.

Forest-wide standards and guidelines continue to phase out season-long grazing; rather, they emphasize short-duration grazing, set maximum forage, and riparian utilization guidelines for domestic livestock and wildlife. Standards do not vary among alternatives. Livestock numbers will vary slightly over time as permittees abandon areas because of increasing conflicts with other uses and as management plans are implemented. Rangeland condition is expected to continue to improve across all alternatives as long as an aggressive noxious weed program exists.

The degree to which domestic livestock grazing affects riparian vegetation and stability mainly depends on the timing, intensity, and duration of that grazing. Excessive stream bank trampling, overuse of plant species, and compaction of soils resulting from improper grazing practices can all have an adverse impact on riparian vegetation. As water tables are lowered and riparian areas are drained, the abundance and diversity

species dependent on free and unbound water is reduced. Forest-wide standards and guidelines address these issues by avoiding season-long grazing, emphasizing short-duration grazing, setting utilization limits on herbaceous and woody vegetation, allowing for periods of regrowth and recovery, and setting acceptable limits of stream bank trampling. Overall these standards and guidelines are designed to maintain plant vigor and hydrologic function. Implementation of these standards and guidelines as well as implementation of grazing strategies identified in allotment management plans and annual operating instructions have resulted in and will continue to maintain riparian vegetation and improve those areas in unsatisfactory condition across alternatives. If found inadequate to resolve a site-specific situation, additional mitigation can be developed at the allotment management planning level.

Because of the low primary productivity of alpine areas and the very high spatial variation in that productivity, many areas within alpine ecosystems are considered unsuitable for efficient grazing use. During the grazing capability analysis, much of the alpine area was identified as rock, barren, or low in productivity and was removed from the lands capable of supporting livestock.

Effects on non-forested vegetation noxious weeds management

Presently it is estimated that there are 89,000 acres infested with noxious weeds on the White River National Forest. Sixteen species are known to occur. See Table 70 for estimated acres and spread rates by species. Although noxious weeds are commonly found in areas of ground disturbance, they are also known to invade otherwise healthy, undisturbed plant communities. Once established, noxious weeds reduce biodiversity and crowd out native plants, displacing wildlife that depend on these native plants and disrupting watershed function, soil chemistry, nutrient and energy flow. Left unchecked noxious weeds can increase at an estimated 14% per year posing a significant threat to ecosystem health. See FEIS Volume 2, Chapter 3, Topic 1, Part 3, Section 6—*Noxious Weeds*, for the effects of various activities on the risk of noxious weed infestations. The risks of noxious weed infestations vary by alternative, with those alternatives with the most ground disturbance having the greatest risk. Presently the White River treats approximately 800 to 1,200 acres per year. Without a concerted effort noxious weeds can be expected to increase dramatically over the life of the plan under all alternatives.

Effects on non-forested vegetation from fire management

The occurrence of fire changes the seral stage of non-forested plant communities from a mid- and late-seral stage to an early seral stage. As a general rule, after disturbances, grasslands progress from bare ground to a forb-dominated community, then to a forb/grass mix, then to a grass-dominated climax community. This sequence is, however, determined by the tolerance of the occurring species to fire and the presence of noxious weeds. Noxious weeds after fire can out-compete native vegetation and slow or even derail succession.

In shrublands, depending on the prior species composition and intensity of the burn, the shrub species may return rapidly or take several years to redominate the site. Species such as Gambel oak (a stump sprouter) reestablish very quickly, whereas shrub species that reproduce by seed take longer to reoccupy the site.

In the short term, fire removes vegetational cover, exposes soils to potential increases in erosion, and releases nutrients previously tied up in woody material. Through time this increase in available sunlight and nutrients results in an increase in herbaceous vegetation. Some nutrients are lost through volatilization. Depending on preburn species composition, there may be a positive or negative impact on the uses of the vegetation. In areas in which noxious weeds or undesirable native species such as rabbitbrush exist prior to the burn, there may be a net loss in desirable species. Over time, as the overstory species begin to dominate the site, sunlight reaching the understory and available nutrients diminish, and understory productivity falls off.

Alternatives vary as to the number of acres to be treated with fire, with Alternative C burning 6,200 acres annually, followed by Alternatives K, D, B, E, F, and I.

By definition, riparian vegetation generally has higher fuel moisture content than surrounding upland vegetation and is therefore relatively more resistant to burning. The effects of burning riparian vegetation during a wildfire or prescribed burn depend on the intensity of the fire and amount of riparian area burned. Under low intensity to moderate intensity fires, riparian areas recover very quickly. Herbaceous species and brush species such as willow start to respond within that growing season or by the following season. As intensity increases and tree species are consumed, recovery of those tree species is much slower. Of greater importance is the amount and intensity of the watershed burned by the fire and its effect on the hydrologic function. Often after a fire of significant size, loss of vegetative cover, runoff, and erosion are significantly higher. Any gullies that may form can lower the water table within a riparian area, dry the site, and result in a loss of riparian species. Overall prescribed fire poses less risk of these conditions occurring than does wildfire, because prescribed fires are planned in smaller size, at lower intensities, and under more controlled conditions. Annual acres treated with prescribed fire depends on budgetary constraints and burning conditions. Project planning and site-specific mitigation play a more significant role in what is burned and at what intensity than do the differences between alternatives.

Effects on non-forested vegetation from travel management

The effects of roads and trails on non-forested vegetation include compaction of soils, concentration and diversion of water, and a loss of vegetation production. Alternative D closes unneeded roads to reduce road density in critical wildlife areas. Alternatives C and I convert some motorized roads and trails to non-motorized trails. The closing of roads will have a positive effect on non-forested vegetation if these roads are ripped, properly drained, and revegetated. Alternative B does the least to restrict motorized use to designated routes. Alternative E creates more trail opportunities, and Alternative F provides for the highest level of new roads. Alternative K includes a mix of road reconstruction for timber harvest and conversion of unneeded roads to non-motorized trail.

Effects on non-forested vegetation from recreation management

Developed and dispersed recreation are expected to increase regardless of the alternative selected. Increased use of current developed recreation sites is anticipated. As dispersed recreation increases, more dispersed recreation sites will be established. These activities are expected to result in localized increases in soil compaction and a loss of vegetation on these sites.

Ski area development varies dramatically across alternatives. Clearing of vegetation for new ski trails disturbs the soil and non-forested vegetation. The implementation of forest wide standards and guidelines, the implementation of standards and design criteria identified in the Watershed Conservation Practices Handbook, and the development of revegetation plans, are all designed to reduce the impacts on soils and native vegetation. Alternatives having the most acres allocated to ski areas include Alternative B and I.

As people are attracted to streams and rivers for fishing and other recreational pursuits, streambank trampling can be expected in areas of concentration. Trails within wetlands or riparian areas can result in draining and drying the area and consequently loss of riparian vegetation. Standards and design criteria in the Region 2 Watershed Conservation Practices Handbook (USDA Forest Service 1994) provide for the construction of recreation sites outside of riparian areas and wetlands and hardening or reclaiming existing sites within riparian areas to prevent detrimental soil or bank loss.

In alpine ecosystems, vegetation plays a major role in providing for the stability of surfaces and succession that exists in those ecosystems (Tieszen and Archer 1979). Since growth is slow in the plants that provide stability, alpine ecosystems are very sensitive to disturbances that alter vegetation cover. Disturbance of the soil surface in many cases leads to greater instability (Tieszen and Archer 1974). Disturbances that are in preparation for and as a result of recreation activities can result in long-term effects on soil stability and vegetative cover. Revegetation is a difficult and slow process. Off-road or off-trail concentrated use can reduce native vegetation and accelerate erosion.

Forest-wide standards and guidelines for alpine areas, and soil and water protection measures identified in the Region 2 Watershed Conservation Practices Handbook (USDA Forest Service 1994), as well as mitigation developed at the project level, are all design to protect the soil and water resources.

Effects on non-forested vegetation from recommended wilderness

The recommendation to designate an area as wilderness affects the management activities that can occur in the area. Activities that would detract from an area's eligibility to become wilderness are not allowed. These activities include timber harvest, road construction, off-road vehicle use, developed recreation sites, and development for oil, gas, and minerals. For the effects of these activities, refer to other parts of this section.

Table 3-106 identifies the acres recommended for wilderness by alternative. Alternative I would have the most acres recommended for wilderness (215,000 acres), and Alternatives B and F would result in no additional acres being recommended.

Effects on non-forested vegetation from research natural areas and special interest areas

Research natural areas (RNAs) are managed to maintain natural, relatively pristine or pre-settlement conditions by allowing ecological processes to prevail with minimal human intervention. RNA designation affects non-forested vegetation by restricting the activities that can occur within the area's boundary. These activities include livestock grazing; timber harvest; construction of roads, trails, and facilities; motorized and mechanized uses; and oil, gas, and mineral development. Acres of proposed RNAs are shown in **Table 120**.

The designation of an area as a special interest area (SIA) would affect non-forested vegetation by restricting the activities that can occur within its boundary. Appendix H provides descriptions and emphasis for each SIA. Direction for management areas 2.1 and 3.1, found in Chapter 3 of the 2002 Forest Plan, identifies the activities that can and cannot occur within the SIAs.

Effects on non-forested vegetation from wild, scenic, and recreational rivers

The recommendation to designate an area as a wild and scenic river affects the management activities that can occur in the area. The outstandingly remarkable feature for which the river candidate is recommended and whether the designation is for the wild, scenic, or recreational category determines what management activities would occur. Activities that would detract from an area's eligibility for designation are not allowed. These include timber harvest, road construction, off-road vehicle use, developed recreation sites, and development for oil, gas, and minerals. Refer to the general effects discussion in the Wild and Scenic Rivers section for the mileages proposed by alternative.

Effects on non-forested vegetation from heritage resources management

Heritage resource management would have little to no effect on non-forested vegetation in all alternatives. All high-probability sites will be inventoried and mitigation measures implemented so that heritage resources are not affected.

Effects on non-forested vegetation from timber management

The direct effect of timber harvest is an opening up of the forest canopy, allowing sunlight to reach the understory vegetation. As slash decomposes, nutrients previously stored in woody material become available for plant growth. In conifer forest types this results in an increase in grass, forb, and shrub production. As the new stand of trees occupies the site and canopy closure occurs, sunlight is diminished and forage production again drops to preharvest levels.

Harvest in aspen types tends to dry the sites and can reduce forage production over the short term, as young dense stands can reduce accessibility. As these stands mature and naturally thin, shading again increases soil moisture and as a result understory production increases. Alternative F would harvest the most acres (1,680 acres annually), followed by B, D, I, C, and E.

Roads and landings constructed for timber harvesting eliminate non-forested vegetation and compact soils at those locations. Acres projected for harvest disturbed by road construction is highest in Alternative F, followed by K, B, D, E, I, and C. Closure, ripping, seeding of unneeded roads, and treatment of noxious weeds will help to reduce compaction and establish vegetation on these sites.

Timber management can directly and indirectly affect riparian vegetation. The actual disturbance on the riparian vegetation during operations is minimized during project design, by limiting or restricting equipment within riparian areas, designating stream crossings, and specifying road design. Removal of ground cover and construction of roads, skid trails, and landings can result in changes in the hydrologic function surrounding a watershed and therefore can potentially influence the riparian species present.

While acres of harvest may provide a relative ranking of the potential effects of the alternatives, the implementation of standards and guidelines and site-specific mitigation developed during project planning reduce risk across the alternatives.

CUMULATIVE EFFECTS

The cumulative effects of management activities on non-forested vegetation can be both positive and negative. Activities that bare the soil can increase its susceptibility to erosion and noxious weeds; such activities also can change species composition or affect site productivity. Forest-wide standards and guidelines help to minimize these impacts. Activities that stimulate growth, protect the soil, restore hydrologic function and maintain vigor and biodiversity will help to maintain and restore the needed attributes of a healthy ecosystem. The maintenance of habitat types on the forest has become increasingly important, because some habitats are being lost to development and urbanization on adjacent lands.

Part 3, Section 5

Domestic livestock grazing

Introduction

Abstract

Fifty-four percent of the White River National Forest is currently within active grazing allotments, supporting some 132,729 animal unit months (AUMs) of domestic livestock grazing. Of the remainder of the forest, 25 percent is within vacant allotments and 21 percent is outside of existing allotments. There are 51 vacant allotments on the forest. Many of these have been vacant since the 1970s and early 1980s. An analysis of these allotments was conducted to determine which allotments or portions of allotments have value from the standpoint of livestock grazing and should be retained as vacant until further site-specific analysis can be conducted. Conversely, allotments found to have little or no value are considered for closure to future livestock grazing based on current knowledge. The allotments recommended for retention or closure vary by alternative. Each will be assessed in a site-specific decision, tiered to the revised forest plan.

Summary

Grazing by domestic livestock is an historical use of the White River National Forest. Little to no domestic livestock grazing occurred before 1870. Grazing peaked between 1890 and 1930. From 1930 to 1950 there was a sharp decline in cattle, while sheep numbers remained constant. Since 1950 there has been a constant decline in both cattle and sheep numbers, with the present levels at 23,070 and 51,212 head, respectively. Elk numbers decreased significantly in the late 1800s as a result of market hunting. Since then, elk numbers have increased to a present-day estimate of 35,000 to 40,000 head forest-wide.

An estimated 1.7 billion pounds of forage is produced annually on the forest. Under current allowable use guidelines, approximately 763 million pounds, or 45 percent of the total, is available for wildlife and domestic livestock. Under current management, domestic livestock use approximately 107 million pounds annually (14 percent of the available forage) and elk and deer use approximately 220 million pounds (28 percent of the available forage).

Although much of the forest supports viable livestock operations, localized urbanization, increases in property values, and the complexities of managing livestock in areas with high recreation use have led to a decline in the desirability and feasibility of some allotments for livestock production. Many of the adjacent ranches have been sold and subdivided. As a result, some allotments no longer support viable operations. Fifty-one allotments (31 percent of the total of 163 allotments) currently lie vacant.

Key indicators

- Acres suitable for supporting livestock
- Vacant allotments retained and closed

Legal and administrative framework

- The **Granger-Thye Act** (1950) provides for the issuance of term grazing permits up for up to 10 years. It also provides for the use of grazing receipts for range improvement work.
- The **Multiple-Use Sustained-Yield Act** (1960) provides that national forests are established and administered for several purposes, including livestock grazing. This act also authorizes the Secretary of Agriculture to develop the surface renewable resources of national forests for multiple uses and sustained yield of the services and products to be obtained from these lands, without impairment of the productivity of the land.
- The **Wilderness Act** (1964) provides that livestock grazing, and the activities and facilities needed to support it, are allowed to continue in wilderness areas when such grazing was established before designation.
- The **Forest and Rangeland Renewable Resource Planning Act** (1974) directs the Secretary of Agriculture to develop a process for the revision of national forest land and resource management plans, including the identification of the suitability of lands for resource management.
- The **Federal Land Policy and Management Act** (1976) states that public lands will be managed in a manner that will provide food and habitat for fish, wildlife, and domestic animals.
- The **Public Rangelands Improvement Act** (1978) recognizes the need to correct unsatisfactory conditions on public rangelands by increasing funding for maintenance and management of these lands.
- The **Rescission Bill** (1995) directs the Forest Service to complete site-specific NEPA analyses and decisions on allotments on a scheduled basis.
- The **Code of Federal Regulations** contains several provisions dealing with capability and suitability. Specifically, **36 CFR 219.3** provides detailed definitions and terminology, as follows:

Capability: The potential of an area of land to produce resources, supply goods and services, and allow resource uses under an assumed set of management practices and at a given level of management intensity. Capability depends on current conditions and site conditions such as climate, slope, landform, soils, and geology, as well as the application of management practices (such as silviculture) or protection from fire, insects, and disease.

Suitability: The appropriateness of applying certain resource management practices to a particular area of land, as determined by an analysis of the economic and environmental consequences and the alternative uses foregone. A unit of land may be suitable for a variety of individual or combined management practices.

- **36 CFR 219.20** contains the following direction about grazing resources:

In forest planning, suitability and potential capability of National Forest System lands for producing forage for grazing animals and for providing habitat for indicator species shall be determined as provided in paragraphs (a) and (b) of this section, summarized below. Lands so identified shall be managed in accordance with

direction established in forest plans.

(a) Lands suitable for grazing and browsing shall be identified and their condition and trend shall be determined. The present and potential supply of forage for livestock, wild and free-roaming horses and burros, and the capability of these lands to produce suitable food and cover for selected wildlife species shall be estimated. The use of forage by grazing and browsing animals will be estimated. Lands in less than satisfactory condition shall be identified and appropriate action planned for their restoration.

(b) Alternative range management prescriptions shall consider grazing systems and the facilities necessary to implement them; land treatment and vegetation manipulation practices; evaluation of past problems; possible conflict or beneficial interactions among livestock, wild free-roaming horses and burros, and wild animal populations, and methods of regulating these; direction for rehabilitation of ranges in unsatisfactory condition; and comparative cost efficiency of the prescriptions.

Affected environment

Introduction Permitted livestock use was first reported in 1918, when 68,000 cattle and 130,000 sheep were permitted to graze. Livestock numbers have declined to fewer than 23,000 cattle and 52,000 sheep. Concurrent with reduced livestock numbers and a shortened season of use has been an improvement in livestock management techniques. Rotational grazing, new management strategies, and guidelines for allowable use and riparian areas have contributed to an overall improvement in rangeland condition.

Currently, 54 percent of the White River National Forest is within active grazing allotments, supporting some 132,729 animal unit months (AUMs) of domestic livestock grazing. Of the remainder of the Forest, 25 percent is within vacant allotments and 21 percent is outside of existing allotments. A summary of existing livestock allotments and numbers is found in **Tables 56A** and **B**. Allotments are illustrated in **Figure 28**.

Nearly 1.7 billion pounds of forage grow on the forest annually, of which domestic livestock consumes about 6.4 percent and elk and deer consume about 13 percent.

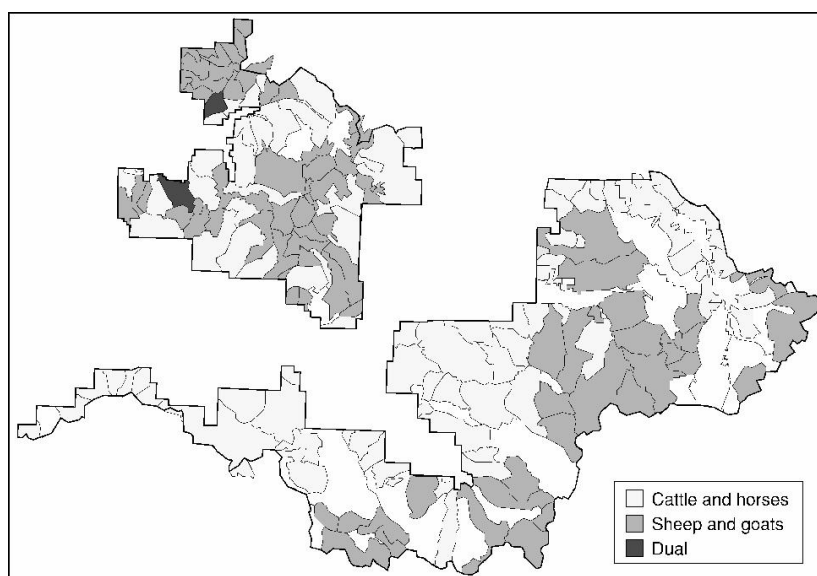
Table 56A
Summary of acres within grazing allotments

	Acres	% Of Forest	Allotments
<i>Within allotments</i>	1,804,313	79	163
<i>Active allotments</i>	1,231,387	54	112
<i>Cattle allotments</i>	766,426	34	64
<i>Sheep allotments</i>	420,594	18	45
<i>Dual-use allotments</i>	44,367	2	3
<i>Vacant allotments</i>	572,926	25	51
<i>Not within allotments</i>	481,000	21	0

Table 56B
Permitted livestock

Permitted Livestock (as of 2000)			
Type	Total Number	Head Months	Animal Unit Months
Cattle	23,070	76,421	93,472
Sheep	51,212	121,035	35,983

Figure 28
Grazing allotments on the White River National Forest



Lands capable of supporting livestock

Lands capable of supporting livestock are determined by the potential of an area of land to produce resources, supply goods and services, and allow resource uses under an assumed set of management practices and at a given level of management intensity. Capability depends upon current resource conditions and site conditions such as climate, slope, landform, soils, and geology, as well by as the application of management practices.

Capable rangelands also include forested lands, which, after timber harvest or fire, have become accessible and can produce forage. These lands are called transitory range. Forage may be produced for 10 or more years before natural or other changes terminate the production or the accessibility. **Non-capable** rangelands include areas that should not be grazed because of limited accessibility, unstable soils, steep slopes, or inherently low potential for forage production.

Criteria used for determining non-capable rangeland include:

Accessibility: Slopes greater than 40 percent for cattle. Slopes greater than 60 percent for sheep

Productivity: Areas with limited or no forage production include: Rock, barren, erosive soils, lakes, reservoirs, ponds, rivers, perennial stream surfaces and road surfaces and soils not capable of producing more than 200 pounds of forage.

Rangeland capability does not vary by alternative. The number of acres that are capable or non-capable of supporting livestock grazing on the White River National Forest are listed in **Table 57**.

Table 57
Acres capable of supporting livestock

	<i>Acres by classification</i>	<i>Running total after deductions</i>
Total White River NF	2,481,949	2,481,949
Private land	195,510	2,286,440
Non-vegetated		
Barren, erosive, low forage productivity	250,816	2,035,624
Lakes, reservoirs, ponds, major rivers	11,901	2,023,723
Perennial streams	1,910	2,021,813
Road beds	4,199	2,017,614
Inaccessible Areas		
More than 40% slope for cattle	530,814	1,486,800
More than 60% slope for sheep	158,971	1,858,643
Acres capable of supporting cattle		1,486,800
Acres capable of supporting sheep		1,585,643

Lands suitable for supporting livestock

Suitable lands refer to the appropriateness of applying certain resource management practices (in this case, livestock grazing) to a particular area of land, as determined by an analysis of the economic and environmental consequences and the alternative uses foregone. A unit of land may be suitable for a variety of individual or combined management practices.

Environmental suitability

We analyzed White River National Forest lands for suitability or unsuitability for grazing and browsing as required by 36 CFR 219.20. The process used is outlined in the Rocky Mountain Region desk guide, "A Process to Determine Rangeland Suitability for Livestock Grazing at the Forest Plan Level" (July 6, 2001). This analysis considered other uses or values of the area, and also identified areas in which grazing is not appropriate. Additionally, uses foregone were also analyzed relative to their effect upon livestock resource management.

Some areas of the forest do not have permitted livestock grazing for various reasons. Lands can be closed to grazing for administrative sites, fenced recreation sites, fenced highway and railroad rights-of-way, watersheds (such as for domestic use), areas inside of city limits, special-use areas, research study enclosures, and some critical habitat for threatened, endangered, or sensitive (TES) species.

Management area prescriptions identify forest management activities that are allowed and appropriate for the area. Livestock grazing has been identified as an appropriate activity in all management areas with the exception of research natural areas. Grazing is not appropriate in these RNAs because it conflicts with the intent of the designation (that is, scientific research in ungrazed areas in research natural areas).

There are fifty-one vacant allotments on the White River National Forest, many of which have been vacant since the 1970s and early 1980s. An analysis of those allotments was conducted to determine which allotments or portions of allotments have value from a livestock grazing standpoint and should be retained as vacant until further site-specific analysis can be conducted, and which ones have little to no value and could be closed to future livestock grazing. Information was gathered on each allotment for such things as acres suitable of supporting livestock, the kind of livestock that historically grazed the allotment, when it was last grazed, access, adjacency to existing active allotments, value for future management flexibility, relative cost efficiency, and whether any interest (demand) had been expressed for grazing that allotment in the past ten years. Other information gathered included present level of recreational use; potential conflicts with adjacent landowners; special wildlife concerns (such as presence of bighorn sheep, Colorado River cutthroat trout, and threatened and endangered species); and whether the allotments are in existing wilderness or areas recommended for wilderness, research natural areas, wild and scenic river corridors, or special interest areas.

Public scoping occurred during March and April of 1999. Based on the information gathered for each allotment, along with public scoping and the alternative themes under consideration, recommendations were developed by alternative as to which allotments should be retained as vacant until a site-specific analysis can be completed; which should be partially retained; and which should be permanently closed to domestic livestock grazing. See FEIS Volume 3, Appendix B—*Description of the Analysis Process* for further details.

Acres suitable for livestock grazing vary by alternative because the acres within RNAs and the allotments recommended for retention and closure vary. Both capable and non-capable lands can be closed to livestock grazing. Areas closed to grazing are considered as lands of foregone uses relative to livestock grazing. See Appendix B for details on the suitability analysis. **Table 58** identifies the acres determined to be suitable for livestock grazing.

Table 58
Acres determined environmentally suitable for sheep and cattle grazing by alternative

	ALTERNATIVE						
	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
Net National Forest System acres	2,286,440	2,286,440	2,286,440	2,286,440	2,286,440	2,286,440	2,286,440
Acres determined suitable for cattle grazing	960,841	791,288	803,141	754,689	863,931	767,956	804,483
Acres determined suitable for sheep grazing	1,167,261	944,521	960,708	891,215	1,040,849	910,922	962,459

Economic Analysis

Forest-wide standards and guidelines for grazing identify desired resource conditions across all alternatives. To achieve these desired resource conditions, specific grazing systems, stocking rates, needed range improvements (structural and non-structural), and coordination with other resources are developed at the allotment management planning level based on the site-specific conditions. Presently numerous grazing systems are being used on the forest, including but not limited to: multi-pasture rotational, deferred rotational, rest rotational, alternate year, once-over-lightly, high intensity, short duration, and to a limited degree continuous. Since livestock grazing was not identified as a major revision topic in this forest plan, and since differences among alternatives are based primarily on the total acreage available for permitted livestock grazing rather than how those livestock are to be managed, a detailed examination of every available grazing system across the 112 active allotments and 51 vacant allotments for each of the seven alternatives was not warranted. For purposes of analysis, the financial and economic consequences of two grazing prescriptions, described below, are compared in **Table 59**.

Prescription A – This prescription is representative of lands managed under active grazing. This prescription follows forest-wide standards and guidelines and management area direction needed meet resource goals and objectives. Grazing systems are developed within this direction at the site-specific level. Range improvements are maintained at each grazing permittee's expense. Existing improvements that have reached the end of their physical life span are reconstructed as needed or removed. New improvements are approved on a case-by-case basis. Forest-wide standards and guidelines are designed to improved unsatisfactory range condition. Areas in unsatisfactory condition become satisfactory through mitigation identified during site-specific analysis. Noxious weed management continues at present levels. Vegetation treatment with prescribed fire is conducted primarily for wildlife habitat improvement and fuels reduction. In general, forest-wide stocking is expected to remain fairly constant at or near 5.9-acres/head month. Vacant allotments remain in vacant status until site-specific analysis can be completed.

Prescription B – Currently grazed lands are managed without grazing. Current grazing permits are cancelled or not reissued at the end of the current term. All existing range improvements not needed for other resources or needed to prevent livestock trespass from adjacent lands are removed. Noxious weed management continues at present levels.

The economic analysis was completed from two perspectives: Financial efficiency and cost effectiveness. Financial considerations include only those revenues received by and costs incurred by the Forest Service. Economic considerations include the benefits and costs of grazing to all of society. These calculations do not include benefit or costs for which monetary values are unavailable.

Historically, many of the vacant allotments now under consideration became vacant when grazing permit holders relinquished their permits back to the government without identifying a preferred applicant. In most instances, the return of the permits was based on economic considerations because the operations were no longer economically viable. Examples of factors contributing to lack of financial viability are the distance to an allotment from private grazing lands, difficulties and expenses associated with obtaining qualified help, difficulties in managing livestock in remote and rugged terrain, market fluctuations and prices, and a low return on investment. Many of these vacant allotments have remained vacant since the 1970s and 1980s because of a lack of demand. Since these permits were returned to the Forest Service, costs of doing business in remote, rugged areas have increased while market value has continued to decline. In addition, some allotment areas that are adjacent to or surrounded by real estate development are increasingly becoming financially infeasible to operate. In some areas, the costs of conducting grazing operations while continuing to meet required standards is prohibitive.

The results of the financial and economic analysis are shown in **Table 59**.

Table 59
Financial and economic comparison of grazing prescriptions

Grazing Prescriptions		Average Profile for Lands Managed for Active Grazing	Average Profile for Lands Currently Grazed, but where grazing will be terminated as permits expire ("no grazing")
Estimated Grazing (Annual Average, 2001-2010)			
Sheep			
	<i>Head Months per Acre</i>	0.346	0
	<i>Animal Unit Months per Acre</i>	0.104	0
Cattle			
	<i>Head Months per Acre</i>	0.182	0
	<i>Animal Unit Months per Acre</i>	0.224	0
Financial Analysis (taxpayer/agency perspective)			
Revenues per Acre per Year			
	<i>Sheep</i>	\$0.47	--
	<i>Cattle</i>	\$0.25	\$0.00
Costs per Acre per Year			
	<i>Sheep</i>	\$0.47	--
	<i>Cattle</i>	\$1.02	\$0.27
Net Revenue per Acre per Year			
	<i>Sheep</i>	\$0.00	--
	<i>Cattle</i>	-\$0.77	-\$0.27
Present Net Value per acre in Decade 1			
	<i>Sheep</i>	-\$3.34	--
	<i>Cattle</i>	-\$6.82	-\$2.31
Economic Analysis (societal perspective)			
Benefits per Acre per Year			
	<i>Sheep</i>	\$1.11	--
	<i>Cattle</i>	\$2.40	\$0.00
Costs per Acre per Year			
	<i>Sheep</i>	\$2.23	--
	<i>Cattle</i>	\$3.11	\$0.27
Net Benefit per Acre per Year			
	<i>Sheep</i>	-\$1.12	--
	<i>Cattle</i>	-\$0.71	-\$0.27
Present Net Value per Acre in Decade 1			
	<i>Sheep</i>	-\$10.15	--
	<i>Cattle</i>	-\$6.98	-\$2.31

The increasing urbanization and resulting increases in recreation often result in increased conflicts with livestock. See **Table B-26**, FEIS Volume 3, Appendix B for information on levels of recreational use, potential conflict with adjacent landowners, and other potential conflicts, as well as interest in these re-stocking vacant allotments by the livestock community.

Although the analyses shown in **Table 59** indicate that net revenues and net benefits are negative, there is no standard for determining when lands must be declared economically unsuitable and removed from grazing (CFR 219.20). Community and environmental benefits of maintaining ranches for their open space, traditional culture, and other local purposes are not included in this analyses, nor are any non-quantifiable costs. Although both prescriptions show net costs of grazing, the grazing permittees, who are the immediate recipients of grazing net benefits, may choose to continue grazing while operating at a loss. Market forces will likely influence whether they continue to graze livestock on public and private lands in the White River area. In the same way, the Forest Service may choose to continue grazing, even while program revenues do not cover program cost. Grazing fees are set by law, and often do not cover program costs. These analyses are useful to the decision-maker for considering the opportunity costs of grazing. No additional acres were removed from suitability because of these analyses.

**Uses
Foregone**

From the livestock grazing standpoint, *uses foregone* are those areas where grazing has been eliminated by management area prescription or a closure to grazing (such as vacant allotment closure or partial closure). See **Tables 60** and **61** for information concerning acres removed from the suitable base by alternative. The use of livestock as a tool to manage nonforested vegetation, to resolve conflicts with other resources on other areas, and to provide food and fiber production would be foregone.

Table 60
Acres suitable for cattle grazing by alternative

	ALTERNATIVE						
	B	C	D	E	F	I	K
<i>Acres presently suitable for cattle grazing</i>	960,841	960,841	960,841	960,841	960,841	960,841	960,841
<i>Management area prescriptions excluding grazing (RNAs)</i>	0	19,069	23,421	11,009	16,180	32,220	4,324
<i>Acres proposed for full or partial closure in this alternative</i>	0	150,484	134,279	195,144	80,730	160,664	152,034
<i>Total environmentally suitable acres (cattle) for this alternative</i>	960,841	791,288	803,141	754,689	863,931	767,956	804,483
<i>Economically unsuitable for cattle</i>	0	0	0	0	0	0	0
<i>Suitable acres for cattle grazing</i>	960,841	791,288	803,141	754,689	863,931	767,956	804,483

Table 61
Acres suitable for sheep grazing by alternative

	ALTERNATIVE						
	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
<i>Acres presently suitable for sheep grazing</i>	1,167,261	1,167,261	1,167,261	1,167,261	1,167,261	1,167,261	1,167,261
<i>Management area prescriptions excluding grazing (RNAs)</i>	0	22,268	27,772	12,020	18,151	38,335	6,374
<i>Acres proposed full or partial closure in this alternative</i>	0	200,472	178,781	264,026	108,261	218,004	198,428
<i>Total environmentally suitable acres (sheep) for this alternative</i>	1,167,261	944,521	960,708	891,215	1,040,849	910,922	962,459
<i>Economically unsuitable for sheep</i>	0	0	0	0	0	0	0
<i>Suitable acres for sheep grazing</i>	1,167,261	944,521	960,708	891,215	1,040,849	910,922	962,459

FUTURE TRENDS

The White River National Forest will continue to support many viable livestock operations. Overall, a moderate decline in the demand for livestock grazing can be expected over the life of this plan, as private land development, higher property values, and conflicts between livestock operations and recreation uses increase in the more urban areas surrounding the forest. Many of the adjacent ranches have been sold and subdivided. As a result, some allotments no longer support viable operations. The current level of demand is expected to continue in the more rural communities surrounding the forest.

Environmental consequences

GENERAL EFFECTS

Grazing animals affect plant communities in several interrelated ways, including plant defoliation, nutrient removal and redistribution through excreta, and mechanical impact on soil and plant material through trampling.

Most native rangelands have evolved under conditions under which animals graze on plants and plants tolerate grazing—that is, the evolution of herbivores and edible plants occurred together. The selective pressures over thousands of years favored plants that developed resistance to browsing, grazing, and trampling. Grazing removes the aerial portion of the plant, allowing sunlight to reach the meristem, where growth occurs.

The short-term or immediate effect of grazing on a plant can (1) be detrimental, that is, reduce plant vigor or even kill the plant; (2) be beneficial, that is, increase size or growth rate; or (3) have no apparent beneficial or negative effect. Grazing by large herbivores in the short run often is of little importance in the process of vegetation change, unless grazing is so excessive that the grazed plants cannot restore themselves (Dwyer et al.,

1984 in Valentine 1990). The long-term effect of grazing largely depends not only on the adaptation of the plant to local environmental factors but also on the relative effects of grazing on associated plants and plant species. Timing, time, duration, and intensity of grazing all play a role in the effects of grazing on plants. Most plants can withstand some loss of foliage and still maintain their position in the plant community.

Perennial plants store enough food to last more than one year. Thus, even if a plant is defoliated, as by grazing, for a year or two, it generally will not die. As the plant produces leaf surface, photosynthetic processes begin to replace depleted carbohydrate reserves, thus generally making herbaceous plants highly resistant to grazing pressures. However, over-utilization of forage species over an extended period results in those plants eventually depleting their food reserves (stored carbohydrates). In the long term, those forage species highly desired by herbivores (thus first to be over-utilized) would be replaced by other species less desired by herbivores.

Forest-wide standards and guidelines phase out season-long grazing and set maximum forage and riparian utilization guidelines for domestic livestock and wildlife. Standards do not vary among alternatives. Total livestock numbers are expected to vary only slightly over the life of the plan as management plans are implemented. Rangeland condition is expected to continue to improve across all alternatives as improved management systems and new standards and guidelines are implemented.

DIRECT AND INDIRECT EFFECTS

Effects on domestic livestock grazing from soils and watershed management

Soil and water management practices as identified in forest-wide standards and guidelines should result in an increase in forage production, plant community stability, and maintenance of soil structure. This in turn should increase forage availability for livestock and management flexibility. Site-specific changes in present livestock management may be needed to meet watershed standards and guidelines.

Effects on domestic livestock grazing from riparian and wetland management

Under all alternatives, management and protection of riparian areas and wetlands are emphasized. Forest-wide guidelines for forage utilization in riparian areas in both satisfactory and unsatisfactory conditions have been adopted and are equally represented in all alternatives. Implementation of these guidelines will require changes in management on some allotments.

Effects on domestic livestock grazing from wildlife habitat management

The primary methods used to improve wildlife habitat of the White River National Forest include prescribed fire and timber harvest, and to a lesser degree construction of water developments and fertilization. The effects of fire on domestic livestock grazing are discussed above. See **Table 76** in FEIS Volume 2, Chapter 3, Topic 1, Part 3, Section 7—*Fire Management* for the number of acres proposed for treatment with fire, by alternative. Water developments if constructed to accommodate livestock can aid in livestock distribution.

Effects on domestic livestock grazing from wildlife viability management

Forest-wide standards and guidelines for the management of wildlife species of viability concern will have some effect on the management of domestic livestock. Management for Colorado River cutthroat trout, boreal toad, leopard frog, Barrow's goldeneye, sage grouse, and Brewer's sparrow has the greatest potential to affect domestic livestock management. The extent of this effect cannot be quantified until habitat areas have been identified, existing conditions determined, and specific management actions identified. When comparing the themes of the alternatives, Alternative D provides for populations of all species to be maintained at the highest level possible through active habitat management. Alternative K puts emphasis on maintaining and restoring habitats of species for which there are viability concerns; fisheries management under Alternative K focuses on maintaining and restoring habitats of native species (such as Colorado River cutthroat trout). Alternatives C and E maintain native and desired non-native species well above minimum viability levels. Alternatives B and I focus habitat improvement on threatened, endangered, and sensitive (TES) species and on restoring or improving wildlife habitat. Alternative F puts the least emphasis on viability. How the selected theme equates to on-the-ground livestock management would be determined at the site-specific project level.

Effects on domestic livestock grazing from management of TES species

In general, the habitat requirements in and around each known or discovered location of a threatened, endangered, or sensitive (TES) species will be protected, restored, or enhanced, and they are dealt with on a site-specific basis. Management for these habitat requirements may result in changes in management on individual allotments. Where conflicts between grazing and a TES species cannot be mitigated, areas identified as critical TES habitat can be closed to grazing and removed from the suitable land base. Management for TES species does not vary among alternatives.

Effects on domestic livestock grazing from bighorn sheep management

Within the 5.42 management area, grazing by domestic sheep is prohibited unless adequate temporal or spatial separation between domestic and bighorn sheep can be demonstrated. Grazing strategies will be implemented to meet bighorn sheep habitat objectives. There are 12 bighorn sheep herds on the White River National Forest. The Colorado Division of Wildlife has identified 4 bighorn herds as high priority, based on the following: (1) they are native (not transplanted); (2) their population size is large; and (3) the relative ability is high to protect and perpetuate the herd from threats to habitat and/or disease. Those herds include Avalanche Creek, Snowmass-Maroon Creek, Gore Range, and Battlement Mesa. Eight other herds were identified as medium-to-low priority because they were (1) transplanted, (2) smaller in population size, and (3) relatively harder to protect and perpetuate from threats to habitat and/or disease. Those herds include Toner Creek, Derby Creek, South Fork of the White River, Deep Creek, Glenwood Canyon, Cline top Mesa, Flat Tops, and Holy Cross herds.

Tables 62, 63, and 64 identify the active and vacant allotments that are partially within the bighorn sheep areas. If allocated to bighorns, management of these allotments may need to be adjusted to comply with standards and guidelines for that management area prescription. Table 62 shows cattle allotments within the bighorn sheep areas identified

above. If allocated to bighorn management, coordination with the Colorado Division of Wildlife during site-specific allotment management planning would occur before converting to domestic sheep use. If vacant allotments shown in Table 63 are allocated to bighorn sheep (Management Area 5.42), all or portions of these vacant allotments may be closed to domestic sheep grazing and removed from the suitable land base for domestic sheep.

Table 62
Active sheep allotments having land within bighorn sheep areas by alternative

Bighorn sheep herd	Alternatives	Active domestic sheep allotments
Avalanche Creek	C, D, E, I, K	North Fork, Lead King
Gore Range	C, D, E, K	Red and White Mountain, Slate Mountain
Glenwood Canyon	D, I,	Coffee Pot
Clinetop Mesa	D, I,	Clark Ridge/Deep Creek, Patterson Creek, Ute Creek/Spring Hill, East Canyon

Table 63
Active cattle allotments having land within bighorn sheep areas by alternative

Bighorn sheep herd	Alternatives	Active cattle allotments
Avalanche Creek	C, D, E, I, K	Nettle Creek, West Sopris, East Sopris, Capitol Creek, Coal Basin
Battlement Mesa	B, E, I, (by RNA in C, D, F & K)	Wallace Creek
Toner Creek	D, I	Basalt Mountain, Taylor Creek, Downey Frenchman
Derby Creek	D	Derby
South Fork	D, E, F, I, K	Hill Creek
Deep Creek	D	Lake Creek/Deep Creek
Clinetop Mesa	D, I	Meadow Creek, Corral Point, Clinetop, Boiler Creek

Table 64
Vacant allotments having land within bighorn sheep areas by alternative

Bighorn sheep herd	Alternatives	Vacant allotments
Avalanche Creek	C, D, E, I, K	Upper Crystal
Snowmass/Maroon Creek	C, D, E, F, I, K	Brush/East Snowmass, Conundrum
Gore Range	C, D, E, K	Black Creek, Boulder Creek, Maryland Creek, Willow Creek, Buffalo Creek, Officer's Gulch, Corral
Battlement Mesa	B, E, I, (by RNA in C, D, F, K)	Horsethief
South Fork	D, E, F, I, K	Park Creek
Glenwood Canyon	D, I	Grizzly Creek, No Name

Effects on domestic livestock grazing from fire management

Fire increases the availability, quantity, and palatability of forage species for livestock. Areas identified as inaccessible because of dense brush or trees can become suitable for livestock grazing through burning. Livestock tend to favor areas that have been burned due to the increased palatability of forage. Depending on location, livestock distribution can be improved or adversely affected by burning. Large fires can increase forage productivity significantly enough to warrant an increase in permitted AUMs. Alternatives B, C, D, and K would provide more than 5,700 acres annually to be treated with fire. Alternative F would provide for 3,750 acres annually. Alternatives E and I vary between 3,200 and 4,500 acres annually. Actual effects on livestock grazing depend on the location and intensity of the fire.

Effects on domestic livestock grazing from travel management

Management of the transportation system can have both a positive and negative impact on livestock grazing. While roads and trails facilitate the movement of livestock and improve accessibility of range improvements for construction and maintenance, new roads can remove natural barriers, create drift problems, and increase the need for additional fences, gates, and cattleguards. Heavy recreational use of trails both motorized and non-motorized can disrupt livestock distribution.

In the livestock grazing suitability analysis, acreage occupied by existing roads is eliminated from the suitable land base. The obliteration/recontouring and revegetation of roads returns those areas to a forage-producing level.

Effects on domestic livestock grazing from recreation management

Recreation is expected to increase under all alternatives. As recreation increases, more conflicts between recreationists and livestock grazing can be expected. As more conflict occurs, there will be more pressure to reduce grazing. Increased recreational use can disrupt livestock distribution and the effectiveness of management systems. Domestic livestock grazing is excluded from developed recreation sites. These areas are removed from the livestock grazing suitable land base. Alternatives E, I, C, B, and K have the most acreage allocated to recreation and therefore the highest potential to increase recreational use, respectively. Alternatives D and F have the fewest acres allocated to recreation emphasis.

Effects on domestic livestock grazing from wilderness management

The 1964 Wilderness Act provides for the grazing of domestic livestock, and the activities and facilities to support a livestock-grazing program in wilderness. Grazing in wilderness areas is controlled under the general regulations governing grazing in national forests. Wilderness designation does not prevent the maintenance of existing improvements or the construction of new improvements needed to protect the range. Costs and time needed for improvement, maintenance, and construction may be higher than outside wilderness because of inaccessibility by motorized means. Wilderness designation does not affect the suitable land base. Management of existing wilderness areas will have a consistent effect on livestock management in all alternatives.

Management of areas recommended for wilderness would be the same as management of existing wilderness. Areas recommended for wilderness vary across alternatives.

Alternative I has 200,400 acres recommended for wilderness, followed by Alternative E at 106,600 acres, C at 94,000 acres, K at 81,500 acres, and D at 47,300 acres. No additional acres would be recommended under Alternatives B or F. Cost of management would be higher because of inaccessibility and restriction of equipment to perform improvement construction and maintenance.

Effects on domestic livestock grazing from research natural areas

One of the criteria used by the White River National Forest for selecting an area as suitable for designation as a research natural area (RNA) is that it can not be currently grazed. Portions of the Main Elk Creek, Deep Creek, Oyster Lake, and W Mountain proposed RNAs are within active allotments (Table 65). For the most part, these RNAs are in areas inaccessible to livestock. The exceptions are Deep Creek and W Mountain, which include presently grazed portions of Heart Lake and Derby allotments, respectively. There are no proposed changes in permitted livestock numbers as a result of designating RNAs. If an area is allocated as an RNA, the boundary of that RNA will be adjusted to exclude areas within active allotments. Areas within selected RNAs would be classified as unsuitable and administratively closed to livestock grazing. Table 66 identifies the vacant allotments having land within the areas recommended for RNAs, by alternative. Tables 68 and 69, later in this section, identify the acres that would be removed from the suitable land base as a result of allocating areas as RNAs.

Table 65
Research natural areas within active allotments by alternative

RNA	Alternatives	Active allotments affected
Main Elk Creek	C, D, I	Meadow Creek/Clinetop
Deep Creek	C, D, F, I	Lake Creek/Deep Creek, Deep Lake, Heart Lake, Coffee Pot, Grizzly/Johnson
Oyster Lakes	C, D, E, F, I	Crooks Park, West Marvine
W Mountain	I	Derby

Table 66
Vacant allotments having land within proposed research natural areas by alternative

RNA	Alternatives	Active allotments affected
Lower Battlement Mesa	C, D, E, F, I, K	Horsethief
Black Creek	C, D, E, F, I	Black Creek
Gift and Kline Creeks	C, D, E, F, I	Upper Crystal
Oyster Lakes	C, D, E, F, I	Park Creek
Warren Peak	C, D, F, I	No Name (Aspen)
Porcupine Gulch	C, D, I	Ptarmigan/Tenderfoot
Difficult Creek	D, I	Richmond/Difficult
Taylor-Willard	D, I	Richmond/Difficult
East Lake Creek/West Cross Creek	I	East Lake Creek, Beaver Creek
W Mountain	I	North W Mountain, South W Mountain

Effects on domestic livestock grazing from wild, scenic, and recreational rivers

Under all alternatives, the five areas identified as eligible for wild and scenic rivers designation will be managed to perpetuate the outstandingly remarkable values. Outstandingly remarkable values include geologic, scenic, recreational, ecological condition, and historical values. Grazing is allowed and presently permitted on all the areas identified as suitable within wild and scenic river corridors with the exception of Cross Creek. Forest standards and guidelines for livestock grazing and riparian management should protect these values; however, some adjustment in management may be necessary if conflicts occur.

Effects on domestic livestock grazing from timber harvest

Timber harvesting in conifer forest types can provide an increase in forage available for livestock and wildlife grazing. Harvested areas become suitable for domestic livestock grazing if the areas become accessible and forage is produced. While an increase in permitted AUMs has not historically resulted from this transitory range, use of these newly available areas can reduce grazing pressure on other areas.

Harvest in aspen types tends to dry the sites and reduce forage production over the short term, as young dense stands reduce accessibility. As these stands mature and naturally thin, shading again increases soil moisture and as a result forage production increases. The alternative with the largest increase in transitory range would be Alternative F, followed by Alternatives B, D, I, and C.

Effects on domestic livestock grazing from closing vacant allotments

Closing of vacant allotments eliminates the use of these areas for domestic livestock production in the future. The areas capable of supporting livestock within these allotments would be removed from the suitable grazing land base for domestic livestock. While closing of vacant allotments does not reduce current permitted AUMs, it does reduce future management flexibility by eliminating the possibility of using these areas to resolve future conflicts between livestock grazing and other resources on active allotments or provide forage in drought years. See Appendix B for ratings given each allotment as to its value in providing management flexibility in the future and the recommended fate of each vacant allotment by alternative. **Table 67** provides a summary of the number of allotments recommended for retention, partial retention, and closure, by alternative (see the vacant allotment alternatives map in the map packet). Allotments identified as ‘retained’ indicate that these allotments will be retained in vacant status until such time as a more intensive site-specific NEPA analysis can be conducted. The acres that would be removed from the suitable land base by the closing or partial closing of vacant allotments are shown in **Table 68 and Table 69**.

Table 67
Number of vacant allotments recommended for retention, partial retention, and closure

Recommended status	ALTERNATIVE						
	B	C	D	E	F	I	K
Cattle							
<i>Allotments recommended for retention</i>	23	5	6	4	10	13	6
<i>Allotments recommended for partial retention</i>	0	3	4	0	2	3	4
<i>Allotments recommended for closure</i>	0	15	13	19	11	7	13
Sheep							
<i>Allotments recommended for retention</i>	28	8	6	4	18	4	9
<i>Allotments recommended for partial retention</i>	0	4	8	0	4	1	4
<i>Allotments recommended for closure</i>	0	16	14	24	6	23	15
Total vacant allotments	51	51	51	51	51	51	51

Table 68
Acres suitable for cattle grazing by alternative

	ALTERNATIVE						
	B	C	D	E	F	I	K
<i>Acres presently suitable for cattle grazing</i>	960,841	960,841	960,841	960,841	960,841	960,841	960,841
<i>Management area prescriptions excluding grazing (RNA's)</i>	0	19,069	23,421	11,009	16,180	32,220	4,324
<i>Acres proposed for full or partial closure in this alternative</i>	0	150,484	134,279	195,144	80,730	160,664	152,034
Total suitable acres (cattle)	960,841	791,288	803,141	754,689	863,931	767,956	804,483

Table 69
Acres suitable for sheep grazing, by alternative

	ALTERNATIVE						
	B	C	D	E	F	I	K
<i>Acres presently suitable for cattle grazing</i>	1,167,261	1,167,261	1,167,261	1,167,261	1,167,261	1,167,261	1,167,261
<i>Management area prescriptions excluding grazing (RNA's)</i>	0	22,268	27,772	12,020	18,151	38,335	6,374
<i>Acres proposed full or partial closure in this alternative</i>	0	200,472	178,781	264,026	108,261	218,004	198,428
Total suitable acres (sheep)	1,167,261	944,521	960,708	891,215	1,040,849	910,922	962,459

CUMULATIVE EFFECTS

Management of the various resources and uses on the White River National Forest can have both a positive and negative effect on the management of domestic livestock on and off the forest. Vegetation treatments such as prescribed burning, timber harvest, and noxious weed control can improve forage quantity, quality, and availability and increase management flexibility. As recreation use continues to increase, the complexity of management of domestic livestock also increases. Domestic livestock and people often prefer the same areas, and conflicts between the two can also be expected to increase. Many ranchers depend on allotments administered by the Forest Service and the BLM to provide a portion of their year-round operations. Much of the forest will continue to support several viable livestock operations. This in turn will provide for stability in the ranching communities in the rural areas surrounding the forest. Localized urbanization, increases in property values, and high recreation use—particularly in Summit, Eagle, and Pitkin Counties—have led to a decline in the desirability and feasibility of some allotments for livestock production. As ranchers sell out and their private lands are subdivided, there is a net loss of open space and in many cases a loss of big-game winter range.

The closing of vacant allotments removes land from the suitable land base for livestock grazing. This can have a positive or negative effect on management depending on site-specific conditions. While it can resolve present concerns and conflicts in some locations, it also can limit management flexibility in resolving future conflicts between grazing and other resources, or in providing forage in drought years. This in turn can affect the management or use of the private lands surrounding the forest. Many of ranches surrounding the national forest provide open space and valuable winter range to wildlife species. Loss of these ranches and subsequent development would have a negative impact on these resources.

The effects of domestic livestock grazing on other resources are addressed in other sections of this chapter. Forest-wide standards and guidelines for riparian management, allowable forage utilization, and watershed conservation practices have been designed to maintain or improve rangeland condition and riparian condition. As site-specific concerns are identified, they will be addressed during allotment management planning and in annual operating instructions.

Part 3, Section 6

Noxious weeds

Introduction

Abstract

Approximately 89,000 acres of the White River National Forest are infested with noxious weeds. Ground-disturbing activities can create habitat for the establishment of these weeds. Alternatives were evaluated as to the amount of earth disturbance that will occur. An integrated program of prevention and detection, education and awareness, inventory, planning, treatment, coordination, and monitoring will help to reduce existing infestation levels and the establishment of new populations.

Summary

Noxious weeds are defined as alien plants that aggressively invade or are detrimental to native plant communities. Exotic plants introduced from other parts of the world arrive without their natural enemies (insects and disease) to keep them in check. This helps give them a selective advantage in their competition with native vegetation. Noxious weeds reduce productivity, crowd out native plants, displace wildlife species that depend on these plants, and disrupt watershed function and nutrient and energy flow.

Seed is spread by humans, vehicles, equipment, horses, livestock, wildlife, wind, and water. Noxious weeds can be expected to occur in higher densities along roadways, in areas disturbed by timber harvests, campgrounds, recreation trails, trailheads, livestock, utility corridors, gaslines, and ditches. Although noxious weeds most commonly are found in areas where ground-disturbing activities have occurred, they also are known to invade otherwise healthy, undisturbed plant communities.

Many resource scientists and land managers consider noxious weeds to be the largest threat to ecological integrity facing wild lands.

Key indicators

Legal and administrative framework

- Acres infested with noxious weeds.
- The **Federal Noxious Weed Act** (1974), as amended, requires cooperation with state, local, and other federal agencies in the application and enforcement of all laws and regulations relating to the management and control of noxious weeds.
- The **National Environmental Policy Act** (1969), and implementing regulations found at 40 CFR 1500-1508 and the Forest Service Manual 1950 and 1909.15, govern environmental analysis and disclosure requirements conducted by the Forest Service on National Forest System lands for proposed noxious weed control activities, such as ground-disturbing activities, herbicide application, or changes in resources.
- The **Colorado Noxious Weed Act** Title 35, Article 5.5 -111(1998) authorizes local governing bodies of all counties and municipalities in the state to enter into cooperative agreements with federal and state agencies for the integrated management of noxious weeds.

Affected environment

Introduction Sixteen species of noxious weeds are known to occur on the White River National Forest: leafy spurge, yellow toadflax, Dalmation toadflax, Canada thistle, plumeless thistle, musk thistle, Scotch thistle, Russian knapweed, spotted knapweed, diffuse knapweed, hound's tongue, scentless chamomile, oxeyed daisy, sulphur cinquefoil, perennial pepperweed, and hoary cress. Species such as squarrose knapweed, yellow star thistle, Dyer's woad, Dame's rocket, common tansy, and purple loosestrife occur on lands near the forest and can be expected to spread to the forest.

A cursory inventory of the White River National Forest indicates approximately 89,000 acres to be infested by noxious weeds. As further vegetation inventories are completed, we are likely to find significantly more affected acres. **Table 70** provides a summary of acres infested with noxious weeds and known rates of spread, if left untreated.

Table 70
Estimated acres with noxious weeds and spread rate by species

<i>Species</i>	<i>Acres</i>	<i>Rate of Spread Per Year</i>
Leafy spurge	295	50
Yellow toadflax	33,265	15
Dalmation toadflax	515	15
Canada thistle	17,220	25
Plumeless thistle	4,070	10
Musk thistle	5,660	10
Scotch thistle	570	10
Russian thistle	1,785	30
Spotted knapweed	106	40
Diffuse knapweed	110	40
Hound's tongue	23,980	15
Hoary cress	1,160	unknown
Scentless chamomile	40	5
Oxeyed daisy	50	unknown
Sulphur cinquefoil	<1	unknown
Perennial pepperweed	20	unknown
Total acres	88,847	

Past noxious weed management has focused primarily on controlling existing noxious weeds, with little emphasis on the prevention of these weeds getting established. Because of budgetary constraints, treatment has been very limited. As of 1997, the White River National Forest has implemented an Integrated Noxious Weed Management Program. With local, state, and other federal agencies, this coordinated effort is directed toward developing and implementing a public awareness program, a prevention and control program, and common inventory, mapping, monitoring, and reporting procedures. Site-specific analysis is conducted to determine the appropriate treatment methods.

FUTURE TRENDS

Without a concerted and coordinated effort among local, state, and federal agencies and private individuals, noxious weed populations can be expected to expand their ranges, threatening ecosystem integrity and function on the forest.

New species of weeds such as Dame's rocket, dyer's woad, purple loosestrife, squarrose knapweed, yellow star thistle, and others occur on lands near the forest and can be expected to spread to the forest. Large established populations will continue to expand, providing a seed source for other areas. Without appropriate mitigation, ground-disturbing activities both on and off the forest will provide habitat for weeds to become established. Once established, these species can and will invade otherwise healthy plant communities. Through public awareness efforts and greater emphasis on noxious weed control and prevention, we expect increasing opportunities for coordinated weed management efforts. Coordination, prevention, early detection, monitoring, and treatment will keep many small infestations from becoming established, and may slow and even reverse the current trend.

Environmental consequences

GENERAL EFFECTS

Under all alternatives, the primary objectives of integrated noxious weed management are education and awareness, inventory, prevention, planning, monitoring, and control. Noxious weed sites will be monitored to plan treatment strategies. Specific prevention methods include minimizing ground disturbance, using certified weed-free seed and feeds, reestablishing vegetation on disturbed areas, and cleaning equipment. Treatment of weed-infested areas include the use of cultural, mechanical, biological, and chemical control agents as described in the 1993 *Environmental Assessment on the Management of Undesirable Plant Species*.

Once established, noxious weeds reduce biodiversity by crowding out native plants, displacing wildlife species that depend on these native plants, and disrupting watershed function and nutrient and energy flow. Left unchecked, noxious weeds can pose a significant threat to ecosystem health.

It is impossible to accurately predict the actual acres of noxious weeds that will result from the implementation of the alternatives, we provide a assessment by alternative to estimate the potential risk that noxious weeds will become established through the spreading of seed and the creation of habitat where ground-disturbing activities occur.

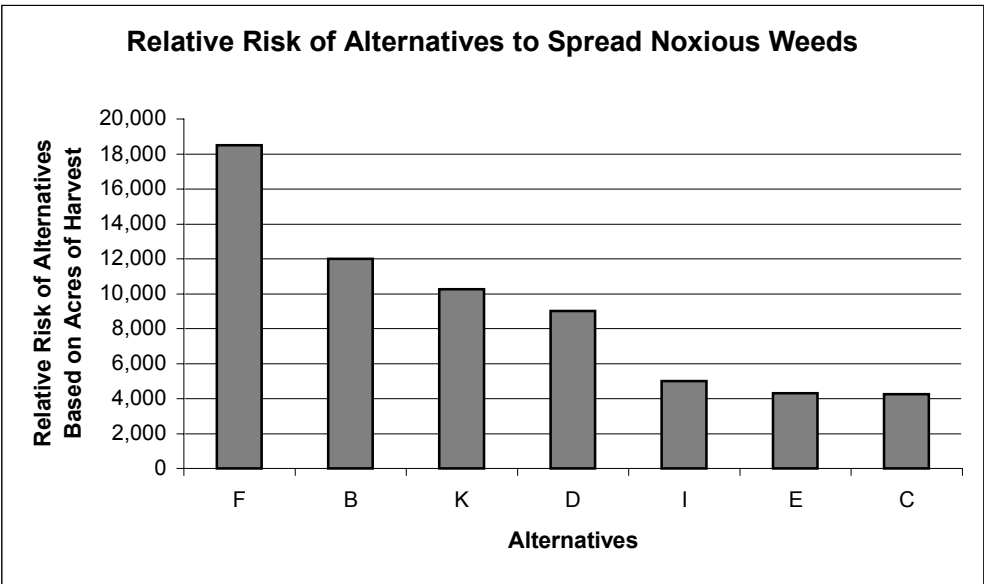
The spread of noxious weeds can be reduced through forest-wide standards and guidelines that require a noxious weed risk assessment be completed for all proposed projects and activities and that appropriate mitigation measures be implemented.

DIRECT AND INDIRECT EFFECTS

Effects on noxious weeds from timber management

Ground-disturbing activities such as the construction of skid trails, roads, and landings or the skidding of logs create habitat that favors noxious weed establishment. The actual establishment of weeds is highly variable and depends on a variety of factors such as seed availability, movement of seed into the site during harvest activities, weed species involved, growing conditions, preventive measures applied, reestablishment of ground cover, kinds and amount of use of the area following harvest, and amount of disturbance. We prepare site-specific noxious weed risk assessments and prescribe mitigation measures to reduce the risk of noxious weed establishment and spread. The comparison of effects of timber harvest levels on noxious weeds among alternatives, as shown in **Figure 29**, is in relative terms of risk of spreading noxious weeds. The alternatives that disturb the most acres have the highest potential to increase the opportunity for noxious weed infestations. The second row of the table demonstrates the magnitude of that risk based on past experience.

Figure 29
Relative risk of annual timber harvest levels on the spread of noxious weeds



Weeds resulting from the timber program are treated under that program budget over a three-to-five-year period, following the closing of a sale. Some residual weed populations can be expected following this treatment period. Complete eradication of weeds is not expected, as seed can remain viable for many years. Residual weeds serve as a source of seed for new infestations. These weeds are treated under the weed management program.

Effects on noxious weeds from travel management

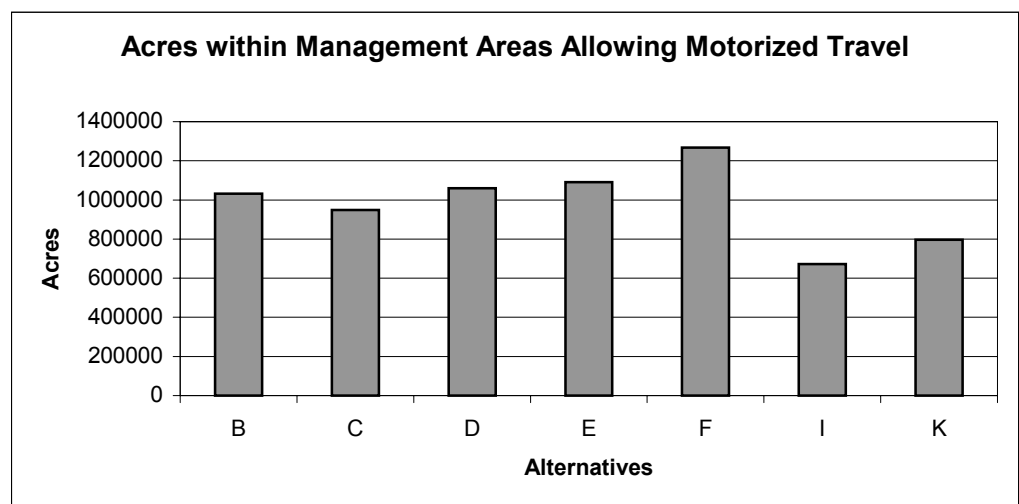
Roads and trails provide corridors for the spread of noxious weeds. Soil disturbances associated with the construction, reconstruction, and maintenance of roads and trails create potential habitat for their invasions. The continual use of those roads and trails can provide a continuous supply of seed. Once established, the weeds can then spread to the adjacent undisturbed habitat types.

Closure of roads without revegetation reduces the movement of seed but does little to reduce the habitat or prevent establishment once seed enters the area. The revegetation of closed roads can further reduce the risk of noxious weed establishment by stabilizing the site and providing competition.

Without specific information on the miles of roads and trails to be constructed, reconstructed, maintained, or obliterated and an estimate of use of these roads and trails by alternative, we can only make a very general comparison of the risk of noxious weed spread based on the travel management opportunities. The alternative themes and total acres within management areas and recreation opportunity spectrum (ROS) classes that allow motorized travel are used to assess the risk of spreading weeds by that means.

Figure 30 displays the total acres within management areas and ROS classes that allow motorized travel. Alternative F is likely to see the highest level of new road construction, reconstruction, and maintenance and has the greatest number of acres within management areas that allow motorized use. It therefore has the greatest potential of spreading noxious weeds through motorized use. Alternative I has the least potential to spread noxious weeds through motorized use as it emphasizes nonmotorized experiences and closing motorized routes.

Figure 30
Acres within management areas that allow motorized use



While the risk of noxious weed spread may be less likely in non-motorized areas, seed is also transported by people, animals, and mechanized equipment. Early detection is more difficult and cost of treatment is higher due to limited access. Therefore, success of treatment is potentially lower.

Effects on noxious weeds from recreation management

Ground-disturbing activities associated with the construction, reconstruction, and maintenance of recreational facilities such as trails, trailheads, campgrounds, and ski resorts create potential habitat for noxious weeds. The establishment of weed infestations depends on the precautions taken during these activities not to introduce weed seed, early treatment of any weeds that occur, and the early reestablishment of desired vegetation. Recreational activities such as hiking, biking, horseback riding, and OHV, motorcycle, and four wheel drive vehicle use have the potential to transport noxious weed seed.

Recreational use is expected to increase under all alternatives. While it is impossible to quantify the effects of this increase in recreation on the establishment of noxious weeds, one can expect that recreation uses will be a significant contributor to their spread. Management areas with emphasis on recreation such as 3.1, 3.31, 4.23, 4.4, 7.1, 8.21, 8.25, and 8.31 have the greatest risk of spreading weeds through recreational pursuits. Based on management area allocations by alternative, Alternative E has the highest risk of recreational spread of noxious weeds, followed by Alternatives B, C, I, K, and F. Alternative D has the least risk of spreading weeds from a recreational perspective.

The infestations that result from recreational use are likely to be small in size. If detected and treated early, they can be controlled. The use of state-certified noxious weed-free products for livestock feed and mulch are essential in preventing the spread of noxious weeds. Weed-free products are required under all alternatives.

Effects on noxious weeds from domestic livestock grazing

The extent to which domestic livestock grazing and associated management activities contribute to noxious weed establishment depends on the amount of disturbance to the plant communities and soil that occurs and the movement of seed from adjacent areas by livestock. The establishment of noxious weeds is favored by grazing practices that reduce the vigor or weaken existing native plants and increase the amount of exposed soil. Heavily used areas adjacent to water developments and salt grounds can provide a location in which noxious weeds can become established. Domestic animals as well as wildlife can disseminate noxious weed seed both in vivo and externally.

Forest-wide standards and guidelines for soil productivity, biodiversity, undesirable species, and livestock management are designed to maintain or improve the health and vigor of native plant communities. These standards and guidelines reduce the potential for noxious weed establishment. Site-specific allotment management plans identify desired conditions for rangeland resources and prescribe livestock management strategies for moving rangeland resources toward desired conditions.

Because forest-wide standards and guidelines do not vary among alternatives, the potential for establishment and spread of noxious weeds based on livestock grazing management should remain constant across alternatives. The acres suitable for livestock grazing do vary based on the number of vacant allotments identified for closure by

alternatives. **Table 71** identifies the number of suitable acres recommended for closure to livestock grazing by alternative. The risk of spreading noxious weed seed by livestock would no longer exist on those acres. The risk from other sources, such as people, vehicles, equipment, pack stock, and wildlife, would continue to exist.

Table 71

Suitable acres recommended for closure to livestock grazing by alternative, in thousands of acres

	<i>ALTERNATIVE</i>						
	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
Thousands of Acres	0	200	179	264	108	218	198

Effects on noxious weeds from oil, gas, and mineral exploration and extraction

Acres authorized for gas, oil, and minerals exploration and extraction do not vary by alternative. The actual acres affected will depend upon the number of applications received. Mineral and energy development will have a direct effect by removing the existing vegetation and exposing mineral soils, making weed invasions possible. Noxious weeds are more likely to become established on these exposed areas. After exploration or production is completed, the sites will need to be rehabilitated and revegetated with native species to prevent the spread of weeds. Gradually, native vegetation species will reestablish on the disturbed areas, reducing the potential for the establishment of noxious weeds.

Effects on noxious weeds from fire management

The occurrence of fire changes the seral stage of plant communities from mid and late seral stage to an early seral stage. In the short term, fire removes vegetational cover, exposes soils to potential increases in erosion, releases nutrients previously tied up in woody material, and favors early seral plant species. As a general rule, most noxious weeds are early seral species; if a seed source is available, they can become established within a season or two following a burn. In areas in which noxious weeds exist prior to the burn, there can be a net loss in desirable species if noxious weed management is not incorporated into the planning or post-burn treatment. With time, these species can spread to adjacent unburned habitat types. Alternatives vary as to the number of acres to be treated using prescribed burns, with Alternative C treating the most acres, followed by Alternatives K, D, B, E, F, and I.

Effects on noxious weeds from wilderness management

The management of areas as wilderness can have a positive and negative effect on the management of noxious weeds. Weed seed is not transported by motorized vehicles and there are no ground-disturbing activities associated with the road system or timber harvest that provide habitat for the establishment of weeds. Weed-free feed restrictions should help to minimize the spread of weeds by recreational stock inside as well as outside wilderness. Because of the remoteness of the terrain within wilderness areas,

early detection and treatment is difficult and more expensive. Existing designated wilderness acreage does not vary across alternatives. See **Table 117** in FEIS Volume 3 Chapter 3 Topic 4—*Roadless area management and recommended wilderness* for the number of acres recommended for wilderness, by alternative.

Effects on noxious weeds from wildlife and fisheries management

The primary methods used to improve wildlife habitat of the White River National Forest include prescribed fire and timber harvest, and to a lesser degree construction of water developments and fertilization. See **Table 22** for the number of acres proposed for treatment with fire, by alternative.

Wildlife species transport noxious weed seed externally and as a result of incomplete digestion. This will not differ across the alternatives.

Effects on noxious weeds from management of threatened, endangered, and sensitive (TES) species

Habitat types identified as important to threatened, endangered, and sensitive species will be managed to protect, conserve, and restore these species. The establishment and spread of noxious weeds is in direct conflict with that goal. Classification of an area as critical habitat could raise the priority for noxious weed treatment as well as dictate the type, kind, location, and timing of treatment. This would not vary among alternatives.

Effects on noxious weeds from riparian, wetland, and watershed management

Under all alternatives, management and protection of watershed, riparian area, and wetland values are emphasized. The establishment and spread of noxious weeds is in direct conflict with those goals. The noxious weed management program is an essential part of maintaining those values. As ground cover by desired native species increases, there are fewer opportunities for weeds to get established. Mitigation measures identified in the *White River National Forest Management of Undesirable Species Environmental Assessment and Decision Notice* (1993) will be used to protect water quality and riparian and wetland values. Noxious weed management may add to the cost of some watershed restoration activities.

Effects on noxious weeds from other activities

Management of the White River National Forest for multiple-use outputs will result in disturbance of the soil surface. Inclusion of noxious weed mitigation in project planning will reduce the potential for noxious weed establishment. The prevention and treatment of noxious weeds potentially can increase the operating costs of all resource operations on the forest.

CUMULATIVE EFFECTS

As mentioned above, the effects of various ground-disturbing activities provide opportunity for noxious weed establishment and spread. As weeds become established both on the forest and on adjacent private and public lands, seed production accelerates exponentially. Noxious weeds out-compete native vegetation, reduce biodiversity, displace wildlife, and interrupt basic ecological and hydrological processes. Many resource scientists and land managers consider noxious weeds to be the biggest threat to ecological integrity facing National Forest System lands. With the loss of plant diversity, wildlife habitat, and forage values comes a host of impacts to the users of resources such as hunting, wildlife and wildflower viewing, wilderness values, and livestock grazing. The loss of these uses and values results in economic losses to the communities surrounding the forest.

The White River National Forest currently has an estimated 89,000 acres infested with noxious weeds. Fortunately, many of these populations are small and controllable; however, there are large areas of the forest where species such as yellow toadflax and leafy spurge dominate plant communities. With present knowledge, the most realistic outlook is to contain some of these species and try to control their spread.

Implementation of forest-wide standards and guidelines for the management of undesirable species will reduce the risk that noxious weeds will have the devastating effects experienced in other areas of the country. Coordination with adjacent private landowners; local, county, state and federal agencies; and livestock and environmental organizations is critical to the success of this effort.

Part 3, Section 7

Fire management

Introduction

Abstract

The ecosystems of the White River National Forest fall within four fire regimes that correspond to the frequency, extent, and intensity of wildfires. Many vegetation communities on the forest are fire dependent. Suppression of fire in these communities can affect their health, composition, and diversity. The use of prescribed fire has become common in recent decades, most commonly for wildlife habitat improvement, and increasingly for fuels management. Strategies for the use of fire in ecosystem management are under development. Although all wildland fires receive an initial attack response, the level of tactical and associated appropriate management strategy that is initiated is determined by the forest's fire management action plan, which reflects forest plan direction. This plan is based on assessment of fuel hazard ratings and values at risk from wildfire. These values at risk are described in terms of five categories, which are based on the role of fire in the ecosystem and the degree of risk to firefighter and public safety as well as private property and improvements on public lands administered by the agency.

Summary

The White River National Forest fire management program has two broad purposes:

- To protect and enhance resources through wildfire prevention, fuel treatment, prescribed fire, and the implementation of the appropriate management response to all wildland ignitions; and
- To meet forest management goals and objectives through the use of prescribed fire, mechanical treatment, and managed natural fires.

Fire has had an integral role in the formation of the White River National Forest's ecosystems. The origin of the spruce-fir, lodgepole pine, aspen, and Gambel oak stands can be traced to some form of a disturbance event. In most all cases, that disturbance event was fire.

The use of prescribed fire became common practice on the forest during the mid-1970s. It has been used most commonly for wildlife and rangeland habitat improvement and enhancement. Past projects have been fairly moderate in scale, affecting about 3,200 acres annually. In addition to broadcast burns for the resources described above, we treat fuel residues from timber harvest activities at a rate of 51 piles (a total of about 204,000 cubic feet) per year. The forest also has reduced about 1,600 acres of natural fuels per year through the implementation of timber harvest activities. The scale of treatment completed over the past five years coupled with the increased emphasis on hazardous fuels reduction under the National Fire Plan indicates that the area treated may increase to approximately 6,000 to 7,000 acres on an annual basis.

In cooperation with the Routt National Forest, in 1995 we developed a fire management plan for the Flat Tops Wilderness and adjoining non-wilderness lands to provide guidance and direction for the management of naturally occurring wildland fires in a manner more consistent with natural processes and wilderness resources. A plan to allow

management of wildland fire in the Eagles Nest and Ptarmigan Wilderness Areas and adjacent non-wilderness lands was approved in April 2001.

Specific strategies regarding the use of fire in all aspects of ecosystem management are currently under development or are continuously being redefined. Management of forested vegetation will include fire as an option. The results of the historic range of viability analysis provides useful guidance for developing treatment options. Appendix D provides a summary report of these findings.

Currently, all wildland fires receive an immediate initial attack response. The level of the response and the subsequent management strategies and tactics employed to manage these fires is determined by the fire management plan (FMP). This plan is updated annually and reflects direction from the forest plan.

The forest participates in an interagency fire management organization with the following interagency partners: the Bureau of Land Management's Grand Junction and Glenwood Springs Field Offices and the Grand Valley Ranger District of the Grand Mesa, Uncompahgre, and Gunnison national forests. Called the Upper Colorado River Interagency Fire Management Unit (UCR), this organization uses agency-specific guidelines of the national fire management analysis system (NFMAS) to implement the direction set forth in land management plans.

The UCR provides resources for initial attack, large incident support, and dispatch support at the Interagency Dispatch Center in Grand Junction. Additional shared duties include management of the Grand Junction Air Center with an airtanker and smokejumpers, and the Rifle Helitack Base with a light helicopter and helitack crew.

Key indicators

- Fuel hazard rating
- Management area prescriptions/values at risk
- Acres burned by prescribed fire

Legal and administrative framework

- The **Organic Administration Act** (1897) authorizes the Secretary of Agriculture to make provisions for the protection of national forests against destruction by fire.
- The **Bankhead-Jones Farm Tenant Act** (1937) authorizes and directs the Secretary of Agriculture to develop a program of land conservation and land utilization to protect the public lands.
- The **Wilderness Act** (1964) authorizes the Secretary of Agriculture to take such measures as may be necessary in the control of fire within designated wilderness.
- The **National Forest Management Act** (1976) directs the Secretary of Agriculture to specify guidelines for land management plans to ensure protection of forest resources.
- The **Clean Air Act** (1977) provides for the protection and enhancement of the nation's air resources.

Affected environment

Introduction

The ecosystems of the White River National Forest generally fall within three fire regimes, which are displayed in **Table 72**.

These descriptions were estimated using Rocky Mountain resource inventory system (RMRIS) and EIS data from the 1984 forest plan. Aspen is found in both the Type I and Type II fire regimes. About 19 percent of the White River National Forest is in the aspen type. This percentage is included in the table under Type I.

Table 72
Fire regimes found on the White River National Forest

<i>Fire type</i>	<i>% of Forest</i>	<i>Description</i>	<i>Fire frequency</i>	<i>Vegetation types</i>
I	28	Frequent fires of low-to-moderate intensity/lower elevations	Less than 50 years	Gambel oak, pinyon-juniper, big sage, aspen
II	52	Infrequent fires of high intensity/higher elevations	More than 50 years, usually 50-300 years	Lodgepole pine, spruce-fir, lower-elevation mixed conifer, aspen
IV	10	Infrequent fires of low-to-moderate intensity	30 -500 years	High alpine, Krummholz
None	10	No fire regime	—	Rock and water

The vegetation or plant communities within these three fire regimes each demonstrate adaptations that maintain the individual species following repeated fire occurrence. These species are considered fire-dependent because fire is integral to the vegetative life cycle. If fire is excluded for any reason, the health, composition, and diversity of the plant community may be altered. An example is the ponderosa pine forest/grassland type, in which fire exclusion has led to a conversion to Douglas fir.

Within the classification of fire dependency are two subdivisions that further define fire's role in the ecosystem. The Type I fire regime is defined as fire-maintained. A fire-maintained ecosystem is one in which light or low-intensity fires reduce the occurrence of destructive high-intensity wildfire through thinning and pruning. Fires of low-to-moderate intensity also will remove any dead and downed surface fuels before they build up, preventing a severe or high-intensity fire.

In the Type II and Type IV regimes, ecosystems are fire initiated. A fire-initiated ecosystem is one in which a severe fire or one of high intensity will simultaneously terminate the resident vegetational life forms and initiate a vegetation response. Within the fire regimes described for the White River National Forest, dominant cover species respond to fire occurrence and intensity in a variety of ways.

Engelmann spruce (*Picea engelmannii*). This species is very fire sensitive and generally is killed even by low-intensity fires. Contributing to this species' sensitivity to fire are its thin bark, shallow rooting pattern, resinous bark, low-growing branches, tendency to grow in dense stands, moderately flammable foliage, and heavy lichen growth.

Subalpine fir (*Abies bifolia*). Subalpine fir cohabitates sites within the subalpine zone with Engelmann spruce. These species occur on cool, moist sites at higher elevations ranging from 9,000-11,000 feet. Spruce is a co-climax species that probably will never be completely replaced on the site by fir. Fir is more shade-tolerant than spruce and reproduces by layering as well as seeds. Subalpine fir may dominate sites in terms of tree numbers after a disturbance by insects (spruce beetle) due to mortality in Engelmann spruce. Over time, the longevity of spruce will return it to dominance on the site. Spruce may live for 700-800 years if undisturbed. Lodgepole pine may be a seral stand component at lower elevations on some sites.

Lodgepole pine (*Pinus contorta* var. *latifolia*). The percentage of closed and open-coned lodgepole individuals within stands varies considerably throughout the Rocky Mountains. This allows lodgepole to regenerate following both high- and low-intensity fires. High intensity fire (>140° F) are necessary to open serotinous cones and release seed. In the absence of wind or slope conditions, low-intensity fires with low rates of spread are common in lodgepole due to the sparse understory. It is also difficult to initiate spread to the crowns because they are elevated well above the ground. Lodgepole stands become more flammable as they age because of the buildup of woody debris typically caused by insects and disease.

Aspen (*Populus tremuloides*). Fire plays a major role in the establishment and maintenance of aspen stands. In some locations, aspen represents climax vegetation; in many areas, however, it is a seral species that depends on major disturbances for regeneration. Fire frequency in stands of aspen, mixed conifer, and spruce is 70-200 years. In some low-elevation aspen/bunchgrass communities, a shorter interval may be common. Research indicates that fire frequencies of 100-300 years are necessary for the regeneration of many aspen communities.

Gambel oak or oakbrush (*Quercus gambelli*). Gambel oak is extremely fire-tolerant and generally sprouts vigorously from stem bases or from underground lignotubers and rhizomes following fire. Fire promotes root sprouting, the formation of buds on rhizomes, and seldom kills oak. Recovery time varies with fire severity, climatic factors, and site characteristics.

Clearly the vegetation types and ecosystems in existence today are a direct result of fire and its defining role in the landscape. Currently, within the high-elevation alpine landscape as well as the mid-elevation spruce-fir, lodgepole pine, and aspen vegetation types, fire is still within its historic range of variability. That condition is changing and will continue to do so within the next 50-100 years. As human development and recreation use impinge upon these fire regimes, increased ignition risks and the concern for protecting economic values will substantially affect fire management activities in these areas. As these vegetation types continue to age, fuel loadings will increase, resulting in a larger number or percentage of high intensity, stand-replacement fires. These fires will be difficult if not impossible to control with existing fire management resources.

Analysis completed and summarized in the HRV report (Appendix D) indicates a changing and variable fire occurrence since European settlement of western Colorado. Before settlement, we estimate (professional opinion) that there were approximately 450 fires ignited each year, burning approximately 20-100 acres annually, with a large fire event of 5,000-10,000 acres occurring every decade or so. It is likely that about 10 percent of the annual ignitions ever burned to a level that would consume significant

acres and reach a size which was detectable by inhabitants of the area during that period. Therefore, we can assume that an average of 45 fires burned annually with an annual average burned acreage of 766 acres (an average of all years, including estimated large fire events). From 1971 until 1995, the rates of detected and suppressed fires remains similar at around 45; however, the acreage has risen by 161 percent to 1,236 acres burned annually.

In many locations where fires normally occurred at lower elevations, the suppression of fires has prevented any substantial fire spread to the mid- and upper-elevation zones. This has led to the increase in shrub biomass accumulation and subsequent creation of a ladder-fuel profile, which increases spread potential into the closed canopies of the forested stands. At the mid- to upper-elevation ranges, aspen stands that have not incurred a low-intensity fire for many years are now being replaced through succession by conifers, thus creating a more flammable fuel profile. Within the upper-elevation conifer forests, the lack of fire coupled with insect and disease epidemics has led to increased fuel loadings in the form of downed woody debris. The lack of fire coupled with relatively older age classes has created vast areas of highly flammable fuels, which burn intensely and for long durations once they are ignited.

In most cases, the lower-elevation Type I fire regimes, including the Gambel oak and sagebrush-grass vegetation types, are now or will shortly be outside of their HRV for fire. This can be attributed to the general public's demand for aggressive fire protection. Current suppression resources are rapid, efficient, and highly mobile at the local, state and federal levels and have effectively removed fire from these habitat types. Although prescribed fire has been effective in the reduction of crown height and biomass in some areas, most of the prescribed burns have not been located in urban interface areas. Increasing development of private lands combined with aggressive fire suppression activities will only continue to limit fire's role in these regimes.

Environmental consequences

GENERAL EFFECTS

Fuel hazard

The potential for wildland fire is measured in terms of fire hazard and resistance to control. Wildland fire hazard can be directly related to age, stand structure, and stand density. These characteristics are used to categorize vegetation for various modeling efforts. Fire managers currently use one such set of models, the fire behavior prediction system fuel models. These help illustrate the differences in fuels and how they react to such factors as wind, humidity, and topography after ignition of a wildland fire.

The various fuel models then are rated based on their relative resistance to fire suppression activities. These classifications are low, moderate, and high. Low resistance to control typifies those fuel models that are relatively easy to suppress in the shortest time frames. Fires in the low hazard category can, however, exhibit rapid spread and erratic behavior when subjected to extreme ranges of low humidities, high temperatures, and/or high wind speeds. High-resistance fuels typically consist of the older-age conifer fuel types with significant downed and dead fuel components. These fuels often produce fire intensities and energy release at extremely high levels, which can influence their

surroundings and exhibit extreme fire behavior for long periods of time. This type of fire behavior exceeds the capabilities of most fire suppression actions.

Fire hazards are greatest when spruce-fir and lodgepole pine are younger than 25 years and older than 250-300 years. Aspen when older than 100 years also has a higher hazard rating than younger stands because of the encroachment by conifer species.

On the White River National Forest, 26 percent of the vegetation is mature and considered to have a high resistance to control, and 21 percent is moderate in its resistance to control and consists primarily of the short-needle conifer types such as lodgepole pine. The remaining lands consist of the grass, brush, aspen, and non-flammable lands, which comprise about 50 percent of the forest. **Table 73** illustrates this distribution. Considering the typical age classes within the moderate resistance to control classification, this class will most likely advance to the *high resistance to control* classification within the next 10-25 years without disturbance or treatment. This represents that approximately 45 percent to 50 percent of White River National Forest lands are in or are rapidly approaching a high fire hazard condition.

Fuel hazard rating is one of the most important criteria when developing fire management plans and the development of fuels treatment programs. Because vegetation systems are highly dynamic and constantly changing, resource management activities performed by agencies and land managers will directly influence changes on the landscape.

Table 73
Fuel hazard rating based on resistance to control

<i>Fire behavior fuel models</i>	<i>Acres</i>	<i>Hazard rating</i>	<i>% cover</i>
1, 2, 5, 6, 28, 99	1,177,292	Low	50
8	496,381	Moderate	21
10	608,742	High	26
0	69,621	Not rated	3

**Values at risk
and fire
management
categories**

To further evaluate fire's relationship to overall forest management and protection, hazards must be related to risk. Risk relates to the source and number of ignitions such as concentrations of people, facilities, roads, industrial operations, lightning, etc. Risk of ignition, however, is often difficult to predict and should not be utilized solely when developing fire management implementation plans. Risk analysis does enable managers to develop specific plans for prepositioning of suppression forces and for the purposes of developing contingency plans.

Forest managers consider values at risk from wildfire to be the other primary element in assessing the forest fuel and fire management situation. Urban interface zones, regenerated forest stands, unique habitats, municipal supply watersheds, electronic sites, and developed facilities and improvements are a few examples of moderate to high values potentially at risk from fire. Areas where fire is a key component of ecosystem function and should be allowed to play as natural a role as possible in the maintenance of the ecosystem are considered to have low overall values at risk. However, fire managers still must place emphasis on protection of life and property when fires occur in low risk areas, and therefore aggressive attack may be conducted. Values expressed in terms of resource values at risk have been developed based upon the management area emphasis.

Table 74 presents the estimated level of risk to resource value(s) from wildland fires by forest plan management area designation. Each risk category corresponds to a specific fire management category, as described below. The fire management categories are based upon wildland fire's role in the ecosystems of the White River National Forest and how this role relates to the values at risk. The fire management categories are:

Category A. Very High Risk. Wildland fire in any form is not desired. Fire either has never played a significant role in the function of the ecosystem or because of human development and/or habitation can no longer be tolerated without significant economic loss and social impact. Virtually all forms of wildland fire are actively suppressed and the use of prescribed fire is primarily limited to reducing an immediate and catastrophic threat to firefighter and public health and safety. Unit costs for prescribed fire are prohibitive to implement on a large scale. Other treatment methodologies are used as an alternative to prescribed fire.

Category B. High Risk. Fire performs a natural role in the function of the ecosystem. However, because of resource concerns and potentially high economic impacts from unplanned ignitions, considerable constraints and mitigation measures are required. Fire suppression actions are generally aggressive. Fuel and hazard reduction as a major means of mitigating potential risks and losses are a priority over other forms of prescribed fire projects. Prescribed fires are usually complex when initiated and unit costs for these projects are high and require stringent contingency planning and monitoring.

Category C. Moderate Risk. Fire is a desirable component of the ecosystem with minimal mitigation requirements and constraints. Certain ecological and resource management constraints may be applied on a case-by-case basis. These constraints along with health and safety are used to determine the appropriate suppression tactics to be applied by the incident commander and the sub-unit line officer. Significant prescribed fire activity would be expected to help attain the desired resource and ecological conditions. Prescribed fire for hazard reduction and reduction of activity fuels are of a lower priority than in Category B areas. Prescribed fire unit costs are low to moderate and are generally non-complex. Wildland fires may be managed in accordance with prescribed weather conditions, location and terrain constraints to meet resource management objectives under an approved wildland fire implementation plan.

Category D. Low Risk. Fire is desired to achieve the desired future condition for designated areas, with little or no requirements for mitigation or resource and ecological constraints. Health and safety constraints will apply. Use of prescribed fire to obtain the desired resource and ecological condition is appropriate. Prescribed fire for hazardous fuel reduction is not a priority except where an immediate threat to public health and safety exists. Naturally occurring fires under certain weather, location, and terrain conditions are permitted to run their course if approved wildland fire implementation plans specify this form of management strategy. Wildland fires may be managed in accordance with prescribed weather conditions, and location and terrain constraints under an approved wildland fire implementation plan.

Category E. This category includes areas such as state and private lands outside of the jurisdiction of the White River National Forest and its agency partners within the UCR. Fires occurring within these areas generally initiate rapid response from the appropriate jurisdictional agency and also may initiate mutual aid cooperative agreements between various federal, state, and local agencies. Because this category is outside the jurisdiction of the UCR's jurisdiction, it is not evaluated any further.

The development of the fire management categories is a crucial tool to assist fire management personnel as well as line officers in the evaluation of various natural resource management options and alternatives.

The mix of management areas will determine the variety and magnitude of fire management's response in managing wildland fires which may occur in a given area. The fire management maps found in the map packet illustrate, by alternative, how areas are allocated to each of the fire management categories.

Table 74 Resource values at risk and fire response strategy by management area prescription

<i>Management area</i>		<i>Implied risk to resource value</i>	<i>Category</i>
1.11	Pristine wilderness	Low	D
1.12	Primitive wilderness	Low	D
1.13	Semi-primitive wilderness	Low	D
1.2	Recommended wilderness	Low	D
1.31	Backcountry recreation, non-motorized	Low	D
1.32	Backcountry recreation, limited winter motorized	Low	D
1.41	Core areas	Low	D
1.5	Wild rivers __ designated and eligible	Low	D
2.1	Special interest areas __ minimal use and interpretation	Low	D
2.2	Research natural areas	Low	D
3.1	Special interest areas __ emphasis on use or interpretation	High	B
3.21	Limited-use areas	Low	D
3.31	Backcountry recreation, year-round motorized	Low	D
3.32	Backcountry recreation, non-motorized with winter motorized	Low	D
3.4	Scenic rivers __ designated and eligible	Low	D
3.55	Corridors connecting core areas	Moderate	C
4.2	Scenery	Moderate	C
4.23	Scenic byways, scenic areas, vistas, or travel corridors	Moderate	C
4.3	Dispersed recreation	Moderate	C
4.32	Dispersed recreation, high use	Moderate	C
4.4	Recreation rivers __ designated and eligible	Moderate	C
5.12	General forest and rangelands __ range vegetation emphasis	Moderate	C
5.13	Resource production __ forest products	High	B
5.4	Forested flora and fauna habitats	Moderate	C
5.41	Deer and elk winter range	Moderate	C
5.42	Bighorn sheep habitat	Moderate	C
5.43	Elk habitat	Moderate	C
5.5	Landscape Linkages	Moderate	C
7.1	Intermix	Very High	A
8.21	Developed recreation complexes	High	B
8.25	Ski areas __ existing and potential	High	B
8.31	Aerial transportation corridors	High	B
8.32	Designated utility corridors __ existing and potential	High	B

The areas allocated to fire management categories are a direct reflection of the management area allocation according to **Table 74**.

Acres of fuels treatment

The amount of desired prescribed fire treatment depends on management area goals and site-specific vegetation cover type and condition. The actual acreage that will be treated in a given year is difficult to predict due to a myriad of variable factors, such as meteorological conditions, seasonal snowpack and rainfall, wildfire activity, and available funding. For the purposed of comparing alternatives, the estimated acreage of fuels treatment activity has been broken out by fire management category. Table 76 displays this information. We assume that for each alternative, approximately two-thirds of the annual acreage will be burned for the purpose of hazardous fuel reduction. The remaining one-thirds of total prescribed burn acreage will be conducted to meet resource management goals and objectives for wildlife, timber, range, and recreation.

Table 75
Use of wildland fire and prescribed fire by management area prescription

Management Area	Description	Wildland Fire Use	Prescribed Fire
1.11	Pristine Wilderness	Yes	Yes
1.12	Primitive Wilderness	Yes	Yes
1.13	Semi-primitive Wilderness	Yes	Yes
1.2	Recommended Wilderness	Yes	Yes
1.31	Backcountry recreation, non-motorized	Yes	Yes
1.32	Backcountry recreation, limited winter motorized	Yes	Yes
1.5	Wild rivers – designated and eligible	Yes	Yes
2.1	Special interest areas – minimal use and interpretation	Yes ²	Yes
2.2	Research natural areas	Yes	Yes
3.1	Special interest areas – emphasis on use and interpretation	No	Yes
3.31	Backcountry recreation, year-round motorized	Yes	Yes
3.32	Backcountry recreation, non-motorized with winter motorized	Yes	Yes
3.4	Scenic rivers – designated and eligible	Yes	Yes
4.2	Scenery	Yes	Yes
4.23	Scenic byways, scenic areas, vistas or travel corridors	Yes	Yes
4.3	Dispersed recreation	Yes	Yes
4.32	Dispersed recreation, high use	Yes	Yes
4.4	Recreation rivers – designated and eligible	Yes	Yes
5.12	General forest and rangelands – range vegetation emphasis	Yes	Yes ¹
5.13	Resource production – forest products	No	Yes ¹
5.4	Forested flora and fauna habitats	Yes ²	Yes ¹

¹ Prescribed fire may be used for treatment of activity fuels. Broadcast burning and/or under burning may be utilized to achieve resource management objectives as support by project level environmental analysis.

² Denotes management areas where wildland fire use may be restricted to an upper limit of acres affected per decade. Once exceeded, wildland fire starts will be suppressed using an appropriate management response.

Management Area	Description	Wildland Fire Use	Prescribed Fire
5.41	Deer and elk winter range	Yes	Yes ¹
5.42	Bighorn sheep habitat	Yes	Yes
5.43	Elk habitat	Yes ²	Yes ¹
5.5	Forested Landscape Linkages	Yes ²	Yes ¹
7.1	Intermix	No	Yes
8.21	Developed recreation complexes	No	Yes
8.25	Ski based resorts – existing and potential	No	Yes
8.32	Designated utility corridors	TBD	Yes

Notes:

¹ Prescribed fire may be used for treatment of activity fuels. Broadcast burning and/or under burning may be utilized to achieve resource management objectives as support by project level environmental analysis.

² Denotes management areas where wildland fire use may be restricted to an upper limit of acres affected per decade. Once exceeded, wildland fire starts will be suppressed using an appropriate management response.

TBD – Ignitions will be evaluated to determine if they can be managed without jeopardizing existing utility corridors and associated improvements.

Table 76
Estimated annual prescribed fire activity by alternative and fire management category

Category	ALTERNATIVE						
	B	C	D	E	F	I	K
	Acres	Acres	Acres	Acres	Acres	Acres	Acres
A	0	25	0	0	15	8	50
B	2,000	2,475	2,000	2,250	2,485	1,000	2,575
C	3,200	3,200	3,500	2,000	750	1,500	3,000
D	500	500	500	250	500	1,492	600
Total	5,700	6,200	6,000	4,500	3,750	4,000	6,200

Note that in virtually all alternatives with the exception of Alternative I, the proportion of total acreage assigned to each fire management category, based on the acreage allocated to each management area, is approximately equal. However, the proportions of prescribed fire treatment acreage by does not generally follow this distribution pattern. Essentially, the prescribed fire accomplishments and funding levels for each of the alternatives will be as follows: Fuels Management will plan and fund for approximately one third of the annual 7,500 acres in each of the alternatives. The remaining 5,000 acres will be planned and funded out of the various resource disciplines depending upon the emphasis stated in the alternative.

TBD – Ignitions will be evaluated to determine if they can be managed without jeopardizing existing utility corridors and associated improvements.

Typically, most of the hazardous fuels treatment will occur in the A, B, and D categories. The majority of the non-fuels management prescribed fire acreage will be located in the C category. This category includes most of the mixed brush cover types where the majority of the wildlife habitat enhancement work will be accomplished. Some resource management prescribed fire will occur in the lodgepole pine and aspen type; however, this is largely dependent upon the management emphasis of the various alternatives.

Prescribed fire projects in forested cover types are expected to make up a majority of the annual fuels management. We anticipate that the proportion of fuels reduction activity accomplished through traditional means (commercial timber sales and personal use firewood) will continue to decline. Lack of available fuels management funds to subsidize the timber management program and the increased unit costs of planning and implementation of projects in forested cover types contribute to this trend. Salvage timber harvest on suitable and available lands continues to decline across the forest because a large portion of the current suitable timber lands containing merchantable quantities of salvageable material has been harvested over the previous 15 years. Remaining lands are more difficult to access in an economical manner using helicopter logging systems.

Mechanized and hand treatment of hazardous fuels accumulations in forested and non-forested cover types is expected to increase during the planning period in urban-interface areas. Fire planning efforts for non-federal lands will provide the basis for local governments, communities, and cooperators to identify and prioritize treatments on private land. Treatment of hazardous fuels on adjacent public lands will be considered where feasible.

The White River National Forest's inexperience in undertaking large-scale, stand replacement prescribed fires in the timber cover types, unreliable prescriptive windows during the late summer and early fall, and the availability of adequate budgetary and staff resources to complete these projects may influence the proportion of activities completed on an annual basis over the next several years.

Acres burned by wildland fire Prediction of wildfire or managed wildland fire acreage burned by alternative cannot be done. Seasonal weather and climatic factors, combined with budgetary and organizational constraints, would make any comparison generic and invalid. The effects upon fire management by other resource programs will identify trends or potential effects, but cannot assign percentage or acreages.

DIRECT AND INDIRECT EFFECTS

Effects on fire management from domestic livestock grazing

Domestic livestock grazing removes herbaceous fuels and makes them unavailable for combustion. The more grazing that occurs, the greater the fuel reduction, and hence the greater the reduction in the fire hazard. However, grazing does not affect all vegetation types equally. Except for situations where severe overgrazing occurs, fuel types with relatively little forage such as dense brush or forested cover will show little or no reduction in fuel hazard due to livestock use. Only those areas with a dominant or co-dominant grass cover will show a noticeable change in fuel loading and fire hazard due to regulation of livestock use.

Because grazing levels will not differ considerably between alternatives, there will be little difference in the resulting fuel hazard between alternatives. Those allotments that remain active will continue to see a slight reduction in fire hazard due to removal of fuels by grazing. Alternatives that would close previously vacant allotments to future grazing would not change the current fuel profile, however it would eliminate a potentially useful management tool should a high herbaceous fuel load result over time or as the result of a disturbance such as fire.

Effects on fire management from recreation and travel management

Dispersed recreation and travel management can affect the fire suppression activities and the fire management program as a whole in both a positive and negative manner. As human use increases on the White River National Forest, more people will observe and report fires that would previously have gone undetected for some time. With increased use, we can also expect an increase in the incidence of human-caused fire ignitions.

Wilderness and semi-primitive non-motorized management prescriptions are conducive to the management of natural fuels through prescribed burns and less aggressive management of naturally occurring wildland fires. However, these management areas must be large in size for wildland fires to fulfill their role in the ecosystem and must be evaluated within site-specific wildland fire implementation plans before managers can allow fire to play its role in the environment.

Alternatives C, E, I, and K facilitate the use of less-aggressive fire suppression options and the use of managed wildland fire ignitions under specific wildland fire implementation plans. This type of management generally is considered to be more cost-efficient and safer for wildland fire personnel.

In the other alternatives that specifically increase the level of recreation and travel use across the forest, such as Alternatives E and F, significant opportunities exist for the White River National Forest to become a leader in wildland fire management education, especially in areas in which wildland fire implementation plans exist or are in preparation.

Effects on fire management from timber management

Timber harvest will create additional concentrations of activity fuel residues, or slash. Harvest-related activities such as chainsaw and motorized equipment use, smoking, and cooking also increase the risk of ignition in the sale area. In the short term, additional hazard fuels will be created that have an adverse effect on relative fire risk. Wildland fire suppression crews engaging in suppression activities in or near these areas of concentrated fuels also face additional safety hazards.

Depending upon the harvest method, increased numbers of openings can reduce fire's ability to transition from a surface fire to a crown fire and can reduce spread rates and spread distance over time.

Timber harvest can reduce fuel loadings substantially in areas where natural fuel loadings are excessively high. However, timber harvest also can create additional activity fuels which if not treated properly under a slash disposal program can lead to higher fuel loadings over a given area and subsequently increase potential for resource damage and loss.

In Alternatives C, E, I, and K, where timber harvest is the lowest, there will be less harvest-related fuel build-up. Some fires may increase in size and intensity to an extent that initial attack success will be low and more incidents will enter an extended attack phase. In addition, as timber stands age and become more decadent, the threat of stand-replacing fires of significant size will become more likely. These types of fires will create more risk to firefighters, the public, and adjoining high-value resources.

Alternatives D and F will have the opposite effects of Alternatives C, E, I, and K, due to the higher rate of timber harvest. Age class diversity will be increased over the landscape, reducing the potential of large-scale, stand-replacement wildfires. The effects of Alternative B will be somewhere between Alternatives C, E, I, and K and Alternatives D and F given that harvest levels are intermediary.

CUMULATIVE EFFECTS

Alternatives that limit the amount of resource production such as C, E, I, and K may possibly lead to a trend in larger and longer-duration fires and will most certainly lead to an increase in stand-replacing crown fires within the next quarter century. This is primarily due to the current age of the stands and the large tracts of continuous even-aged forests with little or no canopy openings.

Due to the reduction of activity fuels created from a diminished timber management program, the fuels management program will be managed to emphasize natural fuels management and hazard mitigation rather than the traditional role of activity fuel disposal.

The increase in human use is a double-edged sword in relation to the fire management program of the White River National Forest. As human activity increases and members of the public spot more ignitions, they will aid in the reporting of fires and in some cases aid the Forest Service in keeping wildfire acreage low. On the other hand, the backcountry theme that some alternatives promote can increase fire size and intensity because it is difficult to access remote areas to implement the appropriate management response. These remote areas coupled with high dispersed use may present a significant wildfire prevention dilemma to land managers in the future.

An increase in accidental or negligence-based human ignitions may also be expected. Unlike national forests in more populated areas, the White River National Forest does not experience arson to the extent other forests do. With increased public use, the White River National Forest may, however, also experience an increase in arson activity.

Another activity that will most likely affect the fire management program is the increase in urban development in areas bordering National Forest System lands in tandem with home construction on private inholdings. As development occurs, increased pressure will be directed toward the federal land management agencies to protect adjacent private lands and developments. Although there needs to be a concerted and cooperative emphasis placed on reducing hazard fuels near these developments, it is the ultimate responsibility of individual landowners to reduce the fire hazards on their property.

Topic 2 Part 1

Travel management and infrastructure

Introduction

Abstract

On the White River National Forest, two decisions will provide direction for travel management. (1) The revised forest plan is a programmatic decision that will provide new standards and guidelines related to travel management for forest-wide application. This will influence the general levels of road and trail construction, reconstruction, maintenance, closures, and decommissionings. (2) The other decision, which will be tiered to the programmatic forest plan analysis, is to finalize a site-specific travel management plan. The Travel Management Plan revision process will continue following the signing of the record of decision for the 2002 Forest Plan because we have separated the site-specific travel management plan decision from the forest plan in response to public comment and in order to allow time for more review. The travel plan will be developed in accordance with the selected alternative for the forest plan. For all alternatives, there are varying levels of emphasis on road reconstruction, road maintenance, and road decommissioning based on administrative and public needs, environmental concerns, and budget allocations.

Summary

Travel is an integral part of virtually every activity that occurs on the forest. Travel is necessary for outdoor recreation, fighting wildfires, management of livestock and wildlife, management of commodity resources, access to private inholdings, maintenance of electronic sites and utilities, and management and monitoring of the forest in general. Modes of vehicle travel on the forest include large commercial trucks, automobiles, high clearance vehicles, four wheel drive vehicles, all-terrain vehicles, motorcycles, snowcats, snowmobiles, mountain bikes, and wheelchairs. Other modes of travel include cross-country skiing, dog sledding, snowshoeing, horseback riding, pack animal driving, hiking, boating, hang-gliding, paragliding, and ballooning.

Travel management is the integrated planning of, and providing for, movement of people and products to and through National Forest System lands. A travel management plan provides clear, specific direction on the appropriate levels of land, water, and air access opportunities to be made available. Management area prescriptions serve as the foundation for travel opportunities. The travel management plan will go beyond the forest plan to define the transportation system and how the system will be managed. Monitoring of impacts on forest resources will be integrated with public and administrative access demands to indicate the need for changes to the existing travel management plan.

While traditional commercial use continues to be a transportation need, recreation use and modes of travel are ever increasing. Considerations have to be made for wildlife habitat and species protection, and for hydrologic, vegetative and soil mitigations. Demand has led to the need to identify areas of motorized and non-motorized travel, and modes of travel for both on- and off-snow travel. If natural resources and ecosystems are

to be protected, development of a road and trail system is essential, along with area management strategies to accommodate this expanding quantity and variety of uses.

Key indicators

- Acres of land available for travel opportunities by management area prescription designation.
- Acres of land available for travel opportunities under the guidance of Recreation Opportunity Spectrum (ROS).

Legal and Administrative Framework

- **The National Forest System Road Management and Transportation System Final Rule and Policy**, approved January 12, 2001, is intended to provide a road system that is safe, responsive to public needs, environmentally sound, and affordable and efficient to manage. The intended effect is to help ensure that construction, reconstruction, and maintenance of roads minimize adverse environmental impact; and that unneeded roads are decommissioned.
- **36 CFR 212**. Administration of the Forest Development Transportation System provides the principal regulations for administration of the forest development transportation system.
- **36 CFR 219.11** provides resource management requirements that cannot be met without putting a viable transportation system in place.
- **Forest Service Manual (FSM) 7700**. Transportation Systems.
- **Forest Service Handbook (FSH) 7709**. Transportation and Related Activities.

Affected Environment

INTRODUCTION

The forest transportation inventory is the official record of the forest transportation facility on the White River National Forest. The inventory is two parts. The first part consists of spatial data contained in the forest's geographic information system, which records the location of individual roads and trails. From these data, informational maps can be produced at various scales. The second part of the inventory is a computer database that contains descriptive details of management, structural information, designations, and maintenance requirements. Records for all National Forest System roads, forest highways, forest development trails, and bridges are included. Information for the forest transportation inventory is updated when more recent survey information becomes available, changes are made in the field, management changes occur, and technological improvements are made.

NATIONAL FOREST SYSTEM ROADS

The forest transportation system currently contains 2,356 miles of forest-managed roads that provide access to and through National Forest System lands. The transportation network is completed by roads under county and state jurisdiction that provide access to the forest's roads. An important aspect of National Forest System roads is that they are not public roads. Although they generally are open and available for public use, they are authorized only for the administration, protection, and utilization of National Forest System lands. Through travel management planning, public access opportunities are

provided along with controls and restrictions necessary to achieve land management objectives.

National Forest System roads provide access in a branching system of arterial, collector, and local roads. Arterials provide access to large land areas, typically linking to county roads, state highways, or communities. They have the highest standards for construction and maintenance because of the larger volumes of traffic they carry. Collector roads disperse traffic from arterials to large forest areas such as watersheds. Local roads, used to access specific project areas or sites, are usually less than two miles long and of lower standard construction. Table 77 displays the total miles of National Forest System roads currently on the White River National Forest by functional class.

Table 77
National Forest System roads by functional class on the White River National Forest

Functional class	Miles
Arterial	133
Collector	346
Local	1,877
Total	2,356

Between 1981 and 1997, 18 miles of new construction and 121 miles of reconstruction of the forest arterial and collector road system were planned. Primarily because of reductions in the timber sale program and lower than expected appropriations for capital investment, these projections were not met. Actually completed were about 9 miles of new construction and 68 miles of reconstruction, or 50 percent and 56 percent of planned levels, respectively. As a result, the condition of many of the primary access roads serving the forest has fallen below the level necessary to safely and efficiently support the traffic volumes being carried. Trends indicate increased traffic volumes in the future, especially from recreation-oriented traffic.

Management objectives are established for all roads and provide construction standards and maintenance levels. Vehicle types, expected traffic volumes, user types, environmental constraints, and economics are considered when determining the appropriate standards to be applied. Traffic service levels represent the significant traffic characteristics and operating conditions for a road: Level A (most efficient and free-flowing) through Level D (single-purpose, low volume). Road maintenance levels prescribe the upkeep and restoration work necessary to retain a desired traffic service level. Level 1 maintenance is the lowest standard and is used to close roads from motor vehicle traffic while preserving the investment in the road structure. Levels 2 through 5 are maintenance levels for roads open to full-sized motor vehicle traffic. Level 2 is used for high-clearance vehicles such as trucks and four-wheel drive vehicles. User comfort improves as the maintenance level increases up to level 5, which is a road with a paved, smooth surface. Maintenance level 3, 4, and 5 (ML 3-5) roads are the backbone road system for the White River National Forest, and provide the primary passenger car access to the Forest. Roads with an objective maintenance level of 3-5 will be managed for public access with passenger cars. Any future changes to the existing system would only occur through the issuance of a subsequent decision document. Additional detail and description of traffic service and maintenance levels can be found in the glossary

(Appendix K). **Table 78** displays the traffic service and maintenance levels for which the current transportation system is being managed.

Table 78
Miles of travelways by traffic service and road maintenance levels

Traffic Service Level	Miles
A	0
B	71
C	420
D	1,865

Maintenance Level	Miles
1	318
2	1,487
3	475
4	64
5	12

Road maintenance budgets have been relatively stable during the past 15 years. However, traffic volumes on the forest road system have dramatically increased. Consequently, not all roads have been maintained to the level prescribed in management objectives.

Because of fewer timber sales and reduced activity in the oil and gas industry, commercial user contributions to road maintenance also has declined. County governments continue to provide maintenance on some forest roads, but also at reduced levels. Local population growth has increased the burden on county road systems, while budgetary constraints have concentrated maintenance priorities on roads closer to urban areas.

Annual accomplishment reporting indicates that the forest has achieved full maintenance standards on approximately 20 percent of the transportation system. To address the declining ability of the forest to provide adequate maintenance and restoration work, physical closures to motor vehicles (level 1 maintenance) and road obliteration have been used to an increasing degree. An average of 100 miles of level 1 maintenance has been reported annually since 1988. In the same period, 45.8 miles of system roads and 97.4 miles of non-system roads have been obliterated.

Public Forest Service Roads

Under consideration is the ability for the Forest Service to designate certain National Forest System roads as public roads. By definition, a public Forest Service road (PFSR) is a National Forest System road that is designated “open to public travel” in accordance with 23USCs101(a). The roads must serve a compelling public need. By definition, the roads would remain open and meet Federal Highway Safety Act requirements.

Exceptions would be for scheduled seasonal closures or emergency closure needs. To date, and per agreement with the Federal Highway Administration, maintenance levels 3–5 roads have been subject to the Highway Safety Act requirements, but without the public

road designation. The Forest Service has identified potential roads for public forest service road classification, along with construction work, which would be required to bring these roads up to the standards necessary for a public road. The Forest Service Region 2 Regional Office has prioritized the projects to be accomplished as money becomes available. PFSR designation is still preliminary and is subject to change, modification, and approval. Further analysis through travel management, road analysis, public involvement, and decision documentation is also required.

Forest Highways

The Colorado State Department of Transportation maintains an inventory of designated forest highways for the public land highway component of the Transportation Equity Act for the 21st Century (TEA-21). Two state inventoried forest highways provide access to the White River National Forest. One is State Highway 133 McClure Pass. Within the forest are 18 miles of this highway, providing access to 269,440 acres of the White River National Forest. This highway is also part of the West Elk Loop Scenic and Historic Byway. The other is the Marvine-Phippsburg road, a Rio Blanco County road, also designated as a scenic byway. It begins at its junction with County Road 12 east of Buford and leaves the forest at the boundary between the White River National Forest and the Routt National Forest. Within the forest are 15.5 miles of this highway, providing access to 189,568 acres of the White River National Forest.

Trails

Trails can be an effective means of managing public travel and access in the backcountry. An increasing demand for a more primitive type of experience by all user groups has placed greater emphasis on trail system planning. As a result, the inventory of forest trails has grown. There are 1,895 miles of forest development trails, 831 miles of which are within wilderness. The forest also manages 40 miles of national recreation trails and 67 miles of the Continental Divide National Scenic Trail. Other national or state recognized trails include the Colorado Trail, the planned American Discovery Trail, and the Sunlight-Powderhorn snowmobile trail. Since 1986, 285 miles of trail construction and reconstruction accomplishments have been reported. Because of the variety of trail use—from hiking, to mountain bikes, to off-highway vehicle use—an update on management of the current trail system along with new considerations in trail design need to be incorporated. Trailheads have been recognized as developments that need more planning for both summer and winter recreation.

Ways

Non-system roads and trails are referred to as ‘ways’ or ‘unclassified’ roads and trails. Unclassified roads or trails are roads or trails on National Forest System lands that are not managed as part of the transportation system. For example, unplanned roads, abandoned travelways, off-road vehicle tracks that have not been designated, and those roads that were once under permit or other authorization and were not decommissioned upon the termination of the authorization. These travelways have not been determined to be necessary for administration of National Forest System lands. Many of these routes are older timber, range, mining, or oil and gas exploration roads that no longer serve the purpose for which they were intended and that were never properly closed. Others have been created by recreation use. There are 528 miles of unclassified roads and trails

inventoried and mapped on the forest; 252 miles are roads and 276 are trails. In addition, others exist but are yet to be inventoried. Public scoping has shown that some of these unclassified roads and trails are of interest and value to forest users. For all, management objectives need to be developed. Decisions will be made in the travel management plan to designate these routes or eliminate them. In most cases, the objective will be to eliminate the routes by obliteration, along with all subsequent routes created there after. Any new route, road, or trail that needs to be created will have to have a compelling need and go through the proper process before construction.

Bridges and Major Culverts

There are 58 inventoried road bridges and 42 major culverts (open-end area equal to or greater than 35 square feet) on the forest. Of these structures, 33 bridges and 38 culverts are under Forest Service jurisdiction. The remainders are under the authority of other public road agencies. Of the structures under Forest Service jurisdiction, 23 are open to public travel and have a span length greater than 20 feet. These structures are subject to National Bridge Inspection Standards (NBIS) and currently are being inspected every two years. Of the NBIS structures inspected to date, nearly \$3 million in repair and /or replacement costs have been identified as necessary to bring the structures up to state legal load requirements. There are also 120 trail bridges on the forest. These structures are of mixed jurisdiction, with the majority being Forest Service property. When inspections are performed, they are intermittent and occur only when specifically requested by field personnel. Local knowledge indicates that maintenance has been lacking on most trail bridges and that some are in need of full replacement.

Administrative Facilities

The forest inventory currently consists of 150 buildings, excluding recreation facilities, located in both urban and remote settings. Most of the office and work facilities are well beyond their designated service life. In some cases, the current use is far from the designated intent for the structure, and needs have exceeded facility accommodations. Retrofit for type of use, energy efficiency, accessibility, safety and compliance with Occupational Safety and Health Administration (OSHA) requirements are ongoing. Issues are prioritized and final recommendations and decisions are made by the Forest Supervisor as funding opportunities arise. However, current funding does not keep pace with the rate of maintenance required to prolong the service of these aging facilities. A backlog of needs exist and is expected to increase in the future.

The Supervisor's Office and ranger district offices are used for administration of the forest, for public information meetings, and as visitor information centers. Forest administrative offices currently are located in the towns of Aspen, Carbondale, Eagle, Glenwood Springs, Meeker, Minturn, Rifle, and Silverthorne. Other facilities that require management are work centers, which consist of offices, shops, warehouses, dwellings, bunkhouses, remote cabins, and storage buildings. Numerous other facilities are located in outlying and remote areas.

Accessibility surveys were conducted on administrative sites during 1992-1993. Because most buildings on the forest predate the enactment of accessibility requirements, there is an extensive list of retrofits necessary to comply with current regulations. Priority is given to insuring full access in those facilities that are open to the public, with the long-term goal of providing reasonable access at other locations.

The Forest Facility Master Plan identifies each building and assesses the current and long-term management direction. Maintenance, rehabilitation, accessibility, safety, and conformance are also addressed in the master plan.

The management of forest administration facilities under all EIS alternatives is not expected to change as a result of the revision process.

FUTURE TRENDS

The past 10 to 15 years have brought a shift in the volume and mix of travel modes on the forest. All forms of recreation travel have increased in volume, some more dramatically than others. Variation in these increasing volumes can be attributed to a number of reasons. Factors include technology advances, economic conditions, changing demands for recreational experiences, population increases, and other social influences. The data in Table 79 are derived from annual recreation information management (RIM) reports. Direct comparison of three-year-average use volumes recorded in the FEIS for the 1984 forest plan to use levels seen more recently illustrates the shift in travel mode patterns during this period. Other modes of travel, not specifically reported, have also appeared as new or significantly increased. Some of these uses are hang-gliding, ballooning, dogsledding, snowshoeing, and animal packing. Total reported travel has increased at an average rate of about 25 percent per year.

Table 79
Changes in travel mode patterns from 1984 to 1996

Travel mode	1984-86 annual average		1995-96 annual average		Average annual % change
	RVDs*	% of total	RVDs*	% of total	
Automobiles	256,000	41	1,278,000	53	+33
Off-highway vehicles	17,000	3	168,000	7	+74
Aircraft	1,000	>1	8,000	>1	+58
Motorized watercraft	7,000	1	9,000	>1	+2
Non-motorized watercraft	10,000	2	39,000	2	+24
Hiking	193,000	31	352,000	15	+7
Horseback riding	39,000	6	64,000	3	+5
Bicycling	9,000	1	240,000	10	+214
Snowmobiles	39,000	6	83,000	3	+9
Cross-country skiing	55,000	9	160,000	7	+16

*RVDs – recreation visitor days

Along with the multitude of diverse uses has come an increasing demand for segregating the uses. Public scoping indicates non-motorized travelers are finding it more difficult to find areas outside of wilderness, free of motorized use. Motorized users maintain that the forest provides more than ample opportunity for seclusion within 750,000 acres of

wilderness; they are concerned that future management will tend to reduce motorized access.

The following common conflicts arise: hikers and horseback riders vs. mountain bikers; all-terrain vehicle users vs. full-sized motor vehicle users; all terrain vehicle users vs. hikers, horseback riders, and mountain bikers; and cross-country skiers vs. snowshoers, and both of those vs. snowmobiling. Other conflicts also need to be addressed. The travel management plan will attempt to deal with many of these conflicts.

Environmental Consequences

Most of the forest's roads and trails for the current level of use are in place.

Reconstruction, maintenance, and decommissioning of existing facilities are emphasized in all alternatives. Projections for new construction are much lower than was predicted for the previous planning period. Commercial use of the transportation system declined in the 1990s and this trend is expected to continue in the coming decade. On the other hand, recreational traffic has more than doubled. This shift in traffic composition and user types is a driving force for development of new travel management philosophies and strategies.

All alternatives place a greater emphasis on restricting motorized and mechanized travel to designated routes. New standards and guidelines have been developed to mitigate the impacts on natural resources resulting from increased traffic on forest roads and trails. Nationally, the trend in the 1990s was to redirect maintenance funding to obliterate unneeded roads and improve the maintenance condition of those remaining. A smaller, more efficient transportation system is the expected outcome.

For any alternative selected, decommissioning of roads will be used for roads no longer needed for administrative or public use currently or in the future. Some of these roads may be converted to trails. Methods of decommissioning include, but are not limited to, physical closures such as earth berms, boulders, downed vegetation, scarifying, seeding, recontouring, and removal of structures such as culverts. The goal is for the roadway to return to a natural state, permanently removing the road from the Forest Transportation System. Other roads may be identified for temporary closure, level 1 maintenance. These roads are identified as roads not needed for current use by the public or continual administrative use, but may be needed in the future. The intent is to preserve the road investment while eliminating vehicular traffic use. The road may be used, if so designated, for non-motorized use. These roads are retained as part of the Forest Transportation System.

To meet standards for traffic safety and environmental protection, all alternatives will require reconstruction of many existing roads. Changing conditions that lead to the need for reconstruction include upgrading traffic service levels to accommodate changes in type and volume of traffic. New standards for watershed protection will also make reconstruction necessary to keep some roads open to vehicular traffic. Reconstruction of roads occurs for various reasons. One is to upgrade the road structure to accommodate a different class of vehicle or to mitigate resource impacts. These upgrades are usually accomplished when projects such as campground developments, mineral entry, ski area expansion, or timber sales are implemented. Funding is usually derived from sources other than normal annual appropriations, often funded by the permittee or proponent of the project. Another reason for initiating reconstruction work is to repair traffic-generated

damage and replace obsolete structures. The objective is to return the road to its originally designed operating standard. This work is beyond what can be accomplished through normal maintenance procedures. In addition, reconstruction on a road may occur to mitigate environmental damage caused by the road, such as sediment to streams, slides, and riparian damage. Analysis of projected budgets for the planning period shows that the forest will be unable to accomplish expected reconstruction needs under any alternative in this EIS.

A significant factor in creating high road construction and reconstruction costs is aggregate surfacing, used on many of the level 3 and 4 maintenance level roads. Aggregate is also used for reinforcement of waterbars, and for sediment and erosion control. Many construction projects have seen in-place unit costs for crushed rock two to three times the regional average. Most surface material is produced at off-forest locations and hauling distances can become cost-prohibitive. This is a significant factor in reducing the forest's ability to attain proper construction standards and reduce soil erosion and stream sedimentation. One solution to this issue is to establish material sources for on-forest material source development sites.

In all EIS alternatives, protection of soil, aquatic, and riparian systems will be given more attention in future road development operations. As standards, guidelines and design criteria are implemented, stream crossings will either be rebuilt or removed. Bridges and hardened fords will be preferred to arches and culverts. As the need for repair or replacement of existing structures arises, design will provide for added streambed and bank stability as well as for fish and amphibian migration. Reconstruction of roads will include moving the travelway away from streams where feasible and reducing the size of connected disturbed areas. Proper use and placement of riprap and sediment barriers contribute to stabilization and provide improved habitat for aquatics and small wildlife, particularly with vegetation incorporated into riprap areas. For any disturbed areas due to construction or reconstruction of roads or trails revegetation with proper top soiling practices and seed mixes is necessary to ensure that ground disturbance from road activities reduces the movement of soils. Part of the purpose of revegetation is to also incorporate noxious weed control.

STRATEGIES FOR ROADS AND TRAILS

Travel management rules and strategies will be developed and implemented from the Travel Management Plan, which will comply with the standards and guidelines in the revised forest plan. Forest-wide standards and guidelines have been used to guide programmatic travel management decisions on all National Forest System lands within the White River National Forest. Management area prescriptions contain additional standards and guidelines that further dictate travel management. The resource emphasis of each management area prescription influences the type of travel management for each area. From these prescriptions, site-specific travel management plans are developed.

Travel management is divided into two seasons, summer and winter. Winter travel rules address motor vehicles designated specifically for travel over snow such as snowcats and snowmobiles. Winter travel management also addresses non-motorized uses such as cross-country skiing, snowshoeing and dog sledding. Because weather conditions vary from year to year, specific dates cannot be used to define the seasons. Summer travel

strategies and restrictions apply to vehicles and modes of travel normally used during snow-free periods or before snow depths make travel impractical.

The rate of increase in motorized travel on the forest has outpaced the forest's ability to maintain the transportation system and protect adjacent lands. Reports developed in response to inquiries regarding backlog and deferred road maintenance indicate that the forest has been maintaining less than 25 percent of the road system to standard. New standards and guidelines designated to protect water quality, fish and wildlife habitat, and primitive recreation opportunities, also affect the degree to which motorized access will be provided.

Based on thematic forest-wide standards and guidelines Alternatives B, C, E, and F allow for the possibility of snow-free off-designated route motorized travel, while Alternatives D, I, and K require all motorized travel be restricted to designated routes during snow-free times. Winter travel has unrestricted travel, travel on designated routes and snow-play areas, and non-motorized travel in varying degrees for all alternatives.

DIRECT AND INDIRECT EFFECTS

Effects on travel management from aquatic and soil management

Greater emphasis is being placed on maintaining the quality of water, riparian areas, and soil stability. Roads can contribute to the degradation of these if not properly engineered and maintained. There are techniques which can reduce and mitigate these impacts. The Forest Service is taking great strides to administer these techniques and invest in ways to improve watersheds. Alternatives that have fewer roads would have fewer impacts due to roads, more likely these would be Alternatives D, I, and K.

Effects on travel management from wildlife habitat management

Habitat improvement projects for most species will include road closures, both permanent and seasonal. Road density also will be limited in some areas. Generally, motorized and mechanized access is reduced as wildlife habitat is emphasized.

Winter range restrictions for deer and elk will usually include total closures to motorized travel, and travel only on designated routes. Total compaction due to recreation use will be limited to a fixed amount in order to enhance lynx sustainability.

Forest Plan alternatives that place greater emphasis on wildlife resources also reduce the total transportation system to the lowest level. Because of their wildlife emphasis, Alternatives D and I would require fewer miles of road to adhere to management prescription allocations.

Effects on travel management from recreation management

Increasingly, National Forest System and other public lands are likely to be the destinations of choice for people looking for high-quality outdoor recreation experiences in natural settings. As recreation use increases, travel management may need to respond with more opportunities, a well-designed transportation system, and more mitigation techniques for addressing impacts. Continued growth without increases in the road system will likely lead to lower visitor satisfaction and more conflict between users.

New road construction for recreation purposes is expected to be low. Recreation traffic has the biggest impact on road and trail conditions of all activities because of its higher traffic volumes. With arterials and collectors handling traffic ranging from 100 to more than 1,000 vehicles per day, the road maintenance program has not been able to keep pace.

The most road and trail damage occurs when traffic peaks and wet weather conditions saturate the road surface and subgrade. One of the highest traffic peaks for most roads on the forest is during hunting season. Unfortunately, it occurs during what can be one of the wettest times of year. Road maintenance methods and scheduling need to correlate with this use.

The diversity in types of experiences recreation users expect tends to add complexity to travel management. Trends indicating increasing demand for semi-primitive and primitive uses such as hiking and cross-country skiing lead to the need for a more extensive trail system. Motorized users have the ability to travel much farther distances in a given span of time; they desire to have more looping or through routes. Managing the multitude of user demands and providing quality recreation experiences will require more intensive efforts in planning, public education, signing, and facility maintenance.

Recreation opportunity spectrum (ROS) classifications affect travel management strategies in that they specify motorized and non-motorized experiences. Recreation managers use ROS to designate areas where people can anticipate a particular type of recreation experience. Part of that experience is to know whether motorized or non-motorized activities should be expected in that area.

Effects on travel management from timber management

Through timber management, timber products become available for the consumer. In order to manage timber, roads are necessary for access and haul. Most of the roads are in place to access the timber; however, new roads would be necessary to get to identified sales and units. Because of economic or resource concerns that warrant restrictions, these new roads will be low standard and usually closed to public motorized use following harvest activities, or they will be only temporary and therefore completely rehabilitated.

Alternatives C, E, and I would likely require the least amount of new road construction, while Alternatives F, D, K, and B would have more new road construction due to timber management.

Timber also contributes to annual road maintenance accomplishment. Timber sale contracts require the purchaser to perform maintenance commensurate with his commercial use. This requirement would allow for more road maintenance to be accomplished in Alternatives F, D, K, and B, and less would occur in Alternatives C, E, and I. While maintenance on the haul road is taken care of by the purchaser, forest road maintenance crews and funds can be used elsewhere. On the other hand, adding large logging trucks to recreational traffic increases public safety risks on roads. These risks can be minimized through proper signing, road management, and contract administration. Additional traffic from timber sales results in an increase in the frequency of reconstruction needs for traffic-related items such as surface rock replacement. The timber program provides funds to accomplish this reconstruction; however, the effect depletes aggregate sources at a faster rate.

Effects on trails from timber harvest activities will be minimal. During project planning, trail locations are identified and mitigation measures applied when appropriate. Beneficial effects can be derived through removal of potentially hazardous trees adjacent to trails, improving access to trailheads, and maintaining vistas.

Timber haul during winter can have both positive and negative effects. Snowmobile trails often follow existing roads; when timber hauling is done, use of the trail can be disrupted. Often, the solution is to relocate the snowmobile trail when the logging operation is underway. One benefit to winter travelers is that roads and trailheads are plowed by the timber operator. This improves access for recreation and administrative traffic.

Oil and gas exploration and development requires roads to be available for well construction and maintenance. Some new roads may be required for production. Mineral exploration and mining also require roads for production. The amount of new roads would likely be few, and some may be only temporary. Any new roads would still be required to follow proper procedures prior to initiation.

CUMULATIVE EFFECTS

Prior to the 1800s, travel in the area of the White River National Forest was made up of a network of trails developed by the Ute Tribe as they moved from one place to another in general to follow game. A more extensive travel system was developed over time, from the late 1800's to the present, in order to access mines, timber, private lands, and popular recreation sites. As time went on a more extensive network was developed to accommodate continuing management and public needs. Presently there is a greater demand for a variety of recreation uses in both motorized and non-motorized settings. The current system is made up of a combination of roads and trails with varying degrees of user comfort and uses. The current system is also in place for land managers to continue to access areas for resource management.

Restricting travel to designated routes will decrease resource damage to the land. This will also however increase the need on the Forest for a good network of roads and trails to accommodate additional recreation use such as 4-wheel driving, ATV, motorcycling, and mountain biking. Other public lands adjacent to National Forest System lands that provide off-road travel opportunities will likely see an increase in these uses.

As travel to and through the forest increases, there will be an increase in impacts on surrounding public roads. County roads will be affected the most. Congestion may increase on state roads and I-70 during peak recreation periods. Currently a study is being conducted to examine possible solutions to the congestion occurring on I-70 from Denver to Glenwood Springs. Improvements implemented to I-70 to accommodate more traffic could bring even more people to the forest at one time. All types of recreation use will significantly increase in volume on the forest. The level of commercial forest product traffic using heavy trucks is not expected to increase significantly.

As populations grow and urban development expands near the White River National Forest, the continuous use of forest roads and trails will increase. The forest arterials and major collectors that connect the forest to these areas will experience the most increased day-use traffic, particularly on weekends. This traffic adds to the maintenance work necessary to keep the roads in a safe and structurally sound condition. Lands administered by the Forest Service and Bureau of Land Management immediately

adjacent to population centers are affected the most by user-created trails that access the forest from residential properties.

Under all alternatives, continual coordination and collaboration with national, state, and county officials in the management of transportation facilities to and through the forest would be continued to ensure that access is maintained, standards are consistent, safety issues are addressed, and efficiency is considered at all times.

The Forest Service is required by law to provide reasonable access to private inholdings. The type of access for an inholding may be determined by the location, type of access needed, and number of access points in one location. As ownership changes, the access required may also change.

Overall, the transportation system for the White River National Forest will strive to be efficient, safe, provide access to areas of interest, and provide for the variety of modes of transportation used by all.

RESOURCE PROTECTION

Use of summer (snow-free) motorized and mechanized vehicles off designated roads and trails have led to environmental impacts on public lands. These impacts need to be mitigated. The White River N.F. Forest Plan for Alternative K calls for limiting motorized and mechanized travel to designated routes. The Forest recognizes the need to provide for these recreational uses. The Forest plans to maintain a system of roads and trails to accommodate the motorized and mechanized users. The Plan does not limit construction of new roads and trails so long as they are created through proper and legal land management practices. The objective however is to minimize resource damage caused by random off-road use, by keeping the use on established, maintained, officially designated routes.

The Forest's obligation stems from Executive Order No. 11644 Use of Off-Road Vehicles on Public Lands with support from 36 CFR 219, and 295. The order states "It is the purpose of this order that the use of off-road vehicles on public lands will be controlled and directed so as to protect the resources of those lands, to promote the safety of all users of those lands, and to minimize conflicts among the various users of those lands." It further states areas and trails shall be located to "minimize damage to soil, watershed, vegetation or other resources of the public lands" and to "minimize harassment of wildlife or disruption of wildlife habitats.". The Executive Order establishes off-road policy and authority by stating "each respective agency head is authorized to adopt the policy that portion of the public lands within his jurisdiction shall be closed to use by off-road vehicles except those areas or trails which are suitable and specifically designated as open to such use."

From 1986 to 1996 the White River National Forest has experienced a 74% increase in off-highway vehicle (OHV) use and a 214% increase in mountain biking. It is anticipated due to a high rate of growth, popularity, and tourism in the area these uses will be ever increasing.

Other public lands are too feeling the pressure of increased recreation use. Recent Travel Plans and EISs such as the Off-Highway Vehicle Plan and EIS for Montana, North Dakota, and Portions of South Dakota January 2001, Motor Vehicle Travel Management Plan Stanislaus N.F. October 1999, Uncompahgre National Forest Travel Plan FEIS April

2000, propose most if not all summer travel be restricted to designated routes. In a letter from the Environmental Protection Agency dated May 2000, in reference to the White River DEIS, support is given to the direction of Spring/Summer/Fall travel management area strategy. "EPA fully supports a move from 'open travel' to 'restricted or limited travel' on all areas of the forest for both motorized and mechanized travel during the non-winter period. Under an open travel policy which allows off-travelway or cross-country travel, Federal land management agencies have no way to ensure that Resource Management Plan goals and Forest Plans goals are met including: managing vegetation, improving wildlife habitat, and biodiversity, maintaining water quality to standards, conserving soil resources, maintaining long-term land productivity, and providing safe, efficient and environmentally sound transportation system." (EPA comment letter on draft forest plan and DEIS, May 9, 2000).

Impacts of Off-road and Off-trail motorized and mechanized use

SOILS

Off-road activities such as mountain biking and OHV riding can potentially lead to detrimental soil compaction, vegetation removal, soil erosion, and ultimately sedimentation to streams. In the case of mountain bikes and OHVs, the primary compactive force is from ground pressure exerted by the weight of the vehicle, although vibrating energy from a running OHV engine may also contribute to compactive potential. For a soil to be considered detrimentally compacted, it must have a 15 percent increase in soil bulk density over that of the same soil in an undisturbed condition (FSH 2509.18-92-1). Detrimental compaction is most commonly associated with repeated vehicle passes. Adams and Froehlich (1981) found the greatest increases in compaction following the first few passes of heavy equipment used in timber harvest operations. Although more passes may be required, this same rule of thumb applies to mountain bikes and OHVs.

Incidental passes of OHVs, for uses such as retrieving big game, are generally not a problem, particularly in forested sites with protective litter and duff layers. However, in meadows and other open areas with little or no protective layer, dispersed trails commonly open the door for other users to make additional passes. When not educated or patrolled, mountain bike and OHV users can create new trails, which are not typically environmentally friendly in terms of compaction, erosion, and sedimentation.

WILDLIFE

Current scientific literature contains a growing body of information concerning the impacts of motorized and mechanized use impacts to wildlife. Four recent major literature review efforts concerning these possible impacts (Wildlife and Recreationists, edited by Knight and Gutzwiller; Effects of Recreation on Rocky Mountain Wildlife, Edited by the Montana Wildlife Society, The Environmental Impacts of Recreation, edited by the Biodiversity Legal Foundation, and Effects of Winter Recreation on Wildlife of the Greater Yellowstone Area: a Literature Review and Assessment) were reviewed and used in the wildlife, recreation, travel management, and landscape pattern analyses of the FEIS. Information from these literature reviews was incorporated into management direction for the RFP. These reports document that off-road travel can result in significant impacts to a variety of wildlife and wildlife habitats. The four major types

of impacts to wildlife include direct exploitation, disturbance, habitat modification, and pollution (Knight and Cole 1995). These impacts can vary greatly depending upon site-specific topographic and habitat conditions, the duration, type, seasonality, and intensity of OHV use, the species of wildlife involved, and the response by individual animals. Wildlife response to OHV activities can be short duration or long term and may or may not be readily observable.

AQUATICS

Roads impact watershed resources in several ways. Incised into slopes, they can intercept surface runoff from snowmelt and rain as well as subsurface runoff (Burroughs et al. 1972; Wemple et al. 1996). This can result in erosion of cut and fill slopes, landslides, and higher peak flow responses in receiving streams.

Road erosion can be delivered to streams at stream crossings or via ditch-relief culverts (Flanagan et al. 1998). Sedimentation will result, compromising drinking water supplies, habitat for aquatic species, and reservoir capacity.

Abandoned roads can contribute to the above impacts if not properly closed. Without regular inspections and maintenance, road erosion can continue unseen. Project specific analyses must include an inventory of abandoned roads to fully assess road related erosion hazards (Flanagan et al. 1998).

RIPARIAN DAMAGE

Off-road travel many times goes through open spaces, as these are the easiest to travel in. Unfortunately, many of these areas are riparian in nature and are vulnerable to destruction by wheeled travel. Due to the fact they are wet, contain saturated soils, vegetation that can easily be disturbed these areas suffer when motorized and mechanized travel randomly goes through. In order to travel through or better still around these areas designated routes with proper engineered features serve for the best way to travel in these areas.

VEGETATION

Displacement and killing of endangered and sensitive plants

Random travel may destroy endangered and sensitive plants. Since most people are unaware of all the endangered and sensitive plants species, where they are, and what they look like, it would be hard to protect and avoid them in open travel.

SPREAD OF NOXIOUS WEEDS

Off-road vehicular travel can promote the spread noxious weeds. Vehicles can transport seed to remote locations. Soil disturbance associated with off road use can create potential habitat for invasion. Once established these weeds can then spread to adjacent, undisturbed habitat types. These remote infestations can go undetected for many years. Once detected these remote infestations are expensive to treat in comparison to infestations along road right-of-ways.

CULTURAL

Destruction of archeological artifacts

The use of mechanized vehicles in undesignated areas poses several threats to the integrity of archeological and historic properties. It has been documented that off-road vehicles, including motorbikes, ATVs and SUVs, can directly cause breakage of artifacts and churning of archeological deposits. Repeated use of mechanized vehicles tends to remove protective vegetation thus exposing archeological material to erosion and vandalism. These effects are minimized on designated roads through environmental analysis to identify archeological properties and develop appropriate maintenance and protective measures.

RECREATION

Hunting

Increasingly, OHVs are being used during the fall hunting seasons for hunter access into areas to hunt. For a minority of hunters there is a temptation to use the OHVs off of designated routes to retrieve the game after it has been shot, disturbing other game, and disrupting the experience of other hunters. The effects of OHV use on wildlife are documented in the references under the wildlife section. The State of Colorado and ATV Connection Magazine direct hunters to stay on designated trails and roads. (www.atving.com/tmpl/features/outdoors/hunting/Colorado/rules.html, accessed September 17, 2001).

OHV

Restricting OHVs to designated trails and roads across the entire forest in summer will reduce some options for OHV travel. However, scoping indicates that this limitation is not significant to the motorized public as long as an adequate amount of on-trail and road opportunities are provided. From a management standpoint, restricting OHVs to designated routes only, allow the resource managers to decide the best locations to allow OHV use.

Mechanized

Mountain biking has dramatically increased in the last decade and will continue to do so. In order to reduce ground disturbance due to mountain bike travel, such as rutting, erosion, and loss of vegetation, travel needs to be limited to a maintained trail system. There is support for limiting travel to designated trails by the International Mountain Bicycling Association. Their April 2000 newsletter stated "IMBA supports the rule that would prohibit bicycle traffic off of system trails." Their August 2001 newsletter affirms the "IMBA position: Unauthorized trail building may produce unwanted environmental consequences. Don't ride off trail." "Mountain bikers and land managers should cooperate to find solutions that work for everyone." As stated by Charlie Willard, State Trails Coordinator for the California Dept. of Parks and Recreation "Environmental impacts and safety can not be controlled when bikes venture off designated routes" published in *Mountain Bikes on Public Lands: A Manager's Guide to the State of Practice*, September 1990, Kit Keller, J. D., Bicycle Federation of America, Inc.

Disability Access

There may be concern the direction is limiting access to persons with disabilities. In a recent document produced by Janet Zeller, Interim National Accessibility Program Manager, OHV access for persons with disabilities was defined. “There is no legal requirements to permit a person with disability to utilize an OHV in any area that restricts or prohibits OHV use under the Forest Plan or the Forest Travel Plan/Transportation Plan.”

Wheelchairs are not limited to designated routes.

Engineering

Limiting travel to designated routes allows for proper construction and maintenance of travel routes. The Forest cannot spend money on roads and trails that are not part of the system and therefore cannot control the impacts produced from non-system roads and trails.

In conclusion, limiting summer (snow-free) motorized and mechanized travel to designated routes still provides the opportunity for OHV and mountain bike use while limiting the impacts those uses have on the land.

Topic 2, Part 2

Landownership

Abstract

Management of the landownership pattern of the White River National Forest involves survey and marking of landlines and other boundaries, exchange of lands with private parties and non-federal government entities, and acquisition of access rights-of-way. These activities will continue under all alternatives because they contribute to increased overall management efficiency regardless of alternative emphasis. Alternatives vary the site-specific project areas and the priorities for which landownership adjustments will be accomplished.

Summary

The White River National Forest is composed of approximately 2,282,000 acres of National Forest System land. About one-third of this acreage is within designated wilderness, while another 200,000 acres within the forest boundary are privately owned. In 1997, Public Law 105-77 transferred the Dillon Ranger District from the Arapaho-Roosevelt National Forest to the White River National Forest, which had administered it since 1973.

Overall, the percentage of private land within the forest boundary is about 8 percent. This figure approaches 20 percent in Summit County. Both percentages are typical of national forests that have historical mining and ranching settlement patterns. This intermix of private land creates a need to simplify the existing private-federal land pattern for efficient administration and conflict reduction. Most of the simplification accomplished since 1985 has been done through equal-value land exchanges, although a significant amount has also been accomplished through purchase using Land and Water Conservation Fund appropriations, especially within wilderness. Policy direction for land ownership adjustments exists extensively in the Forest Service Manual (5400).

Key indicators

- No other identified key indicators vary by alternative; each alternative provides a general direction or focus to the landownership adjustment program.

Legal and administrative framework

- The **Transfer Act** (1905) transferred the forest reserves to the Department of Agriculture
- The **General Exchange Act** (1922) authorizes land adjustments within national forest boundaries
- The **Land and Water Conservation Fund Act** (1965) provides for funds for the acquisition of lands and interests in lands
- The **Sisk Act** (1967) provides for the exchange of lands with states and local governments
- The **Small Tracts Act** (1983) provides for the sale, exchange or interchange of certain parcels of minimal size.

Affected environment

Since 1985, important landownership adjustments on the White River National Forest include the 2,100-acre Wallace Creek and 5,800-acre Coal Basin acquisitions, purchase of the Warren Lakes and Crooked Creek Lakes inholdings and more than 1,300 acres of

patented mining claims in or abutting designated wilderness, and a large land exchange program on the Dillon Ranger District geared toward increasing dispersed recreation opportunities and protecting wildlife habitat from development.

Intensive public and intergovernmental landownership adjustment planning has been completed on the entire Dillon Ranger District, as well as parts of other districts. One or two land exchanges are likely to be completed each year on the forest. Total acres acquired would likely average around 400 acres per year, but may approach several thousand acres in any single year. National policy and funding will influence accomplishment. As in past years, local issues such as public access to National Forest System lands; wildlife habitat; watershed protection and recreational opportunities will likely determine priorities and parcel selections.

Environmental consequences

GENERAL EFFECTS

As stated earlier, the forest management alternatives prioritize or focus the direction of the landownership adjustment program. These priorities and direction would be reflected in the location of land parcels involved in adjustments, as well as the benefits obtained from the adjustment. For example, Alternatives C and E would likely see emphasis on landownership adjustments directed toward increasing recreation opportunities, while Alternative D would likely emphasize adjustments that benefit or increase wildlife habitat, especially that of endangered species. While the alternatives may vary the site-specific lands that would be adjusted, the total acreage adjusted would not be expected to vary significantly by alternative. In all alternatives, the White River National Forest land base would be expected to increase slightly, while the landownership pattern would be expected to simplify and consolidate. Access would likely increase slightly in all alternatives, with the possible exception of Alternative I.

DIRECT AND INDIRECT EFFECTS

There are no identified direct effects on landownership adjustments from other resources. However, indirectly, most resources affect landownership adjustment in several ways. Wetlands, floodplains, and heritage resources can sometimes limit the existing National Forest System lands available for conveyance to other ownership. Ski area and community expansion can influence which lands are best managed by exchanging to the private sector. Other resources, especially recreation, wilderness, and wildlife management, can prioritize or determine which lands and access rights-of-way should be acquired for inclusion in the National Forest System.

CUMULATIVE EFFECTS

There are no anticipated cumulative effects from landownership adjustments.

Topic 2, Part 3

Special use authorizations

Abstract

Special use authorizations approve most non-recreation use and occupancy of the White River National Forest by private parties and government entities. Specific laws and Code of Federal Regulations requirements govern decisions regarding these authorizations; however, forest plan standards and guidelines are applicable. Utility corridor and communication site designations for these types of uses are made via the forest plan and vary slightly by alternative.

Introduction

All occupancy, use or improvements on National Forest System lands that are not directly related to timber harvest, grazing of livestock, mining activities or recreation are designated as “special uses.” Some recreation activities are also considered special uses. “Special use authorizations” in several formats are issued to permit these improvements, occupancy or use to occur. Typical non-recreation special uses include roads, utilities, water transportation and storage facilities, and agriculture improvements.

The White River National Forest has a large number and variety of special use authorizations in existence. This is due in part to the intermixed private land in several areas of the forest. The location of several communities and resorts in or adjacent to the forest, as well as the central location of the forest within the state and nation, also contributes to the need for locating special uses on the forest.

Key indicators

- Miles of utility corridors
- Number of communication sites.

Legal and administrative framework

- The **Federal Land Management and Policy Act** (1976) provides authority for the majority of non-recreation special use authorizations on NFS lands.
- The **Ditch Bill** (1976) amended FLPMA to provide for free, non-expiring easements for certain qualifying agriculture-type water facilities.
- The **Alaska National Interest Lands Conservation Act** (1980) provides direction for providing access to non-federally owned land within the boundaries of the forest.
- Thirteen additional laws not listed above can currently authorize “special uses” on NFS lands. Occupancy also has been authorized by laws that have since been repealed, several of which actually predate establishment of the White River National Forest or the National Forest System. Situations can exist in which rights to occupy the forest were properly established under laws and authorities that were later repealed. These rights could still be valid today. Administrative authority for the Forest Service to regulate these rights or occupancies may be restricted. The Forest Service recognizes that these situations may exist on the forest, and will recognize valid rights when provided with proper evidence. Forest Service regulation of these types of occupancies will be adjusted to a level consistent with recent court decisions. In some cases, amendment or modification of the forest plan may be necessary to provide this recognition.

Affected environment

On average, about 650 non-recreation special use authorizations are in existence on the forest, although this number varies because some expire while new authorizations are issued. The actual number of improvements, uses or occupancies may exceed 1,000 because many authorizations provide for multiple occupancies. However, the total area occupied by all these non-recreation authorizations is relatively small, covering about 0.5 percent of the total forest outside of wilderness.

The number of authorizations has steadily increased since 1984, mainly due to the development of private land in or near the resorts and communities within the forest boundary. This trend is likely to continue. The forest has experienced a problem of being able to process all new applications as a result of a shortage of available staffing and funding. Priorities established in the 1984 Forest Plan have been used to determine which applications will be processed each year.

Most non-recreation authorizations cover linear-type improvements such as roads, electric power and telephone lines, natural gas transmission lines, ditches and other water transmission facilities. A large percentage of the authorizations are issued to local government and public utility entities. A variety of water transmission facilities makes up the largest category of occupancy authorized. Communication site and utility corridor designations exist at numerous locations on the forest; however, new technologies such as cellular telephones and fiber optic cable, as well as increased demand for utilities such as electric power and natural gas distribution, have engendered the need to increase the number and area of these designations.

Environmental consequences

GENERAL EFFECTS

The number of non-linear utility sites and utility corridors vary by alternative. The locations, limitations and variations by alternative are shown in **Tables 81** and **82**. **Figures 31, 32, and 33** illustrate the locations of these sites and corridors.

Table 81
Designated non-linear utility sites on the White River National Forest (electronic and communication sites)

Site	Name	Approved in alternative	Approved occupancy and/or conditions of occupancy
A	Lake Hill	All	Multi-user
B	West Tunnel	All	Multi-user cellular only
C	Hoosier Pass	All	Multi-user
D	Officers Gulch	All	Multi-user cellular only
E	Copper Mountain	All	Multi-user cellular only
F	Shrine Pass	All	Multi-user cellular only
G	East Vail	All	Multi-user cellular only
H	Vail Mountain	All	Multi-user
J	Lower Dowd	All	Multi-user
K	Beaver Creek	All	Multi-user
L	Red Table — East	All	FAA only
	Red Table — West		Multi-user
M	Red Hill	All	Multi-user
N	Sunlight	All	Multi-user
P	Haystack Mountain	B only	Multi-user
R	McClure Pass	C, D, E, F, and I, K	Multi-user
S	Lower Red Mountain	All	No new or additional users
T	Upper Red Mountain	All	Multi-user; no additional users until access issue resolved
U	Aspen Mountain	All	Multi-user

Table 82
Designated utility corridors

Corridor	Approved in alternative	Approved occupancy and/or conditions of occupancy	Range of scenic integrity objectives
A	B only	Aerial only	Moderate to Low
C	All	Aerial or underground	Moderate to Low
D	C, D, E, F, and I, k	Underground only	Moderate to Low
E	All	Aerial only	Moderate to Low
F	All	Aerial only	High to Moderate
G	All	Aerial only	Moderate
H	All	Aerial or underground	High to Moderate
K	C, D, E, F, and I, k	Underground only	Very High to High
L	C, D, E, F, and I, k	Underground only	High
M	C, D, E, F, and I, k	Aerial or underground	High
N	C, D, E, F, and I, k	Underground only	Very High to High
P	*B, C, D, E, F, and I, k	Aerial only	High to Moderate
R	C, D, E, F, and I, k	Aerial or underground	Moderate
S	C, D, E, F, and I, k	Aerial only	Moderate

Note: Only south sections are in Alternative B. "Aerial" is defined as "at or above prevalent tree canopy level."

Figure 31
Electronic sites

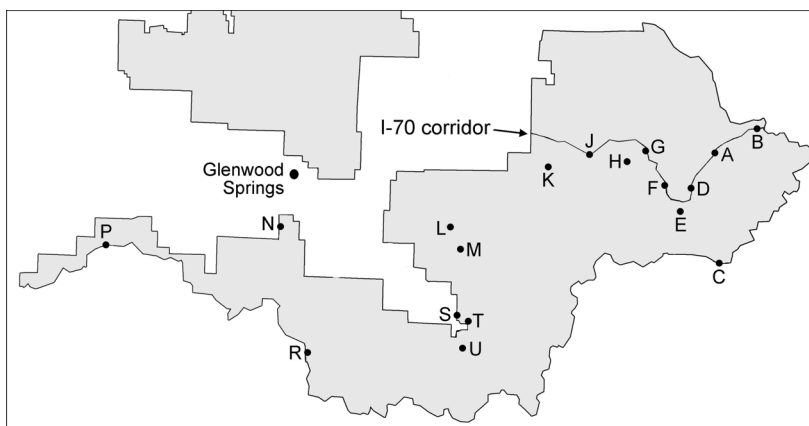


Figure 32
Utility corridors, east side

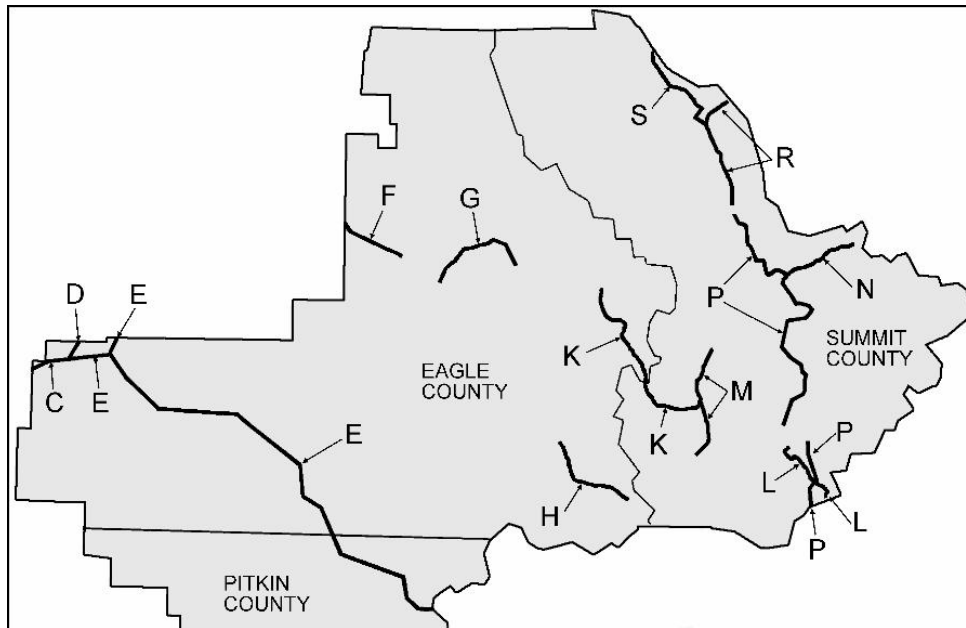
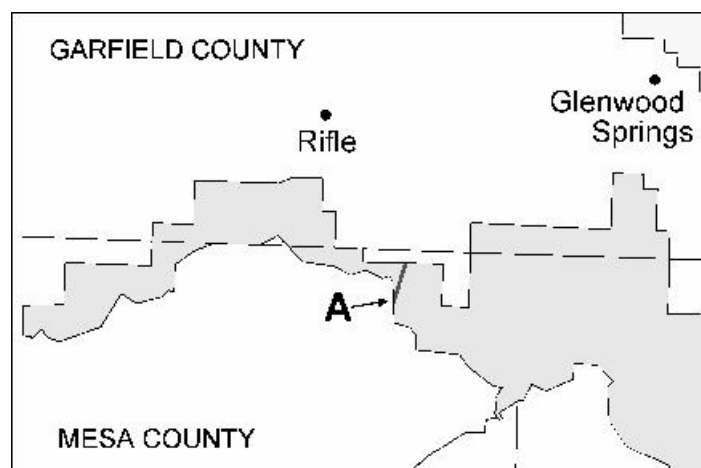


Figure 33
Utility corridors, west side



Non-recreation special use proposals are subject to individual environmental analysis, as well as review for compliance with Code Federal Regulations requirements. Decisions regarding the majority of non-recreation special use proposals are based more on these two processes than on forest management alternatives. Standards and guidelines found in the proposed 2001 Forest Plan will be the basis for conditions or requirements placed on individual approvals. All alternatives except Alternative B provide for increased utility corridor uses. However, under all alternatives, additional facilities could be constructed outside of designated corridors when evaluated and approved through a specific proposal and site-specific analysis. Utility corridor designations only remove the requirement to analyze alternative locations outside of the designated corridor. Utility corridor designations do not limit utility facilities to designated corridors. Also, smaller-sized distribution facilities are evaluated through individual environmental analysis and usually are not tied to a designated corridor.

All alternatives provide for existing communication site needs as well as those anticipated during the planning period, except for cellular telephone expansion demands, which will need to be addressed by site-specific evaluations.

DIRECT AND INDIRECT EFFECTS

Effects on utility corridors and communication sites from watershed and soil management

The 1984 Forest Plan approved a utility corridor in the Alkali Creek area of the Rifle Ranger District. This corridor is presently occupied; however, watershed and soil stability issues and concerns have arisen and all alternatives except Alternative B provide for this designation to be removed. In all alternatives, the existing facility would remain. Any utility facilities proposed for the Alkali Creek would require an analysis of locations outside this drainage in all alternatives except Alternative B.

The 1984 Forest Plan also designated a communication site on top of Haystack Mountain on the Rifle Ranger District. This site has never been developed, and all alternatives except Alternative B provide for the removal of this designation due to water quality and soil stability issues related to the road construction that would be needed to develop the site.

Effects on utility corridors from wildlife management

Experience and observations have shown that the largest significant effect on wildlife from underground and aerial utility facilities is increased public access to the Forest via the utility corridor. This effect usually can be mitigated through proper location of the utility facility, proper construction techniques and post-construction monitoring and regulation. However, facilities such as roads raise significant wildlife management issues, including increased public access and effects on actual wildlife movement. Utility corridor designations in all alternatives except Alternative B do not carry pre-approval for on-the-ground level occupancy within any corridor because of these wildlife concerns.

Effects on utility corridors from scenery and recreation management

All alternatives except Alternative B provide for sizable expansion of utility corridor designation, however all alternative fall short of approving all designations shown in the Western Utility Group's Western Regional Corridor Study. Also requirements such as required underground and/or aerial installation have been placed on designated corridors. This somewhat restricted approach to utility corridor designation is based mainly on high scenic values and extensive public recreation use in many places on the forest. This is especially true in areas such as Glenwood Canyon, Fryingpan and Crystal River drainages and Summit County areas.

CUMULATIVE EFFECTS

No cumulative effects from non-recreation special use authorizations are expected.

TOPIC 3

Part 1—Recreation management

Part 2—Ski areas

Part 3—Aerial transportation corridors

Part 4—Scenery

Topic 3, Part 1

Recreation management

Introduction

Abstract

Recreation management consists of providing a range of recreation opportunities to meet the needs of users and local communities in balance with protection of forest resources. On the White River National Forest, demand for recreation continues to grow. This rise in demand is linked to an increasing local and regional population as well as to higher numbers of visitors from throughout the world.

All forest management alternatives provide for continued recreation management. Special emphasis is given to recreation in Alternatives B, C, and E. Across all alternatives, areas and degrees of emphasis vary.

Summary

The White River National Forest is recognized throughout the world as a source of exceptional outdoor recreation opportunities. Recreation has grown to become the predominant use of the forest. As a result of increased use, however, conflicts between recreationists have increased and crowding may be contributing to deterioration of resources and visitor experiences in some locations.

Based on total recreation visitor days (RVDs) in the National Forest System, the White River National Forest ranked fourth in the nation in recreation use in 1992 and fifth in 1995, the most recent year these numbers were compiled. Although the forest contains about 16 percent of the National Forest System lands in Colorado, it serves as host to about 30 percent of the state's national forest recreation.

Factors that will affect recreation management on the White River National Forest are:

- A changing visitor profile, stemming from the aging of the general population to the reduced role of traditional family structures. These factors are prompting such developments as easier access, shorter trail lengths, and modernization of campgrounds (Cordell, Bergstrom, Hartmann, and English, 1989);
- A trend toward vacationers taking numerous weekend outings throughout the year in place of the traditional two weeks each summer (Cordell, Bergstrom, Hartmann, and English, 1989);

- The development of a new generation of machines, such as all-terrain vehicles and mountain bikes, as well as better outdoor equipment and clothing. Together these increase access to the backcountry for dispersed recreation (Cordell, Bergstrom, Hartmann, and English, 1989);
- The evolution of alpine ski resorts into four-season resorts that attract visitors for a range of activities throughout the year;
- Dramatic growth and diversification of dispersed winter recreation;
- An increased role for partnerships between the Forest Service and commercial businesses, non-profit organizations, and volunteers; and
- A rapidly growing local population at a rate well above national population growth; likewise, a higher rate of local recreational use increase than in the region as a whole.

Key indicators

- Changes in recreation opportunities based on the Recreation Opportunity Spectrum (ROS)
- Changes in recreation carrying capacity.
- Supply by individual recreation activity and ROS class.

Legal and administrative framework

- The **Multiple-Use Sustained-Yield Act** (1960) supplements the purposes for which national forests were established and administered to include outdoor recreation, range, timber, watershed, wildlife, and fish.
- The **Wilderness Act** (1964) established a National Wilderness Preservation System (NWPS) consisting of public lands designated by Congress for that purpose.
- The **Land and Water Conservation Fund Act** (1964) “assists in preserving, developing and assuring accessibility to all citizens of the United States of America . . . such quality and quantity of outdoor recreation resources as may be available and are necessary and desirable . . . by . . . providing funds for the federal acquisition and development of certain lands and other areas.” The law also provides for the collection of daily recreation use fees for each federal agency that develops, administers, provides or furnishes, at federal expense, specialized outdoor recreation sites, facilities, equipment, or services.
- The **Architectural Barriers Act** (1968) establishes additional requirements to ensure that buildings, facilities, rail passenger cars, and vehicles are accessible to individuals with disabilities. It covers architecture and design, transportation, and communication elements of recreational site planning and development.
- The **National Trails System Act** (1968) states that “to provide for the ever-increasing outdoor recreation needs of an expanding population ... trails should be established.”
- The **Forest and Rangeland Renewable Resource Act** (1974) directs the Secretary of Agriculture to periodically assess the forest and rangeland resources of the nation and to submit to Congress, at regular intervals, recommendations for long-range Forest Service programs essential to meet future resource needs.
- The **Americans with Disabilities Act** (1990) establishes additional requirements to ensure that buildings, facilities, rail passenger cars, and vehicles are accessible to individuals with disabilities.

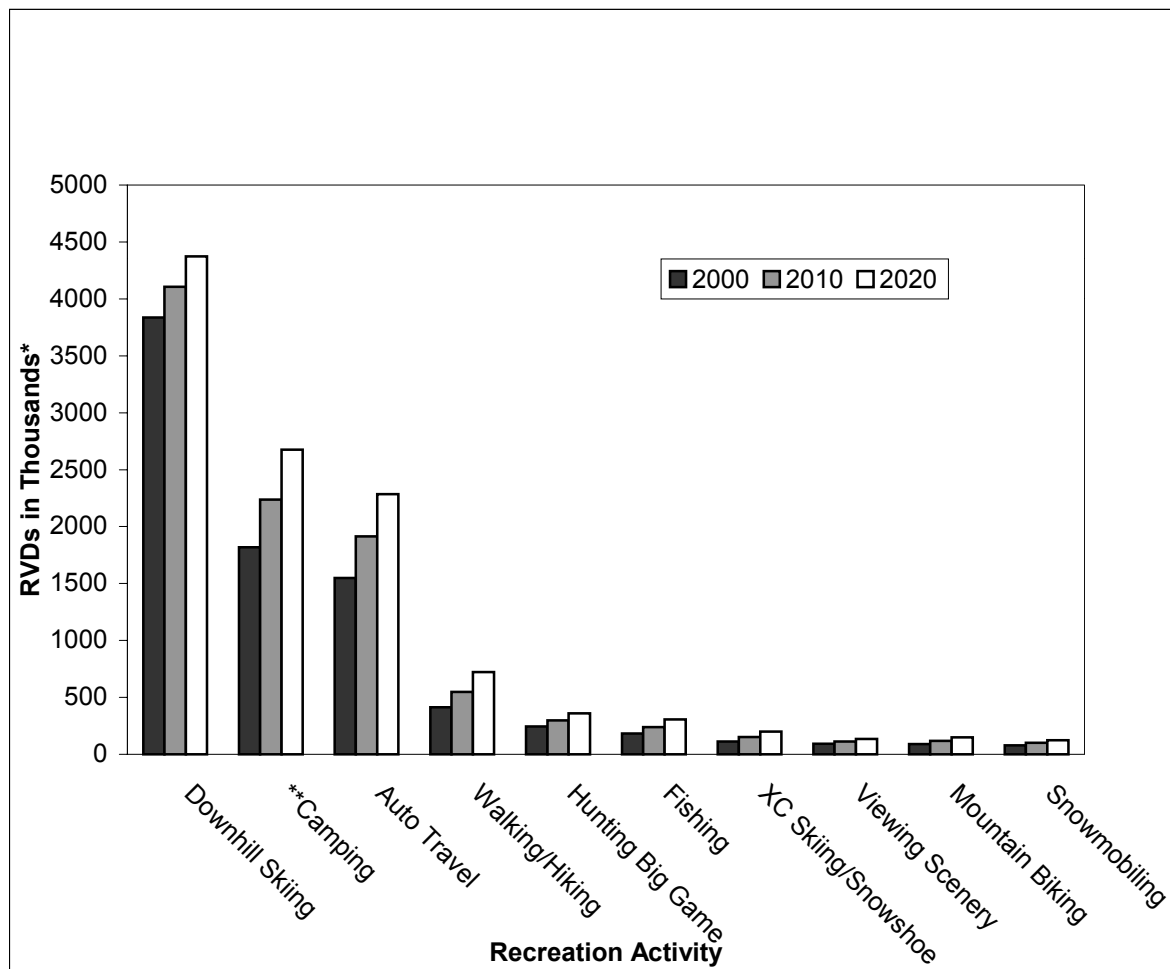
Affected environment

INTRODUCTION

The eastern boundary of the White River National Forest is less than 60 miles from the Denver metropolitan area. The forest's key attractions include internationally renowned ski areas, outstanding scenic vistas, abundant opportunities to view or hunt wildlife (in particular, the nation's largest elk herd), eight mountain summits that exceed 14,000 feet in elevation, and 754,000 acres of designated wilderness.

An estimated 8.9 million people visited the forest in 1997, an increase of 85 percent since 1984. **Figure 34** illustrates the activities that attract most visitors. **Figure 35** illustrates the projected future growth in each of these activities.

Figure 34
Ten predominant recreation activities on the White River National Forest

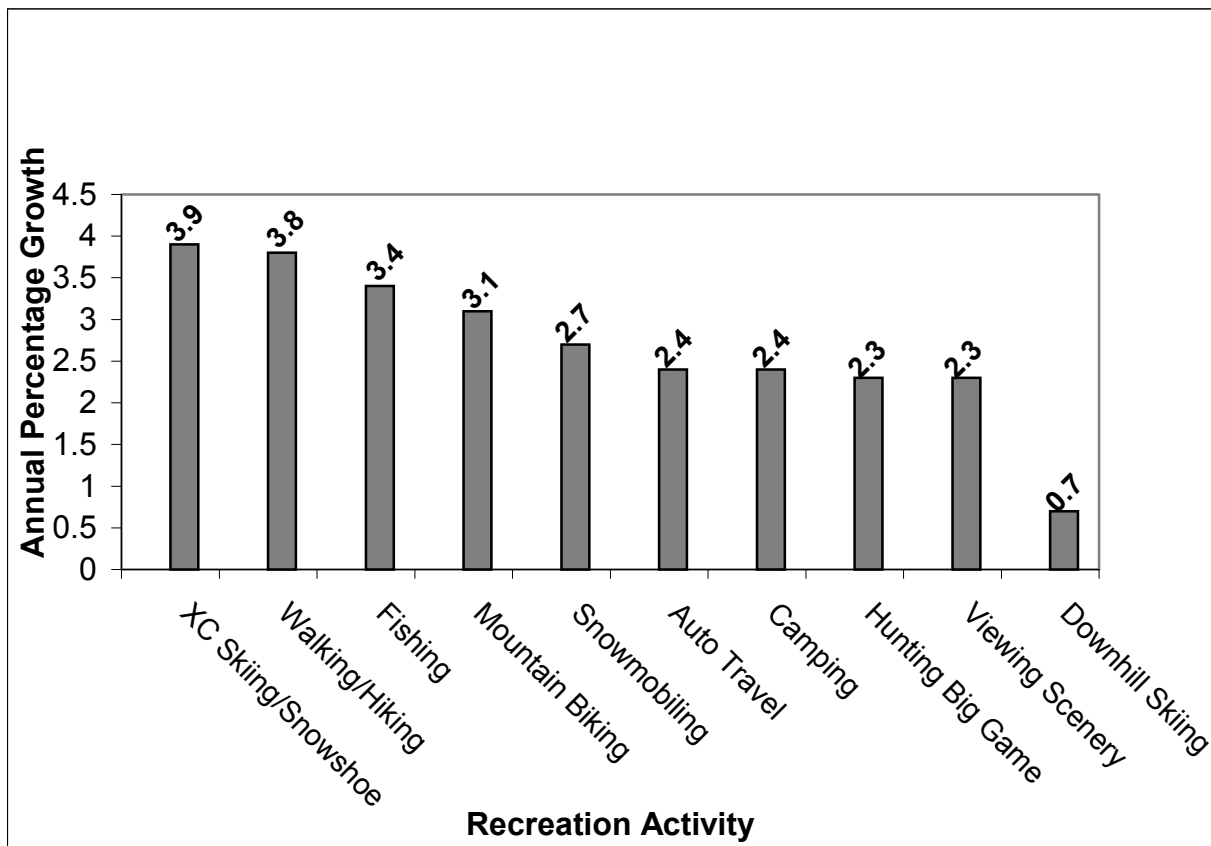


*One RVD is equivalent to 12 hours of continuous use. One visit is any time spent on the forest.

**Includes vehicle, general day, tent, and trailer camping.

Source: Base data from Infrastructure Report 1997 and 2000-2001 Ski Area Use Reports.

Figure 35
Projected annual percentage growth of the ten predominant recreation activities on the White River National Forest



Source: Base data from Infrastructure Report 1997 and 2000-2001 Ski Area Use Reports.

Recreation setting The primary aim of outdoor recreation resource management is to provide an environment in which visitors can enjoy a satisfying experience. By managing the natural resource setting, and the activities that occur within it, forest managers provide for a range of recreation opportunities. These opportunities can be expressed in terms of three principal components: activities, setting, and experience. For the purposes of management, the range of possible combinations of activities, settings, and probable experience opportunities has been represented in terms of a spectrum or continuum. This continuum is called the recreation opportunity spectrum (ROS). ROS classes cover all acres of land on the National Forest and are used by managers to provide guidance for the desired conditions of all areas in relationship to the recreational experience whether they have a forest planning management area prescription emphasizing recreation or another resource.

The assigned desired ROS condition class is the maximum level of use, impact, development, and management that an area should experience over the life of the forest

plan. The ROS is not prescriptive; it serves as a tool for land managers to identify and mitigate change. Recreational carrying capacity is a consequence of adopting specific ROS classes for which a landscape will be managed. On the White River National Forest, there are eight ROS classes

- *pristine*
- *primitive*
- *semi-primitive non-motorized*
- *semi-primitive motorized*
- *roaded natural*
- *roaded modified*
- *rural*
- *urban*

Table 83 displays the existing acres in each ROS condition class for summer and winter as inventoried in 1997. Winter ROS was first separated from summer ROS in 1997 on the forest and the *pristine* condition class was added in 2001.

Table 83
Recreation opportunity spectrum (1997)

<i>ROS Class</i>	<i>Summer ROS Acres</i>	<i>% of Forest</i>	<i>Winter ROS Acres</i>	<i>% of Forest</i>
Primitive	523,000*	23	762,000*	33
Semi-primitive non-motorized	980,000*	43	323,000*	14
Semi-primitive motorized	266,000	12	1,098,000	49
Roaded natural	135,000	6	0	0
Roaded modified	265,000	12	0	0
Rural	100,000	4	91,000	4
Urban	13,000	<1	8,000	<1

*Includes acres of wilderness.

Source: Data from 1997 forest actual ROS mapping.



DEVELOPED RECREATION

At developed recreation sites, facilities have been constructed to provide recreation experiences, protect resources, or otherwise manage activities. These infrastructure developments range from a complete campground with a water system, toilets, and showers, to a simple bulletin board or parking barriers at a parking lot. The forest currently provides 70 developed campgrounds, 15 picnic grounds, 11 interpretive sites, and 209 trailheads. In addition to publicly developed facilities, numerous privately developed recreation facilities are located on the forest. There are 19 huts in three hut systems, six resorts that are not associated with downhill skiing, an organization camp, and recreation residences.

Each site has a theoretical capacity based on its level of development and a practical capacity based on a 40 percent utilization rate. Studies indicate that when use levels are consistently above 40 percent of the theoretical capacity, long-term resource damage is likely to occur. The combined theoretical capacity of all developed sites (excluding downhill ski areas) is 26,601 people-at-one-time (PAOTs). Table 84 displays these developed sites with their corresponding capacities.

The following summary of developed recreation use levels does not include downhill skiing, aerial tram rides, or trailhead use among the recreation activities measured:

- Estimated developed use for 2000 is 826.5 MRVDs
- Publicly developed site use is currently 21 percent of theoretical capacity or 51 percent of practical capacity
- Privately developed site use is currently 43 percent of theoretical capacity or 107 percent of practical capacity
- Estimated campground use for 2000 is 665 MRVDs; use is approximately 29 percent of theoretical capacity or 72 percent of practical capacity.

Projected developed recreation use, less ski areas, aerial trams, and trailheads, for the years 2010 and 2020 is 1,074 MRVDs and 1,338 MRVDs, respectively; therefore, in 2010, developed use is projected to be at 29 percent of current theoretical capacity and 72 percent of current practical capacity. In 2020, all developed use is projected to be at 36 percent of current theoretical capacity and at 90 percent of current practical capacity. Campground use for 2010 is also projected to be at 36 percent of current theoretical capacity and 90 percent of practical capacity. In 2020, campground use is projected to be at 44 percent of current theoretical capacity and 109 percent of practical capacity. Some of the recently rebuilt and more popular campgrounds are already exceeding practical capacities.

Table 84
Developed recreation infrastructure and capacities

<i>Kind of Recreation Site</i>	<i>Number of Sites</i>	<i>Theoretical Capacity (PAOT) ¹</i>	<i>Theoretical Capacity (MRVD) ²</i>	<i>Practical Capacity (MRVD)</i>
Publicly developed sites				
Boating	8	871	133	53
Documentary site	2	300	85	34
Family campground	63	7,345	2,086	835
Family picnic ground	12	485	91	37
Fishing site	8	357	79	32
Group campground	7	840	221	88
Group picnic ground	3	270	43	17
Information site	6	480	160	64
Interpretive site — minor	5	240	68	27
Observation site	9	800	265	106
Other winter sports site	1	300	109	44
Playground, park, special sport	3	670	95	38
Trailhead	209	12,835	2,252	901
Subtotal	336	25,793	5,687	2,276
Privately developed sites				
Huts	19	285	102	41
Resorts	6	243	83	33
Organization camps	1	25	18	7
Recreation residences	47	235	71	28
Isolated cabins	2	10	3	1
Subtotal	75	798	277	110
Total	411	26,591	5,964	2,386

¹ PAOT = people at one time, derived by assuming five people per campsite or per parking spot at day-use sites

² MRVD = thousands of recreation visitor days (PAOTs x season length x length of stay / 12)

Source: Infrastructure Report, 1997

Although we are upgrading many existing campgrounds, outdated facilities are still the norm. Many parking spurs are too short for modern recreational vehicles and trailers, and doorways to toilets are too narrow for wheelchairs. Unfortunately, any need for additional facilities is overshadowed by a shortfall in maintenance and rehabilitation funds for existing facilities and the high cost of construction around the forest. As funds have become available, the trend has been to devote resources to upgrading the larger campgrounds and developed recreation sites that receive high levels of use.

Recently, we granted a 10-year permit to a concessionaire to operate and maintain 74 developed recreation sites across the forest. It is the responsibility of the permittee to perform daily cleaning and maintenance; however, the long-term quality and condition of these facilities still is the responsibility of the Forest Service.

Accessibility Participation in outdoor recreation can be restricted by old age, disabilities, poor health, lack of appropriate facilities within an accessible distance, undesirable recreation settings, lack of information about recreation opportunities, poor transportation, or lack of convenience.

The forest is making improvements in this area by making facilities more accessible to people with disabilities as well as by providing better general forest access and information about recreation opportunities. Recreation facilities were evaluated in 1995 for accessibility barriers. A transition plan for correcting problems was prepared and corrective actions are done as funding becomes available. All new construction is reviewed for compliance with Uniform Federal Accessibility Standards (UFAS) and the Americans with Disabilities Act Guidelines (ADAAG). As newer Accessibility Guidelines for Outdoor Developed Areas, currently being developed, become final, the standards in this document will also be followed.

Access As more private land is developed adjacent to the forest, traditional access into some areas on the forest may be restricted. Some traditional access routes do not have valid easements for public access through private lands. In other cases, private owners may try to block valid access through misleading signing, by erecting physical barriers, or through court proceedings which can drag on for several years. Local governments have the capability to require public access routes onto the forest when approving land use plans for private development projects. Where valid access does not exist and when opportunities arise, rights-of-way are acquired by the Forest Service or local governments for recreational access.

Partners In 1988, the President's Commission on Americans Outdoors highlighted the need for land management agencies to pursue more partnerships for recreation management. It also highlighted the need to connect urban, rural, and wildland areas when planning and implementing projects. In 1991, the White River National Forest reported more than 100 partnerships in recreation and wilderness, with partner contributions of more than \$350,000.

A large portion of the recreation on the forest is provided or assisted by partners. Many of these are profit-oriented businesses, but some are non-profit entities or volunteers. The forest manages commercial recreation by granting special-use permits. In granting these permits, the forest recognizes the value of permittees in achieving such management goals as providing access to those who might not otherwise be able to use the forest, providing interpretation and education opportunities, and helping those who lack specialized skills. However, special-use permit administration is costly. Although it will continue, the basis for permitting any new commercial recreation use will be based on public need, administrative, and resource capability.

In concert with the trend toward partnerships and in response to agency budgets failing to keep up with inflation, more of these arrangements are likely to be seen in the future and a higher percentage of the budget will need to be allocated to manage these partnerships. On the White River National Forest, some of the key partnerships include:

- ***Outfitters and guides*** – More than 200 outfitters and guides are permitted to provide approximately 225,200 days of service to their customers. The kinds of services include guided cross-country skiing, snowmobiling, snowcat skiing, snowshoeing, hunting, fishing, hiking, biking, rafting, caving, jeep, and mountain climbing trips, as well as sleigh/wagon and horseback rides.
- ***Ski and recreation resorts*** – There are 12 ski areas and six recreation resorts operating under special use permit on the forest.

- **Nordic skiing** – The forest administers three Nordic centers that are not associated with the large ski areas.
- **Mountain hut systems** – A total of 19 huts operate under permit within three separate hut systems. Though the huts were originally established as shelters for winter backcountry skiing, eight huts are now open for summer use as well.
- **Interpretation** – Interpretive services and programs are provided at many sites throughout the forest via partnerships with ski areas, concessionaires, historical societies, environmental education groups, the Colorado Division of Wildlife, and the 10th Mountain Division Hut Association.
- **Special recreation events** – An annual average of about 40 different groups are issued short-term permits to conduct recreation events on the forest.
- **Recreation residences and isolated cabins** – Forty-seven recreation residences and two isolated cabins are located on the forest.
- **Campground and picnic ground concessionaires** – One concessionaire is permitted on the forest.
- **Public-private ventures** – These are another type of partnership which may be available in the future, though not presently used on the forest. This approach focuses on opportunities for private, profit-oriented businesses to invest in the development of campgrounds or other appropriate facilities in the same manner that ski areas are developed.

DISPERSED RECREATION

For 2000, estimated dispersed recreation use (which occurs where there are no developed facilities present) was 4,690 MRVDs. About 95 percent of this use, or 4,448 MRVDs, is estimated to have occurred in the summer, and 5 percent, or 250 MRVDs, in the winter. About 50 percent of the total recreation use on the forest was dispersed. Projected dispersed use for the years 2010 and 2020 are 5,884 MRVDs (5,548 MRVDs in summer and 336 MRVDs in winter) and 7,188 MRVDs (6,758 MRVDs in summer and 429 MRVDs in winter), respectively.

The diversity of activities continues to grow, contributing greatly to increased conflicts among users. Winter uses in particular are expanding at a rapid rate (see Figure 35). Terrain, snow depths, and avalanche hazards all combine to decrease the land available for winter use. Because the accessible area and the number and size of access points are greatly reduced in winter months, the potential for conflict increases.

Studies predict use to be more than 200 percent of 1987 levels in 2020 for backpacking, day hiking, visiting prehistoric sites, running and jogging, rafting/tubing, sailing, and cross-country skiing in the Rocky Mountains (Cordell et al. 1993). The same studies predict gaps, or shortages, when projected demand for a specified year exceeds projected supply. The largest gaps identified for the Rocky Mountains are for backpacking, day hiking, and cross-country skiing. Reservations for the 3 ski hut systems on the forest seem to support Cordell's projections for the rapid growth in cross-country skiing.

Forest Recreation Information Management (RIM) data show recreation activities that have increased most dramatically since 1986 to include study of wildlife and viewing nature, participating in guided or unguided tours or walks, biking, hiking, picnicking, and rafting. Forest use data, again, seem to support Cordell's observation that "driving for

pleasure and sightseeing are expected to remain the top two dispersed activities in terms of the number of trips taken” in terms of total numbers of visits.

Allocation of public, private, and commercial use within available capacities has become more of an issue in dispersed areas as the number and variety of uses increase. Capacity is particularly important to commercial outfitters, who in most cases are limited to 15 percent of the total available capacity.

Forest-wide theoretical dispersed recreational capacities were calculated for the purpose of comparison of the forest plan alternatives. These theoretical capacities were calculated using the ROS condition class, vegetative type, linear access routes and use coefficients (see Appendix B). A more detailed site-specific capacity analysis (practical capacity analysis), which includes additional factors such as trailhead capacity and social constraints is scheduled to be completed following release of a final travel management plan. This practical capacity analysis will guide more site-specific use allocation decisions in the future.

The forest’s theoretical summer capacity (Memorial Day weekend through the end of September) has been estimated at 9,796 MRVDs, and the theoretical winter capacity (Dec. 1 through Easter Weekend) at 2,783 MRVDs. The forest currently is at 45 percent of its theoretical summer capacity and at 9 percent of its theoretical winter capacity. By 2010, projected dispersed use will be at 57 percent of current theoretical summer capacity and at 12 percent of current theoretical winter capacity. By 2020, dispersed use will be at 69 percent of current theoretical summer capacity and at 15 percent of current theoretical winter capacity. Table 85 summarizes projected dispersed (wilderness and non-wilderness) capacity.

Table 85
Dispersed use projections and capacity in thousands of RVDs

	<i>Summer</i>	<i>Winter</i>
Current use	4,448	250
Projected use in 2010	5,548	336
Projected use in 2020	6,758	429
Current theoretical* capacity	9,796	2,783
Percent of theoretical capacity at current use	45	9
Percent of theoretical capacity at projected use in 2010	57	12
Percent of theoretical capacity at projected use in 2020	69	15

Source: *Infrastructure Report, 1997, Capacity Analysis, 2001.*

In 1997, identifiable dispersed campsites were inventoried across the forest; roughly 3,500 sites exist. A 5-year process to identify and begin monitoring the condition of these campsites was begun in the summer of 2001.

Wilderness About one-third of the White River National Forest, or 754,000 acres (including some private inholdings within the wilderness boundaries), is designated wilderness. This is the largest wilderness proportion of any national forest in Colorado and represents 24 percent of all national forest wilderness in the state.

In 2000, wilderness use was estimated at 606 MRVDs in the summer and 21 MRVDs in the winter.

Projected summer wilderness use for 2010 and 2020 are 792 MRVDs and 1014 MRVDs, respectively. Winter use for 2010 and 2020 are projected to be 29 MRVDs and 38 MRVDs respectively. Capacity within wilderness throughout the forest is not expected to be exceeded within this planning period as a whole; however, it is anticipated that there will be situations where site-specific capacities will be exceeded. A more site-specific practical capacity analysis will be completed for all wilderness areas following completion of a forest travel management plan.

Trails and trailheads The forest trail inventory consists of four types of routes: *forest development trails* (FDT), *national recreation trails* (NRT), *national scenic trails* (NST), and *ways*. The non-system, user-created trails, also known as ways, were not inventoried for the 1984 Forest Plan.

The current inventory shows 1,834 miles of forest development trails, 40 miles of national recreation trails, and 276 miles of ways. Sixty miles of the Continental Divide National Scenic Trail cross the forest, with an additional seven miles planned for construction. A full discussion of national trails can be found in Topic 5, Section 6. Motorized vehicles are authorized during snow-free periods on about 163 miles of trail. There are 209 summer trailheads.

About 521 miles of snowmobile trails, 517 miles of cross-country ski trails, and 301 miles of mixed (snowmobile and cross-country) trails occur on the forest. There are about 75 winter trailheads.

Many trail users expect trails to provide an opportunity to experience backcountry settings, get away from traffic and crowding, find solitude, and test survival skills. In some instances, technology has made it possible to access areas much more readily than before, especially with the introduction of the mountain bike. Mountain biking has been allowed on all trails outside of wilderness, both motorized and non-motorized. However, most of the current system of non-motorized trails was not designed to accommodate bicycles or other wheeled uses.

Environmental consequences

GENERAL EFFECTS

Overall recreation use will continue to increase in all alternatives; however, the rate of increase for non-motorized summer use outside of wilderness would not be as great in Alternative F as current projections indicate, and the rate of increase for motorized summer use would not be as great in Alternative I. The rate of motorized winter use would decrease in Alternatives C and D and most noticeably in Alternative I. In Alternatives D and I, big game hunting, wildlife viewing, and fishing would not increase

as fast as current trends indicate because of restrictions on human access to protect wildlife habitat.

The quantity, quality, and distribution of recreation opportunities depends on the mix of ROS classes available in summer and winter (**Figures 36 and 37**) and the theme of each alternative. Recreation funding, which varies by alternative, was discussed in Chapter 2. Developed recreation carrying capacity depends on funding levels and the theme of each alternative, and dispersed capacity depends on the ROS classes available and travel management strategies of each alternative.

Available quality recreation opportunities depend on access, resource condition, and the ability to disperse and manage use across the forest. A desired condition, or ROS class, indicates the maximum levels of change an area should experience in terms of ROS criteria (1986 ROS Book) over the life of the forest plan.



Figure 36
Recreation opportunity spectrum in summer, by alternative

ROS classes: PS = pristine; P = primitive; SPNM = semi-primitive non-motorized; SPM = semi-primitive motorized; RN = roaded natural; RM = roaded modified; R = rural; U = urban

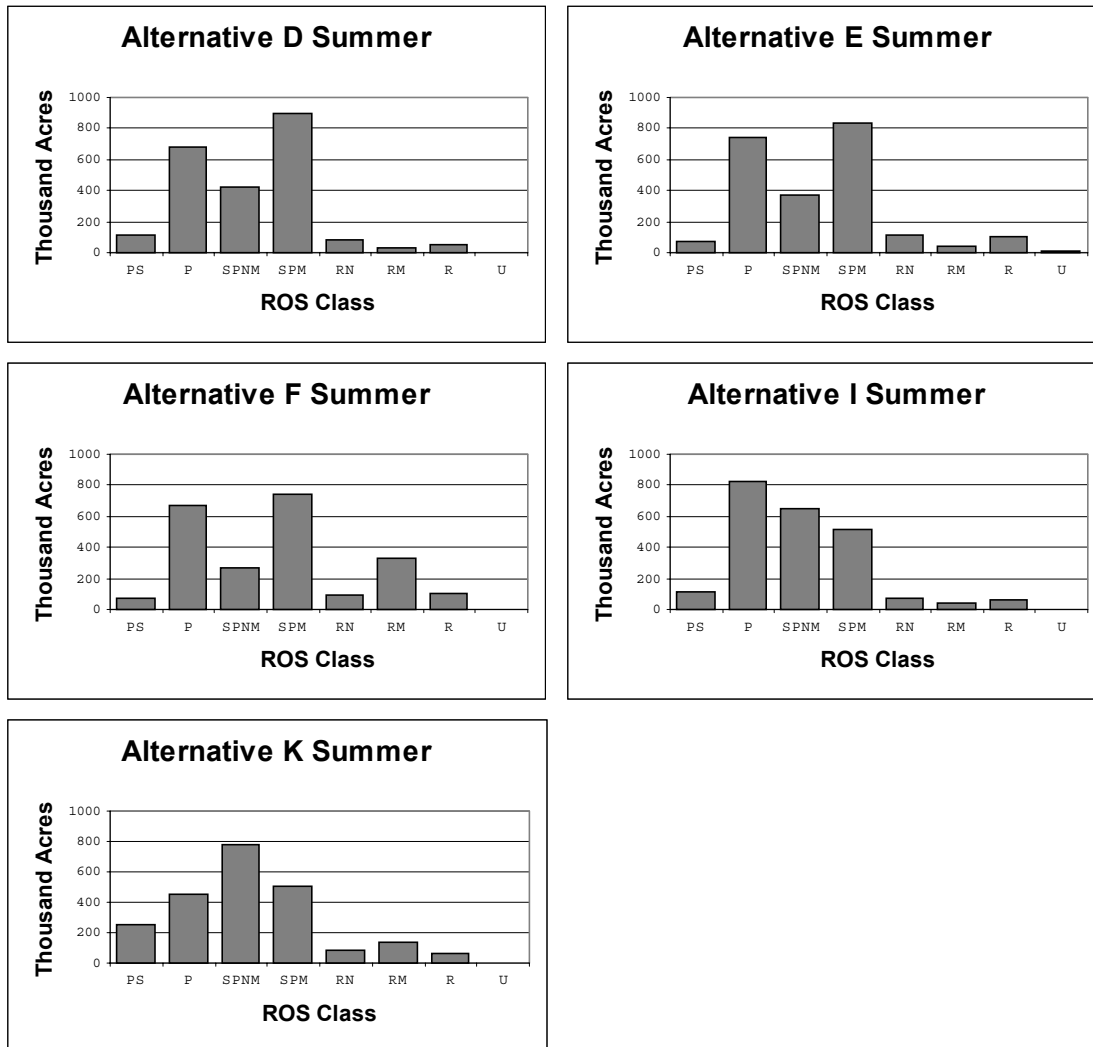
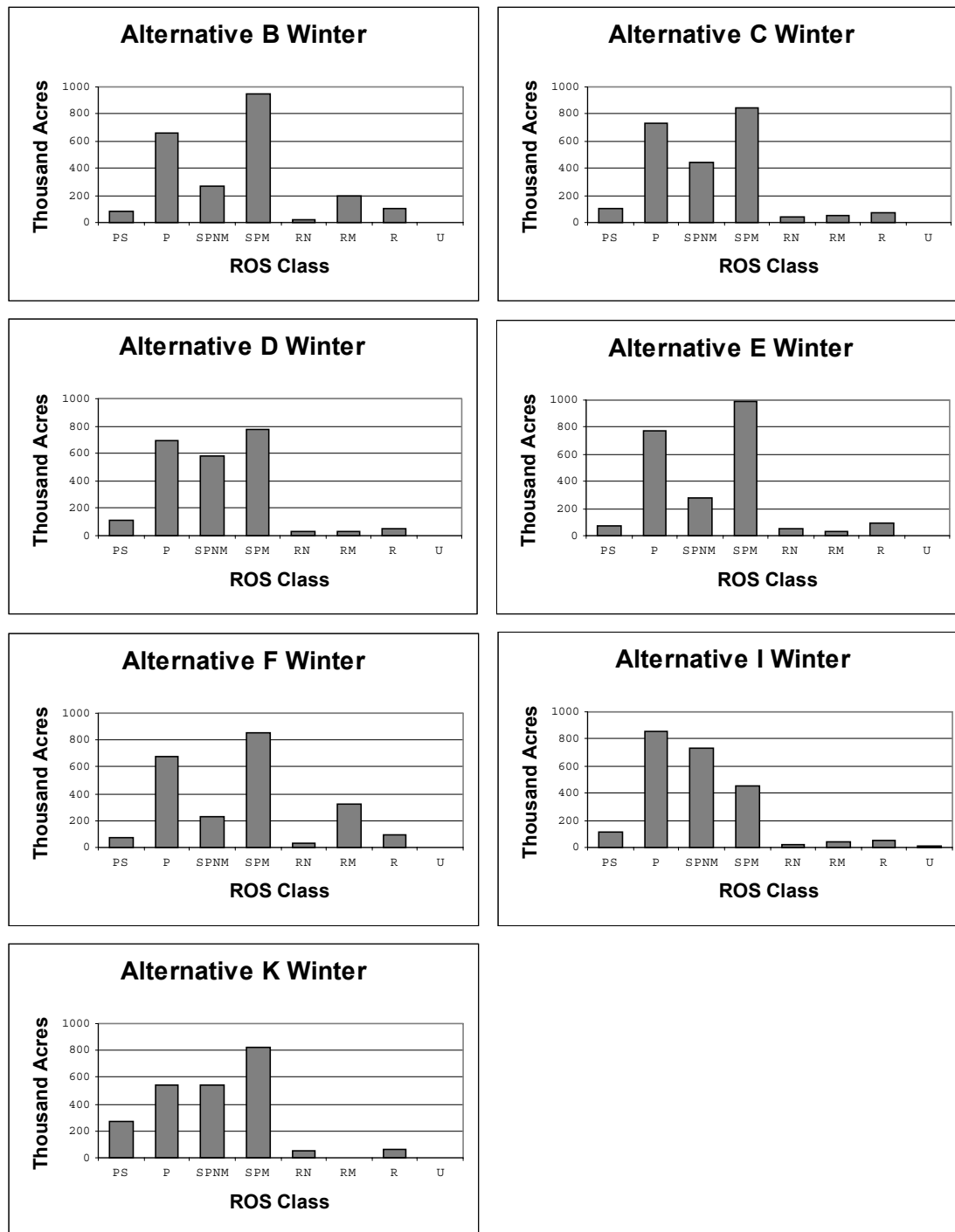


Figure 37
Recreation opportunity spectrum in winter, by alternative

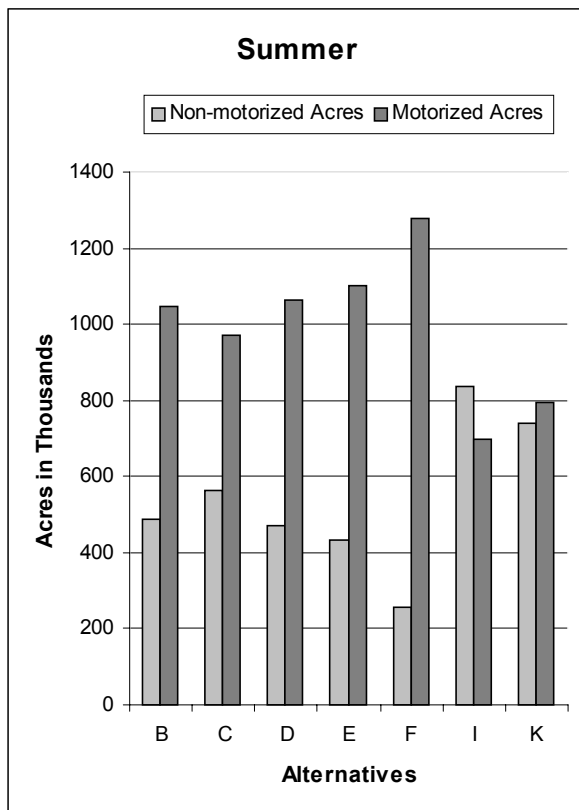
ROS classes: PS = pristine; P = primitive; SPNM = semi-primitive non-motorized; SPM = semi-primitive motorized; RN = roaded natural; RM = roaded modified; R = rural; U = urban



Source: *Winter ROS maps*

User conflicts exist in the summer and winter between motorized and non-motorized users, primarily on trails and roads. In the winter, user access points and trailheads are points of congestion, and access into wilderness is limited by avalanche-prone slopes that reduce the number of safe entry points and routes. Conflicts may occur more often in the summer in Alternative F and in the winter in Alternatives B, E, and F because few non-motorized opportunities outside of wilderness are provided. **Figure 38** illustrates the mix of motorized and non-motorized acres outside of wilderness in each alternative.

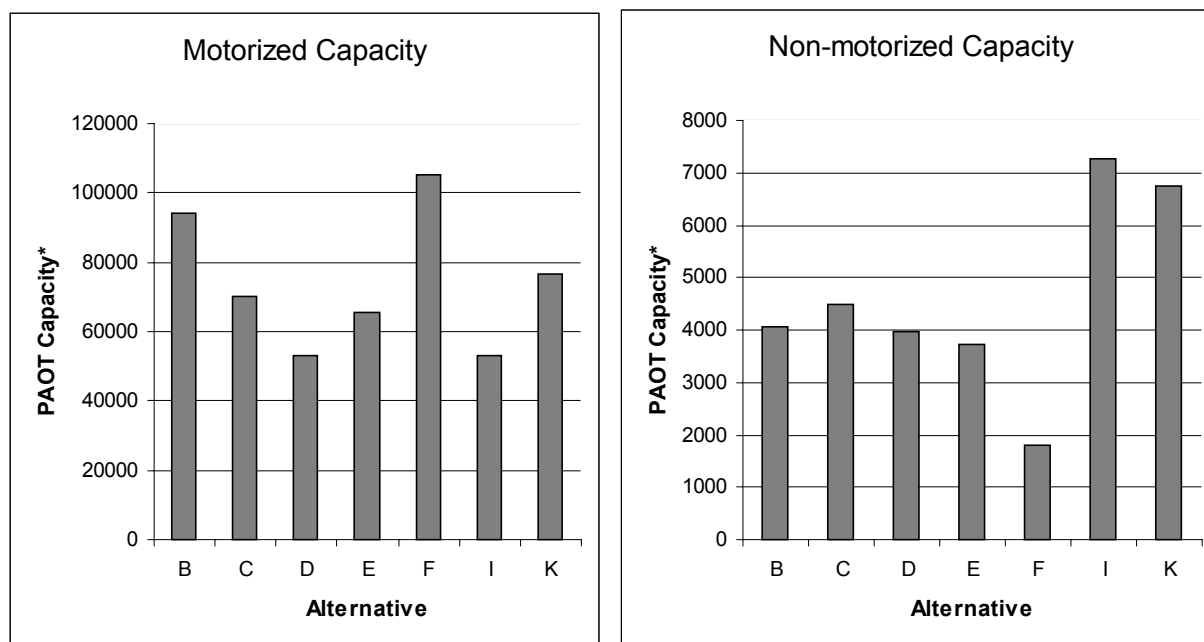
Figure 38
Proposed mix of motorized and non-motorized acres outside of wilderness, summer and winter, in each alternative



Source: ROS maps for all alternatives.

Perhaps more important in comparing dispersed recreation opportunities than using a gross acreage comparison is to use a comparison of recreational capacities. Persons at one time (PAOTs) are commonly used to measure an area's capacity. **Figure 39** shows that Alternative F has the highest summer motorized recreation capacity followed by Alternatives B, K, and C. For summer non-motorized capacity, **Figure 39** also shows Alternative I has the most capacity followed by Alternatives K, C, and B.

Figure 39
Estimated summer theoretical motorized and non-motorized PAOT capacity outside wilderness



**Note: PAOT capacity levels are on differing scales between charts. Motorized PAOT capacity includes non-motorized activities within areas designated for motorized experiences.*

Source: Recreation capacity analysis by alternative, 2001.

Because of the intensive recreation use, vegetation and terrain management that ski areas receive, they are managed in summer and winter in the rural setting category in all alternatives. The resource production/forest products management area (5.13) is managed in summer and winter to meet a roaded modified ROS class in all alternatives. Scenery and recreation concerns when harvesting and hauling trees result in the ROS classification of roaded modified in the 5.13 management area.

DEVELOPED RECREATION

Budget levels will continue to affect the quality of services in developed facilities in all alternatives. Under the experienced budget level, developed facility capacity (PAOTs) to be rehabilitated or reconstructed annually ranges from 340 in Alternative E to 240 in Alternative F (see Table 15). This equates to rehabilitating or reconstructing 68 developed units in Alternative E and 48 units in Alternative F. For example, a family campground on the White River National Forest may have between four and 108 units. Improvements listed in the forest transition plan receive priority for facility rehabilitation and reconstruction. The forest transition plan sets forth steps necessary to complete structural changes to facilities to achieve accessibility.

The current backlog in facility maintenance for developed sites is estimated to be in excess of \$65 million. This maintenance deficit increases the priority for investing capital investment funds into reconstructing existing facilities as opposed to building new ones. Experienced capital investment program allocations would not resolve the backlog

situation within 20 years. As a result, the backlog will continue to increase in all alternatives; it would increase at a faster rate in Alternative F. Beyond the capital investment program, facility construction and reconstruction are contingent on increased (beyond full implementation) funding levels and on the use of private partners to assist in developing and managing facilities.

Current theoretical capacity for the forest's publicly developed sites (excluding trailheads) is 12,958 PAOTs. Because developed site capacities depend on facility construction and reconstruction, additional capacity is not be noticeably increased in any alternative, providing that private partner assistance does not significantly change. Specifically, the number of PAOTs added ranges from 22 (12,980 total PAOTs) in Alternative E to 4 (12,962 total PAOTs) in Alternative I. This equates to constructing four new units in Alternative E to no units in Alternative I. Consequently, campground capacity would be exceeded within the planning period in all alternatives due to increased use that is expected throughout the alternatives. Overall developed recreation use will be very near capacity by the end of the period. As capacity is reached, visitors would be displaced to dispersed areas and to other developed facilities off the forest. Under the full implementation budget level, road obliteration priorities in Alternative I may limit user access.

Opportunities for private partners to expand backcountry hut systems exist in all alternatives, although opportunities may be more limited in Alternatives D and I.

**Special uses
administration**

Some recreation special uses, such as outfitter/guide operations, could be affected by the amount of area managed for semi-primitive non-motorized and primitive settings. Additional wilderness may increase the need for outfitted activities due to limitations on access. Because Alternative I has the most semi-primitive non-motorized and primitive ROS acres, it may have the greatest potential for additional types of primitive outfitter/guide activities. Alternative E emphasizes primitive or undeveloped and developed special-use operations.

No other uses have currently been identified for the areas occupied under permit for the 47 recreation residences. Current permits in all alternatives will be continued until such time as conditions change. Each permit and tract would then be evaluated. No permits for additional uses will be approved.

The two isolated cabin permits on the forest will expire within the planning period. Upon expiration, they will not be re-issued and will not be transferred to anyone else. All improvements will be removed and the sites restored.

Currently, the forest administers one concessionaire permit authorizing private businesses to operate and maintain Forest Service campgrounds. The impact of this administration on the special uses program is considerable and will continue to be in all alternatives as a result of new and additional administrative requirements.

A much larger share of the recreation budget will be allocated to managing recreation special uses in all alternatives, but especially in Alternatives C and E, because of commitments authorized in existing permits. The forest currently has approximately 350 recreation special-use permits. Under the experienced budget level, only 13 permits could be administered annually to standard as defined by Meaningful Measures in Alternatives B, C, D, F, I, and K. These thirteen permits are ski area and concessionaire permits. Alternative E provides for the annual administration of 155 permits to standard or 44 percent of the forest's existing recreation permits.

DISPERSED RECREATION

Dispersed recreation includes motorized and non-motorized activities. Alternative F provides the most summer and winter motorized opportunities, and Alternative I provides the most summer and winter non-motorized opportunities.

Dispersed car campers prefer the solitude along primitive roads. The ROS classes that best support this activity are semi-primitive motorized and in some instances roaded natural and roaded modified (RM). Alternative D provides the most semi-primitive motorized acres in the summer, followed by Alternatives E, F, C, B, K, and I. In winter the activities along these primitive roads change to snowmobiling and non-motorized activities such as cross-country skiing and snowshoeing. Alternative E provides the most semi-primitive motorized acres in the winter followed by Alternatives B, F, C, K, D, and I. Cross-country skiers and snowshoers prefer the solitude in non-motorized areas outside of wilderness; winter access in wilderness is minimal because of avalanche-prone slopes. In winter, Alternative I provides the most non-motorized acres outside of wilderness followed by Alternatives D, K, C, E, B, and F.

In the winter, the Vail Pass area has been separated into motorized and non-motorized suggested use zones as recommended by the Vail Pass Task Force, a cooperative group of recreation users and land managers who began meeting in 1990. Management of this area will continue to emphasize these mutually agreed-upon zones and/or routes in Alternatives C, E, and K.

Roads (FDRs and at least 50-inch-wide ways) open to motorized use provide for additional opportunities to disperse use. As use levels concentrate in limited areas, the quality of the recreation experience may be degraded. Dispersed capacity depends on the ROS classes and the transportation system. Alternative F has the highest total summer dispersed recreation capacity outside of wilderness followed by Alternatives B, K, C, E, I, and D. Because dispersed use is projected to increase in all alternatives, summer capacity outside of wilderness may be reached within the planning period for alternatives D and I. Alternative F also has the highest winter dispersed recreation capacity outside wilderness followed by B, C, and E. Alternatives D, I, and K have similar winter capacities.

Summer visitors, especially those for whom the White River National Forest is a vacation destination, may be displaced to locations off of the forest as summer use fills capacity. We do not expect winter dispersed capacity to be reached within the planning period in any alternative.

Hunting and fishing opportunities exist in all alternatives. Because Alternatives D and I have more restrictions on motorized access, future hunting, fishing, and wildlife viewing uses are projected to increase at a slightly lower rate than in Alternatives B, C, E, F, and K. Big game hunting use is projected to increase the most in Alternative F due to a higher amount of roaded recreation opportunities, but hunter success may not be as high because of the movement of animals, especially movement off of the forest.

Fishing use is projected to increase the most in Alternative C because of greater recreational fishing emphasis. Greater amounts of recreational fisheries management activities would occur in Alternative C, but greater amounts of native fisheries management activities would occur in Alternative D.

The need for wildlife viewing opportunities has been identified in the 1992 Colorado Statewide Comprehensive Outdoor Recreation Plan (SCORP). Wildlife viewing use is projected to increase more in Alternatives E and F because of fewer access restrictions and additional roaded recreation opportunities, although viewing satisfaction may not be as high in Alternative F because of the effect of additional roads on wildlife.

Wilderness recreation Use-related environmental impacts generally are most severe in high-altitude areas where vegetation is most sensitive to trampling. Additions to the National Wilderness Preservation System could potentially disperse wilderness use, thereby decreasing impacts along heavily used wilderness trail systems. Alternative I recommends the most roadless areas for wilderness designation, with 200,000 acres (9 percent of the forest), followed by Alternative E with 107,000 acres (5 percent). Alternatives C, K, D, B, and F follow in descending order.

As demand for recreational use in wilderness increases, it is important to continue allowing use as long as wilderness resource management objectives are being met. Different areas within wilderness areas may have different recreation use capacities. Carrying capacities in wilderness are tied to trails and ROS class in the 1.12 and 1.13 management areas and to gross acreages in the 1.11 management areas. Capacities are important for implementing provisions in the wilderness Act for solitude and for long-term protection of the entire range of wilderness resources. Alternative K provides the most theoretical summer capacity (6,392 PAOTs) followed by Alternatives E, C, I, D, F, and B.

Trails and trailheads Trails provide the opportunity to experience backcountry settings, get away from traffic and crowding, find solitude, and test survival skills. They also provide a link to communities and other recreation resources on adjacent lands. According to the 1992 SCORP, recreational access to public lands and recreation trails opportunities rank as top issues for the area around the White River National Forest. Access is provided in all alternatives, but opportunities to disperse use once on the forest may be limited in Alternative D in order to protect wildlife habitat. Higher use levels could be expected on fewer miles of trail in Alternative D.

Trail uses such as backpacking, day hiking, mountain biking, cross-country skiing, and snowmobiling will continue to increase. As use increases, trail maintenance and management will become important tools for dispersing and separating trail users in order to provide satisfying experiences and to provide resource protection where it is most needed.

The quality of non-motorized trail opportunities depends on scenery and the number of users at one time in a specific area. Although summer non-motorized trail use increases in all alternatives, the rate of increase is less in Alternative F because of its emphasis on motorized settings. Mountain biking opportunities may be limited in the primitive ROS class in Alternative I. Winter non-motorized trail use increases in all alternatives at the same rate; demand does not depend on the number of non-motorized acres.

A high-quality motorized trail system is dependent on budget allocation and private partner assistance to accomplish trail maintenance and management objectives. Summer motorized travel on roads and trails is projected to increase in all alternatives, except that the rate of increase is less in Alternative I because of its emphasis on non-motorized settings. Winter motorized travel on roads and trails also is projected to increase. In all alternatives, winter theoretical capacity is more than double projected demand.

Under the experienced budget level, the amount of annual trail maintenance conducted outside of wilderness ranges from 540 miles in Alternative E to 220 miles in Alternative F (see Table 15). Inside wilderness, Alternative C provides the most miles annually maintained at 860 trail miles, and Alternative F again provides the least trail maintenance at 200 miles. The current backlog in trail maintenance is estimated to be over \$6,635,000. This backlog would continue to increase in all alternatives; it would increase at a faster rate in Alternative F.

Alternative E provides the most trail miles annually reconstructed or constructed inside wilderness (12 miles) and outside (14 miles) (see Table 15).

DIRECT AND INDIRECT EFFECTS

Effects on recreation management from mineral exploration and extraction

Recreation would be affected comparably by mineral exploration and extraction in all alternatives. Road building can create changes in the ROS; non-motorized settings could potentially change to motorized settings. Developed sites, both publicly and privately developed on National Forest System lands, should be withdrawn from locatable mineral entry.

According to the *Oil and Gas Leasing EIS* (1993), existing wilderness is legally withdrawn from oil and gas leasing. It also states that a no surface occupancy stipulation is applied to the ski areas, primitive areas outside of wilderness, national recreation trails, recreation special-use developments, developed recreation facilities, backcountry huts, recreation residences and isolated cabins, and the Maroon Creek corridor. In addition, timing stipulations apply to snowmobile and cross-country skiing corridors as mapped in the 1993 EIS. As part of the forest plan revision, recommended wilderness would not be available for oil and gas leasing.

Short-term effects may include noise and visual impacts from the drilling operations. In the long-term, effects may include a change in ROS to Road Modified from a more naturally appearing landscape, new permanent physical structures, and new roads and road corridors constructed for the drilling operation. These new roads may or may not be open for motorized and mechanized use, which sometimes creates confusion for the recreating public.

Effects on recreation management from wildlife management

Wildlife management can directly affect recreation opportunities. Road density standards to protect wildlife habitat can concentrate motorized, dispersed recreationists on fewer miles of open roads, diminishing their experience of solitude while increasing the experience of solitude for non-motorized, dispersed users. Management areas 5.4 and 5.43 set road density standards. Timing restrictions, seasonal closures during sensitive periods such as calving and migration, and prescribed burning to improve habitats can temporarily displace recreationists to other areas.

Management areas such as 5.4, 5.43, and 5.5 restrict motorized and mechanized uses to designated routes during snow-free periods. Alternative D has more acres allocated to these prescriptions, followed by Alternatives K, C, F, B, E, and I.

Management areas such as 5.41, 5.42, and 5.5 restrict over-the-snow vehicles to designated routes and play areas. Alternative D has more acres allocated to these prescriptions, followed by Alternatives K, I, C, B, F, and E.

Recreational benefits from wildlife management could include increased hunter and wildlife viewer satisfaction, as well as maintaining angler satisfaction.

Effects on recreation management from management of TES species

In all alternatives, recreation would be comparably affected by management of threatened and endangered species because law, direction, and policy require that listed species be protected. Management of sensitive species is guided by agency direction and policy and already included in standards and guidelines. Because lynx and wolverine use large home ranges, the 5.5 management area links together larger protected areas of habitat. Allocation of 5.5 acres varies by alternative. Alternative K allocates the most acres to this prescription, followed by Alternatives D, I, F, C, E, and B.

In the management area 5.5 prescription, both motorized and mechanized travel are restricted as described in the previous section.

Effects on recreation management from domestic livestock grazing

Recreation would be affected comparably by livestock grazing in all alternatives. Active grazing allotments currently comprise 54 percent of the forest. Active allotments do not vary by alternative. Decisions to graze vacant allotments will be made in a separate site-specific document. Signs of livestock grazing, such as the presence of cows or sheep, fences, driveways, stock tanks and ponds, cropped forage, trampled vegetation, or manure may be offensive to recreationists. Conflicts can occur between visitors and livestock or with the dogs used by permittees to control herds. These concerns are most keenly held by recreationists who prefer a livestock-free experience yet choose to visit areas that are actively grazed.

Effects on recreation management from travel management

Travel management directly affects developed and dispersed recreation experiences and opportunities. Directional signing assists visitors in finding their destinations. Travel management strategies, including road development and maintenance, influence ROS settings and recreation carrying capacities.

Maintenance and upkeep of the roads system is critical for recreational access. Alternative I places emphasis on maintaining the existing road system and maintains the highest percentage of the existing transportation system to standard followed by Alternatives C, D, K, E, F, and B. Conversely, Alternative I allows for the reconstruction of the fewest road miles annually.

Effects on recreation management from utility corridors

Recreation is comparably affected by utility corridors in all alternatives. Clearcutting and roadbuilding can create long-term changes in the landscape resulting in changes to the ROS. Semi-primitive settings could potentially be converted to roaded modified and occasionally to roaded natural settings.

Recreational benefits from utility corridors could include additional dispersed opportunities. Trails could be created over below-ground pipelines; an example includes snowmobile routes.

Effects on recreation management from dams and water diversions

Recreation is comparably affected by dams and water diversions in all alternatives. Facility construction could create long-term changes in the landscape, resulting in changes to the ROS. Semi-primitive settings could change to settings toward the urban end of the spectrum. Water diversions can reduce significantly the recreation experience, especially in sites associated with water features such as viewpoints and campgrounds by waterfalls.

Recreational benefits from dams and water diversions could include increased water-based recreation opportunities as well as hunting, fishing, and wildlife viewing opportunities.

Effects on recreation management from ski areas

Ski area expansions have the potential to affect dispersed recreation experiences and opportunities by creating long-term changes in the landscape resulting in changes to the ROS. Semi-primitive settings could change to rural settings. Alternative B has the greatest potential to create such changes, followed by Alternatives E, F, C, and K.

Recreational benefits from ski areas include managed, convenient access to National Forest System lands for visitors participating in such activities as hiking, mountain biking, viewing scenery, skiing, and snowboarding. Ski areas provide year-round natural-resource-based recreation. The number of recreation opportunities enhanced by lift-served access generally is proportional to the number of acres allocated to the 8.25 management area; Alternatives B, E, F, C, and K therefore would increase the number of recreation opportunities within this prescription. Alternatives D and I would limit recreation opportunities and use to existing permitted sites.

Effects on recreation management from aerial transportation corridors

Aerial transportation corridors could increase use on National Forest System lands within and adjacent to permitted sites; this use would be concentrated near lift terminals. In addition, these corridors have the potential to affect dispersed recreation experiences and opportunities by creating long-term changes in the landscape resulting in changes to the ROS. Semi-primitive settings could change to rural settings. Alternative E has the greatest potential to create such changes, followed by Alternatives F and C.

Recreational benefits from aerial transportation corridors could include enhanced opportunities to view scenery and managed, convenient access to National Forest System lands for visitors to participate in natural-resource-based recreation activities. Alternatives E, F, and C allow for 8.31 management area allocations.

Effects on recreation management from roadless area management and recommended wilderness

Undeveloped areas provide non-motorized backcountry opportunities in relatively unmodified settings. The undeveloped condition creates the feeling of solitude and, in some instances, provides an experience similar to wilderness recreation, with additional

opportunities for activities not allowed in wilderness. ROS classes compatible with undeveloped areas are primitive and semi-primitive non-motorized. Mountain biking opportunities are limited in the primitive ROS class in Alternative I.

Although the total acreage of undeveloped areas does not vary by alternative, Alternative B assigns more of these acres to management areas that allow road building, followed by Alternatives F, D, K, E, C, and I. Road building can create changes in the ROS; non-motorized settings could potentially change to motorized settings.

Alternative I allocates more undeveloped areas to recommended wilderness, followed by Alternatives E, C, K, and D. Alternatives B and F do not recommend any additional wilderness. As in Congressionally designated wilderness, recommended wilderness (management area 1.2) would prohibit motorized uses and mechanized uses such as mountain biking.

Effects on recreation management from research natural areas

Research Natural Area (RNA) designations can affect future recreation opportunities, although all proposed RNAs are compatible with current use patterns. RNA designation prohibits motorized and mechanized uses as well as the construction of new trails. An exception is the allowed use of mountain bikes on FDT 1949 in the proposed Assignment Creek RNA under Alternatives C, F, and I. Existing outfitter/guide permitted use would be allowed to continue, although new or expanded recreational uses are not encouraged. Alternative I has the largest amount of proposed RNAs (129,290 acres), followed by Alternatives D (105,796 acres), C (87,002 acres), F (78,316 acres), E (61,012 acres), K (42,389), and B (328 acres).

Proposed RNAs inside the National Wilderness Preservation System would have little effect because of current limitations on uses in wilderness. In Alternatives C through I, a high percentage of the proposed RNA acreage would be inside existing wilderness. Specifically, percentages of proposed RNA acreage inside wilderness are as follows: Alternative I, 64 percent; Alternatives D and E, 59 percent; Alternative F, 57 percent; Alternative C, 52 percent; and Alternative K, 51 percent. The only RNA considered in Alternative B is the existing Hoosier Ridge RNA, which is outside of wilderness.

Effects on recreation management from timber harvest

Management areas that emphasize recreation management activities do not contribute to the ASQ, but vegetation management is allowed within these prescriptions to meet specific recreation and scenery management objectives. When these activities are underway or when people recreate in other management areas that do contribute to the ASQ, vegetation management has the potential to affect recreation experiences and opportunities in several ways. Short-term effects may include increased noise and dust levels; the sight of landscapes altered by differing types of harvesting; the presence of slash piles, burned areas, and roads constructed for timber sales; conflicts with logging trucks on roads used by other drivers or by bicyclists; and the removal of snow for winter log hauling from roads frequented by snowmobilers, cross-country skiers, and snowshoers. Users may be temporarily displaced to other locations because of log truck traffic, helicopter operations, and the noise from chainsaws. Visitors may be permanently displaced the longer a project or series of projects continue in the same vicinity.

Alternative F places highest emphasis on logging, followed by Alternatives B, K, D, I, C, and E. Alternatives C and K would emphasize prescribed burning the most, followed by Alternatives D, B, E, I, and F. Clearcutting and road building can create long-term changes to the landscape, resulting in changes to the ROS. Alternative F has by far the greatest potential to convert semi-primitive settings to roaded modified and occasionally roaded natural settings. Alternatives B, K, D, I, C, and E follow in descending order. Partial cutting could lessen the impacts to recreationists.

Road development for timber management purposes in undeveloped areas has the potential to attract more visitors to the interior of the forest where access previously has been limited. As use increases, visitors would experience less solitude and remoteness. Primitive and semi-primitive non-motorized settings could change to semi-primitive motorized and roaded modified settings.

Recreational benefits from vegetation management can include new roads and trails and the opportunity to gather firewood. In many cases, roads built for logging operations are then used by recreationists, although these roads typically are closed and/or obliterated after completion of the timber sale. One result has been a misunderstanding by some people about the purpose of the roads after they have grown accustomed to using them. Depending on resource objectives, some logging roads can be left open to create additional dispersed recreation opportunities.

CUMULATIVE EFFECTS

The White River National Forest has experienced many changes in recreation since it was established and even over the life of the 1984 Forest Plan. Initially, recreation was primarily dispersed in nature with few developed campgrounds or other sites being developed until the Civilian Conservation Corps era. At that time, many of the developed trails on the forest were constructed, as were other recreation facilities such as Chapman Dam and Campground. Another big boom in developed recreation construction occurred in the early to mid-1960s as post-war population started heading to the forest, demanding more and better recreation facilities. During this same time period, downhill skiing started rapidly increasing in popularity and attracted increasing numbers of year-round residents into the valleys, especially in Summit, Eagle and Pitkin counties. In addition to increased local populations, changes in technology have also shifted the recreational modes and composition of users on the forest. Fairly recent technical advancements in snowmobiles now allow them to travel many places where they were unable to travel as recently as 5 years ago. The invention of the ATV has added a new motorized use in the summer and allows many persons to travel on 4-wheel drive routes into areas that they never may have been able to travel into previously. Lastly, the invention of the mountain bike has added a summer non-motorized use that did not exist at the writing of the 1984 Forest Plan. All of these issues, along with several others, have led to more crowded recreation experiences during peak use times, increasing levels and range of demands on natural resources and resource managers, and more conflicts among the users themselves.

Population growth in the counties within and surrounding the forest will probably be the single largest impact on forest recreation management over the next 20 years. Population growth rates of the local counties are projected to be higher than are most of the projected growth rates for recreation uses on a regional basis (Colorado State Demographers Office, June 2001, Cordell, et al., 1993). Especially in areas around the higher population centers, capacity may be reached and the focus on uses may shift more toward

accommodating uses associated with local populations rather than destination visitors. Activities such as developed recreation site camping will continue to increase, but the increase will be primarily on weekends and holidays. Peak use periods on other activities such as mountain biking, motorcycling, or kayaking may be after 5 p.m. instead of peaking around noon as with many of the destination visitor dominated activities.

Use capacities will also be reached more rapidly on the forest than would be expected around the rest of the region. This may necessitate implementing use management techniques in some of the more popular locations.

Other actions, such as the efforts to improve transportation along the I-70 corridor, will further increase the amount of use, especially on the eastern side of the forest.

Continuing changes in technology of equipment used for recreational purposes on the Forest will have impacts as new uses, or existing uses changing the ease or areas where people may recreate, continue to further change the recreational experience in some areas. This may be especially concerning to those who pursue more traditional recreation such as hiking in remote settings.

In addition to the White River National Forest, other recreation providers in central Colorado include:

- Dinosaur National Park, Colorado National Monument, and Black Canyon of the Gunnison National Park are all within two-hour drives of the forest.
- Other national forests adjacent to the forest are the Medicine Bow-Routt, Arapaho-Roosevelt, Pike-San Isabel, and Grand Mesa-Uncompahgre-Gunnison national forests.
- Bureau of Land Management resource areas adjacent to or within the forest boundary include Glenwood Springs, White River, and Kremmling.
- State wildlife management areas adjacent to or within the forest boundary include Garfield Creek, Coke Oven, Christine, Oak Ridge, Jensen, and Radium.
- State recreation areas adjacent to or within the forest boundary include Sylvan Lake, Rifle Falls, Harvey Gap, and Rifle Gap.
- Rifle Mountain Park, adjacent to the forest, is operated by the city of Rifle, Colorado.
- Several private recreation facilities such as campgrounds operate on private land adjacent to or within the forest boundary.

These areas provide developed and dispersed recreation opportunities including camping, fishing, hunting, wildlife viewing, boating, hiking, rock climbing, bicycling, picnicking, four-wheeling, snowmobiling, and skiing. As recreation carrying capacities on the White River National Forest are approached, recreationists may be displaced to these areas, assuming that capacity is available.

The 1992 SCORP indicated that the issue of linkages between recreation and tourism was of high-to-medium importance for areas around the White River National Forest. As tourism grows and the country's population ages, there may be added demand to increase recreation opportunities on the developed end of the ROS. The resultant change to the natural landscape would increase opportunities associated with road development and decrease opportunities for recreationists seeking a more primitive setting. For the Rocky Mountains, the largest predicted gaps or shortages, where projected demand exceeds supply, are for backpacking, day hiking, and cross-country skiing (Cordell et al. 1993).

All alternatives generally emphasize primitive and semi-primitive recreation opportunities, providing today's recreationists with reasonable assurances of future backcountry opportunities as well as development possibilities. Alternative F may provide slightly more recreation opportunities toward the developed end of the ROS by accelerating the rate of growth into the interior forest through the development of roads. Other values such as remoteness, solitude, and wildlife-related recreation opportunities could be lost in Alternative F. In Alternative C, road development would not occur in currently unroaded areas, possibly creating congested travelways as use levels rise.

Topic 3, Part 2

Ski Areas

Introduction

Abstract

About 50 to 55 million skiers visits are recorded at American resorts each year. Colorado accounts for about 22 percent of the national total. The White River National Forest provides 64 percent of the skiing in Colorado and 13 percent of the national total. Weather is the key variable affecting seasonal fluctuations in skier use throughout North America. The health of the economy and specialized marketing also play a role in influencing user preferences. Improvements to transportation systems, technological advances in lifts and personal equipment, and new capital improvements at individual resorts attract skiers to specific areas.

Summary

The White River National Forest currently receives about 7.6 million skier visits per year. Downhill skiing and snowboarding are popular recreation activities and an important part of Colorado's tourist economy. During the past 10 years, skier visits on the White River National Forest increased most rapidly in Summit and Eagle Counties. Throughout the Rocky Mountain region, existing ski areas rather than new ones are expected to provide the additional capacity needed to meet future demand for skiing.

All of the alternatives provide for the continued operation of the 12 ski areas on the White River National Forest that are currently permitted for forty year periods. Each alternative provides a different level of developed skiing capacity based on a variety of land allocations. The 8.25 management prescription allows ski area development within lands allocated to it. In the 1984 Forest Plan, the ski area management category was called 1B. The total number of acres assigned to the 8.25 management prescription is representative of the amount of potential acreage each ski area has available for development. However, each ski area is managed through a site-specific management plan, so any new lift development in currently undeveloped 8.25 terrain must also gain approval through this process.

In response to local community concerns about traffic congestion and air pollution, the White River National Forest also created a new 8.31 management prescription for aerial transportation corridors to accommodate potential facilities such as gondolas and chairlifts. Planners identified corridors where aerial trams could be used to transport people to, from, or between locations within resort communities and ski areas in place of private automobiles or buses. See Topic 3, Part 3 for more information about this subject.

The forest plan process results in the allocation of specific acres of National Forest System lands to a variety of management prescriptions based on highest and best use, legal, and administrative guidance. It is similar to city or county zoning of private land. In the 1984 Forest Plan, the management prescription for areas allocated the 8.25 management prescription are managed to protect and enhance their future potential for skiing in accordance with the standards and guidelines assigned the 8.25 management prescription.

Key indicators

Legal and administrative framework

- The number of acres assigned to the 8.25 management prescription
- The **National Forest Ski Area Permit Act** (1986) allows the Forest Service to issue special use permits to the private sector to construct and operate ski areas on an unlimited number of acres of National Forest System land for a period of up to 40 years.
- The **Occupancy Permits Act** (1915), as amended, previously authorized the issuance of term permits for structures or facilities on National Forest System lands on up to 80 acres for up to 30 years.
- The **Organic Administration Act** (1897) authorized annual permits for land occupied by ski runs as well as undeveloped portions of the ski areas.

Affected environment

National Overview

HISTORIC PERSPECTIVE

National Forest System lands occupy much of the mountainous terrain in the United States that is best suited for ski area development. As a result, the Forest Service has been involved with skiing since the inception of modern ski areas in the 1930s. At that time, public demand for high quality alpine skiing opportunities was growing and the Forest Service made a critical decision that fundamentally influenced the development of the ski industry. That decision was to enter into partnerships with the private sector to construct and operate ski areas on national forests. The Forest Service permitted the occupancy of National Forest System lands, while the private sector provided the capital to construct facilities. In these early years, the Forest Service played a very active role in the planning and development of ski areas. Using New Deal labor programs such as the Civilian Conservation Corps (CCC) and the Works Progress Administration (WPA), the Forest Service employed some of the pioneers of the ski industry to inventory potential ski areas, develop master plans, and actually clear ski runs. Forest Service snow rangers conducted the avalanche control at these areas, developing many of the techniques and much of the knowledge used in snow safety programs at ski areas today.

As a result of this partnership, 121 of the country's 503 ski areas operate on 62 different national forests in 18 states. While only 24 percent of the ski areas operating in the U.S. are located on the national forests, these ski areas produce the majority of the nation's skier visits. They generate about 30 million skier visits and pay over \$18 million in land use fees each year.

THE NATURE OF THE RELATIONSHIP BETWEEN SKI AREAS AND THE FOREST SERVICE

Permits Ski areas are authorized to operate on national forests by permits issued by the Forest Service. These permits are issued under the authority several laws including the Organic Administration Act of 1897, the Occupancy Act of 1915, and the National Forest Ski Area Permit Act of 1986. Ski area term permits, issued under the authority of the National Forest Ski Area Permit Act of 1986, may be issued for terms up to 40 years and include sufficient acreage within the boundary to accommodate the needs for

ski operations and appropriate ancillary facilities. Appropriate ancillary facilities are those facilities that are directly related to the operation and support of skiing activities.

**Master
Development
Plans**

A master development plan is part of each ski area permit. These master development plans describe the improvements and facilities that are authorized at each ski area. A key factor in the master development planning process is the establishment of the planning capacity, expressed in people at one time, for the ski area. The planning capacity is established through balancing the capacities of the various interrelated components of the ski area, such as ski lifts and trails, restaurants and restrooms, and parking lots and transit systems. New technology and changing skier preferences with regard to terrain and on mountain services motivate ski areas to adapt and change in order to remain competitive. Because of this, master development plans are dynamic. The Forest Service participates with ski areas in planning changes to meet public needs. Prior to approval for implementation, the master development plan and its component parts are subject to environmental analysis in accordance with the National Environmental Policy Act and other relevant laws and regulations.

**Operating
Plans**

An operating plan is also part of each ski area permit. These plans, prepared annually by the ski areas for approval by the Forest Service, describe the authorized winter and summer operation of each ski area and include such things as the types of activities allowed, avalanche control procedures, vegetation management plans, erosion control techniques, boundary management plans, general safety, sanitation procedures, and special events such as ski races or summer concerts.

**Off-season
uses**

Forest Service policy encourages off-season use of ski area facilities where the use is compatible with natural resource-based recreation and does not require additional specialized facilities. Natural resource-based recreation includes those activities that are associated with and dependent on the natural environment. They are the types of activities that commonly occur on national forests, such as hiking, nature study, fishing, and mountain biking.

**Partnerships
with NSAA
and USSA**

The Forest Service, National Ski Area Association (NSAA), and United States Ski and Snowboard Association (USSA) work in partnership to achieve common goals of managing and promoting active participation in alpine recreation and sports by all people. A memorandum of understanding was signed in 1996 to establish a general framework of cooperation.

Major areas of emphasis are the public and private partnership in developing recreation facilities on National Forest System lands; multiple use public land management; sustainable communities; viable local economies; and ecosystem health. Recognizing that the majority of skiing and snowboarding takes place at resorts located on National Forest System lands, the focus of the framework for cooperation is to recognize the importance of partnerships in developing alpine venues; to raise public awareness of the environment; to emphasize the relationship between nature, conservation, recreation, and the individual; and to promote universal access to National Forest System lands, recreational facilities and opportunities. The Forest Service agrees to provide technical assistance to partners in building environmental awareness and education; provide expertise that will help provide facilities and programs accessible to people of all ages, abilities, and cultures.

USSA agrees to enhance awareness of nature by incorporating conservation education into existing programs; raise public awareness of multiple use management and conservation principles; promote athletes demonstrating a positive environmental image; and advocate a strong environmental ethic and the importance of maintaining natural healthy environments.

NSAA shares the agency's objectives of increasing public awareness of environmental responsibility and the role public land, recreation, especially alpine recreation, play in improving one's quality of life. NSAA agrees to develop and implement strategies that advocate the linkage between quality of life and healthy environments; encourage ski areas to sustain healthy ecosystems; promote an environmental ethic; contribute to sustaining communities; and point out benefits to people, communities, and society about recreation on National Forest System lands.

NATIONAL SKI INDUSTRY TRENDS

The ski industry in the United States may be characterized as mature. The average age of ski areas in this country is 40 years. Over the past 20 years, annual skier visits have fluctuated but remained essentially level, exhibiting no sustained growth and averaging about 52 million skier visits a year. During the 2000-01 season the ski industry enjoyed a record year with 57.3 million skier visits, which eclipsed the previous record of 54.6 million set in the 1993-94-ski season. All regions of the country had strong seasons, with the Midwest enjoying its best year in 20 years, the Southeast enjoying its best season in 5 years, and the Rocky Mountains and Pacific West enjoying their best seasons in 3 three years. (Kottke National End of Season Survey 2000/01)

In the last 15 years, the number of ski areas operating in the country declined 32 percent from 735 areas in the 1983-84 ski season to 503 areas in the 1999-00 ski season. One result of this trend is that average skier visits per ski area increased by 50 percent during this period, from an average of 68,884 skier visits per operating ski area in the 1983-84 season to an average of 103,773 skier visits per operating ski area in the 1999-00 ski season, as surviving ski areas expanded their market shares, accommodating skiers who had previously patronized ski areas that ceased operating (NSAA).

While only 24 percent of the ski areas operating in the U.S. are on National Forest System lands, these ski areas produce approximately 56 percent of the nation's skier visits. Consistent with overall industry trends, the number of ski areas operating on National Forest System lands declined 12 percent from 153 areas in the 1985-86 seasons to 121 operating ski areas in the 1999-00 seasons. These 121 ski areas experience almost twice as many annual skier visits than the industry as a whole, averaging 215,933 skier visits in the 1998-99-ski season.

Approximately 178,000 acres of National Forest System lands are under permit to ski areas. While this represents only 0.09 percent of the 191 million acres in the National Forest System, the skier visits they accommodate represent 15 percent of the total annual recreation use that occurs on all national forests. (National Forest Visitor Use Monitoring Report, April 23, 2002)

Snowboarding

While overall skier visits have remained flat, snowboarding has shown sustained growth throughout the 1990s and now represents 28.1 percent of the nation's annual skier visits. The average annual growth rate for snowboarding in the past several years

was 8.7 percent. While this annual growth rate has slowed from annual growth rates averaging 20 percent in the sport's early years, it still represents an annual national increase of 1,400,813 snowboarder visits each year.

Nationally, day visitors represent about 53 percent of total skier visits with the remaining 47 percent being overnight, or destination visitors.

Ownership

In the past several years, there has been a trend in certain parts of the country toward ski areas offering heavily discounted season's passes. These discounted passes tend to be offered in larger day-skier markets. Nationally, the average number of season passes sold per ski area was 4,005 passes in the 2000-01-ski season. Over the past three years, the average annual growth rate in season pass sales per ski area was 28 percent.

In the past decade, there has been a trend toward consolidation of ski area ownership. Companies or government entities owning more than one ski area controlled 14 percent of the 509 ski areas operating in the U.S. in the 1998-99 ski season. This phenomenon is even more pronounced with respect to ski areas operating on National Forest System lands, with 24 percent of these ski areas owned by firms controlling more than one ski area. These ski areas tend to be relatively large, including 8 of the top 10 ski areas based on annual skier visits, and 19 of the 31 ski areas with over 300,000 annual skier visits. Ski areas in consolidated ownership generate 50 percent of all skier visits on the National Forests.

The past decade has also seen an increase in the number of ski areas that are owned by publicly traded corporations. Large corporations now own 11 ski areas on National Forest System lands. These ski areas represent 7 of the top 10 ski areas in terms of annual skier visits, collectively generating 34 percent of the skier visits to National Forest ski areas.

Demographics

As stated earlier, over the past two decades, national skier visits have been flat. During this same period the U.S. population grew by 19 percent. National demographic projections and the demographic profile of the skiing public raise questions about the industry's ability to maintain historic levels of skier visits, let alone grow participation in the sport.

In the 1996-97-ski season, it was estimated that the median age of U.S. skiers was 29 years and the mean age was 31 years. (NSAA Demographic Research 1996/97) Eighty-seven percent of the skier population is in the 12 to 44 year old age bracket. Additionally, 87 percent of skiers are non-Hispanic Caucasians. According to U.S. census projections, the total white non-Hispanic population is projected to remain flat and grow older over the next 20 years. (Special Report: A Model for Growth, NSAA National Convention and Trade Show, May 4-7, 2000) In this period, the size of the population segment that has been the traditional core market for skiing will decrease with many current skiers attaining the age when they are unable or less likely to participate in the sport, with no corresponding increase from younger age segments. All of the population increases in the age groups currently most likely to ski will be in ethnic minorities who have historically represented only a small proportion of the participants in the sport.

Climate change

Weather trends also do not favor skiing. These trends indicate a warming of the earth's climate. Evidence of this is the fact that the four warmest years on record since 1860 all occurred in the 1990s and the 20th century's 10 warmest years all occurred in the last 16 years. This warming has been most pronounced in the winter season over land

in mid- to high latitudes in the northern hemisphere. Additionally, snow cover in the northern hemisphere has been decreasing for the past 100 years. (Special Report: A Model for Growth, NSAA National Convention and Trade Show, May 4-7, 2000) Taken together, these phenomena may work to shorten ski seasons and hold down skier visits.

Industry marketing strategies

Ski industry leaders, in recognition that these trends will depress future skier visits, have proposed an industry-wide course of action designed to counter their effects. The basis of the industry's initiative is the fact that 85 percent of the people who try skiing drop out of the sport, or in other words, 15 percent of people who try the sport are eventually converted from beginners to core skiers. The proposal involves two actions, increasing number of people who try skiing, and increasing the percentage of the people who try skiing and become part of their core market.

Industry analysts have developed a model and a hypothetical benchmark to simulate and quantify the effects of market interventions. The benchmark incorporates the effects of the demographic projections and weather trends and projects that absent intervention, national skier visits will decline by about 12 percent from the current annual average of 52 million skier visits to about 46 million skier visits in year 2010. The model indicates that by increasing the number of people who are introduced to the sport and increasing the percent of these people who convert from beginners to core skiers, this decline is preventable. The model indicates that increasing the beginner conversion rate by 2 percent a year (to 17 percent) maintains current skier visit levels. The model predicts that a 6 percent annual increase in people trying the sport, combined with a 1 percent increase in the beginner conversion rate, will result in sustained growth producing 59.8 million skier visits by year 2010.

COLORADO OVERVIEW

The Colorado ski industry, like the national ski industry, may be characterized as mature. The average age of ski areas in the state is 43 years, slightly older than the national average. The Sol Vista ski area, located on private land, and Chuchara Mountain Resort, located on the San Isabel National Forest, which both opened in 1982, are the latest ski areas to be developed in Colorado.

Growth trends

Unlike the national skier market, until four years ago Colorado skier visits exhibited sustained growth. In the 1979-80 ski season, the state experienced 7,887,181 skier visits. From that time, it experienced steady growth until the 1997-98 ski season, when a record 11,979,719 skier visits was recorded. Over the past two decades, the Colorado ski industry has enjoyed a 2 percent annual average growth rate. Following the record 1997-98 ski seasons, Colorado's skier visits declined for two seasons then rebounded to 11,527,310 skier visits in the 2000-01 ski season. The state's share of the national skier market increased from 15 percent in the 1981-82 ski season to 22.1 percent in the 1997-98 ski season and has declined each succeeding year, registering a 20.1 percent share of the national skier market in the 2000-01 ski season.

Mirroring the national trend, in the last 20 years, the number of operating ski areas in Colorado has decreased by 22 percent from 32 ski areas in the 1981-82 season to 25 operating areas in the 2000-01 season. Additionally, the permits for three potential new ski areas (Adam's Rib, Catamount, and East Fork) were terminated by the mutual consent

of the permittees and the Forest Service or as a result of a failure to pursue development in a timely manner. As a result, the number of acres of National Forest System lands in Colorado under permit to ski areas decreased by 15 percent from 85,130 acres in the 1990-91 season to 72,612 acres in the 2000-01 season. While ski areas occupy about one-half of one percent of the National Forest System lands in Colorado, they generated about 30 percent of the total recreation visits to National Forest in the state. (National Forest Visitor Use Monitoring Report, April 23, 2001)

Colorado ski areas tend to be larger in terms of the annual skier visits they generate than the ski industry average. The state's 25 operating ski areas in the 2000-01 season represent less than 5 percent of the nation's 503 ski areas but generated over 20 percent of the total skier visits. Colorado ski areas on National Forest System land also tend to be larger, in terms of both skier visits and fees generated, than the average of all ski areas operating on National Forest System lands. In the 1997-98 ski season, Colorado's 24 operating ski areas on National Forest System lands represented about 20 percent of all ski areas operating on National Forest System lands. However, these ski areas generated about 60 percent of the total skier visits and over 36 percent of the total land use fees.

Destination visitors

Colorado has a higher proportion of destination or out-of-state skiers than the national average. However, the percentage of Colorado skier visits attributable to out-of-state or destination visitors has been declining. In the 1993-94 season, 65 percent of the state's visits were attributed to out-of-state skiers, while in the 2000-01 season the percentage of out-of-state visitors had decreased to 60 percent of total skier visits.

Seven percent of Colorado's skier visits in the 2000-01 season were attributable to foreign skiers. This represents a continuation of a declining trend. International visits made up 8.9 percent of Colorado skier visits in the 1996-97 season, 8 percent in the 1997-98 season and 7.8 percent in the 1998-99 season. (Colorado Ski Country USA 1998/99 Season Review, May 1999, RRC Associates and Nolan Rosall's presentation to the 2001 Colorado Ski Country USA Annual Convention)

Snowboarders

On a percentage basis, snowboarders accounted for fewer skier visits in Colorado than national average. In the 1998-99 season, snowboarders accounted for 17 percent of Colorado skier visits and 22 percent of national skier visits.

Buddy Passes

The 1998-99 ski season saw the introduction of the heavily discounted season passes, or "Buddy Passes," in Colorado. In that year, smaller Front Range ski areas that did not offer such passes experienced a 8.4 percent decline in visits from Front Range skiers, and destination ski areas that did not offer such passes experienced a 6 percent decline in visits from Front Range skiers. In contrast, Front Range destination ski areas that did offer such passes experienced an increase of about 10 percent in total Front Range skier visits. (Colorado Ski Country USA 1998/99 Season Review, May 1999, RRC Associates)

Ownership

The trend of consolidated ownership of ski areas is more pronounced in Colorado than in the national ski industry. Firms controlling more than one ski area own 56 percent of Colorado's 25 ski areas, as compared to 14 percent of all ski areas nationally and 24 percent of all ski areas on the National Forest system lands.

The trend of ski areas being owned by publicly traded firms is also more pronounced in Colorado than in the ski industry as a whole. Twenty percent of Colorado's ski areas are

owned by publicly traded corporations, as compared to 9 percent of all ski areas on National Forest System lands.

Several of the trends discussed earlier have a direct bearing on the future growth potential of the Colorado ski industry. As discussed earlier, national demographic trends, the demographic profile of the skier market, and climate change are projected to depress future national skier visits absent successful market interventions. Additionally, Colorado has been losing national market share in recent years. This has been most pronounced in the decline in the percentage of out-of-state and international visitors to the state's ski areas. The Colorado industry has been able to maintain roughly level skier visits in recent years by attracting more in-state skiers. Front Range destination ski areas that have offered heavily discounted season passes have experienced most of these additional in-state-skier visits.

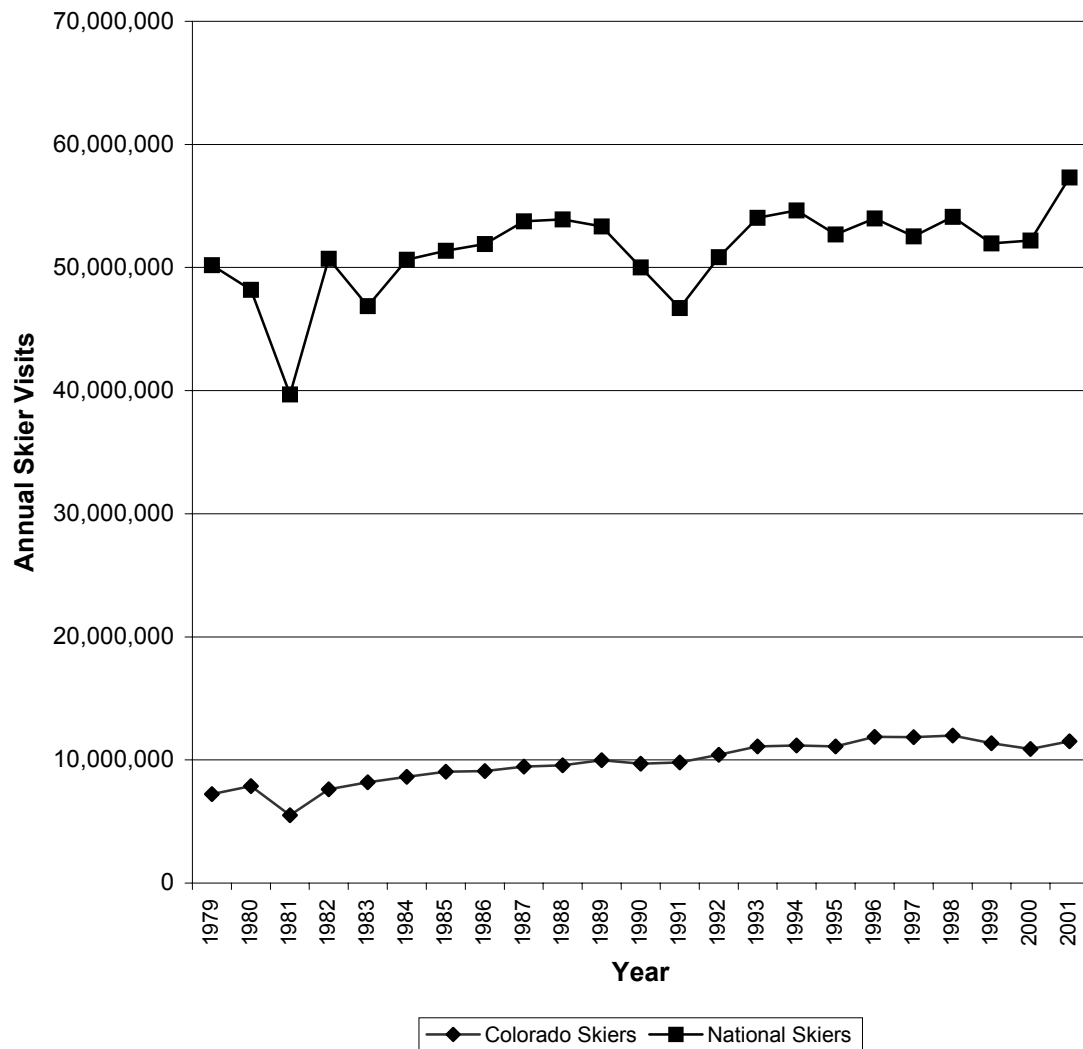
On the positive side in terms of skier numbers, Colorado is the third fastest growing state in the nation. The state's population is projected to increase 800,000 over the next ten years. In the 2000-2001 ski season, in-state skiers were responsible for 40 percent of Colorado's 11,527,310 skier visits, or about 4,600,000 skier visits. With a population of 4,300,000, this translates to a participation rate of about 1.07 skier visits per state resident. Looking into the future, it appears reasonable to assume that Colorado's projected increase in population of 800,000 in the next ten years will translate into an additional 855,814 skier visits.

**Future growth
projections**

Given the facts that the Colorado ski industry has historically outperformed the industry as a whole, and that these areas tend to be larger with more resources than average, it appears reasonable to assume that these ski areas will be able to implement successful market interventions and maintain current number of out-of-state skier visits. In short, we project that all of the growth in Colorado's skier visits will result from the state's population increase which will result in an additional 855,814 skier visits over the 10 ten years for an average annual growth rate of 0.25 percent.

Figure 40 shows how Colorado skiing is increasing relative to the nation as a whole.

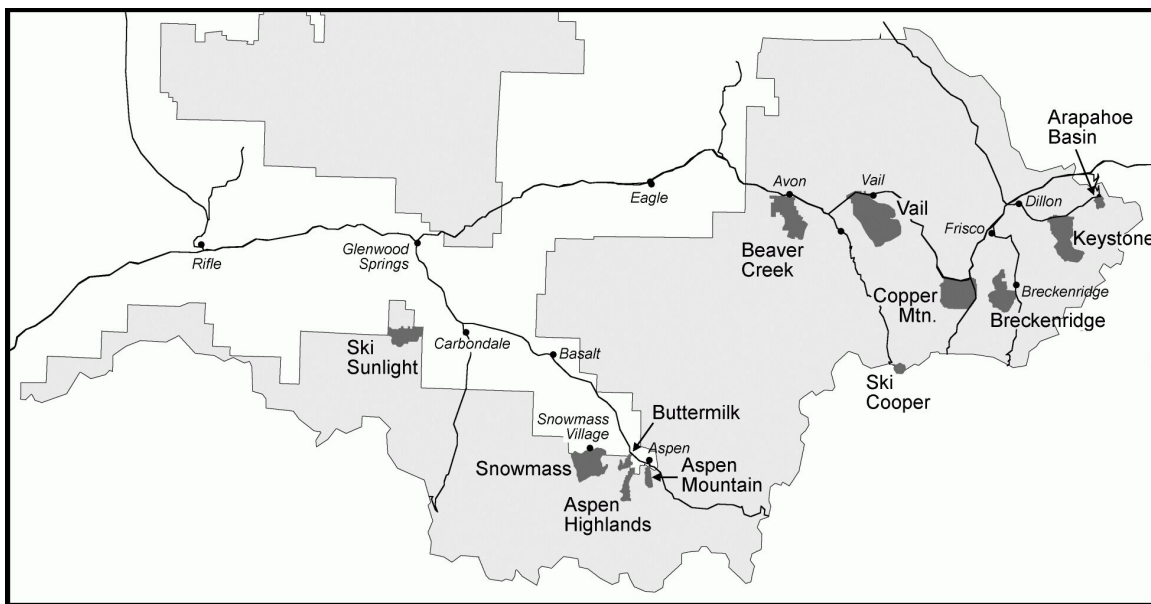
Figure 40
Colorado and national skier visits, 1980-2001



WHITE RIVER NATIONAL FOREST

There are twelve ski areas on the White River National Forest. Existing resorts include Keystone, Copper Mountain, Breckenridge, and Arapahoe Basin in Summit County; Vail, Beaver Creek, and Ski Cooper in Eagle County; Aspen Mountain, Aspen Highlands, Buttermilk, and Snowmass in Pitkin County; and Ski Sunlight in Garfield County. Ski Cooper is partially located on the White River National Forest but administered by the Pike-San Isabel National Forest.

Figure 41
Location of ski areas on the White River National Forest



HISTORICAL SUMMARY

In 1960 there were four ski areas on the White River National Forest. In combination, they sold 200,000 ski tickets and provided 100,000 recreation visitor days (RVDs). From 1960 through 1980, growth rates in skier visits on the forest averaged about 17 percent annually. By 1980 there were twelve ski areas and 4.8 million skier visits. In 1984 the combined daily capacity was 69,182 skiers per day. The daily capacity of all of the sites identified as suitable for skiing in the 1984 Forest Plan was estimated at 191,754 skiers per day. In 1990 an amendment to the forest plan projected that annual skier visits would increase about 4 percent annually until 2000 and skier visits were predicted to reach 15.4 million by 2030. By 2001 the White River National Forest had recorded over 7.6 million skier visits. The combined daily capacity of the twelve ski areas is now about 95,169 skiers per day. The 7.6 million annual skier visits (3.8 million RVDs) is 41 percent of the total number of recreation visitor days on the White River National Forest. Skier use on the White River National Forest annually generates more than \$6 million in fees to the United States Treasury.

Summit County

Ski areas include Arapahoe Basin, Keystone, Breckenridge, Breckenridge Nordic Center, and Copper Mountain. Summit County receives over 50 percent of the skier visits on the White River National Forest. The county had strong growth in skier visits the last fifteen years. The number of skier visits increased from 2.7 million in 1985 to 3.8 million in 2001, an increase of over 1 million skiers or 40 percent during this planning period. Proximity to Front Range cities and Denver International Airport are strong factors influencing growth. The majority of future growth in skier visits on the White River National Forest is likely to occur in Summit County. Population growth in Colorado is expected to continue to fuel an increase in skier visits in Summit County in the next

decade. Some good potential ski terrain exists on adjacent National Forest System lands for expansion of each of the four ski areas. On peak days, the ski areas are likely to exceed their planned capacities. Copper Mountain, Keystone, and Breckenridge have either begun major base development projects or have current plans to develop their base areas to increase bed base on private land. The special use permit issued to Breckenridge Nordic Center is identical to the permits issued to the other four ski areas in Summit County. Each of the five special use permits issued to ski areas in Summit County authorized under the Ski Area Permit Act of 1986 allows the permit holder to provide developed facilities for alpine and Nordic skiing.

Eagle County

Ski areas include Vail, Beaver Creek, and Ski Cooper. Eagle County hosts about 30 percent of the total skier visits on the White River National Forest. Vail and Beaver Creek showed steady growth over the last fifteen years. Vail grew from 1.2 million skiers in 1985 to 1.6 million in 2001. Beaver Creek increased from 332,198 skiers in 1985 to 676,000 skiers in 2001. The number of skier visits increased 45 percent in the last 15 years. Existing access portals to Vail and Beaver are at or near capacity. Construction of a new gondola from Avon to Beaver Creek Village may improve public access to the mountain and may provide a public attraction for winter and summer visitors.

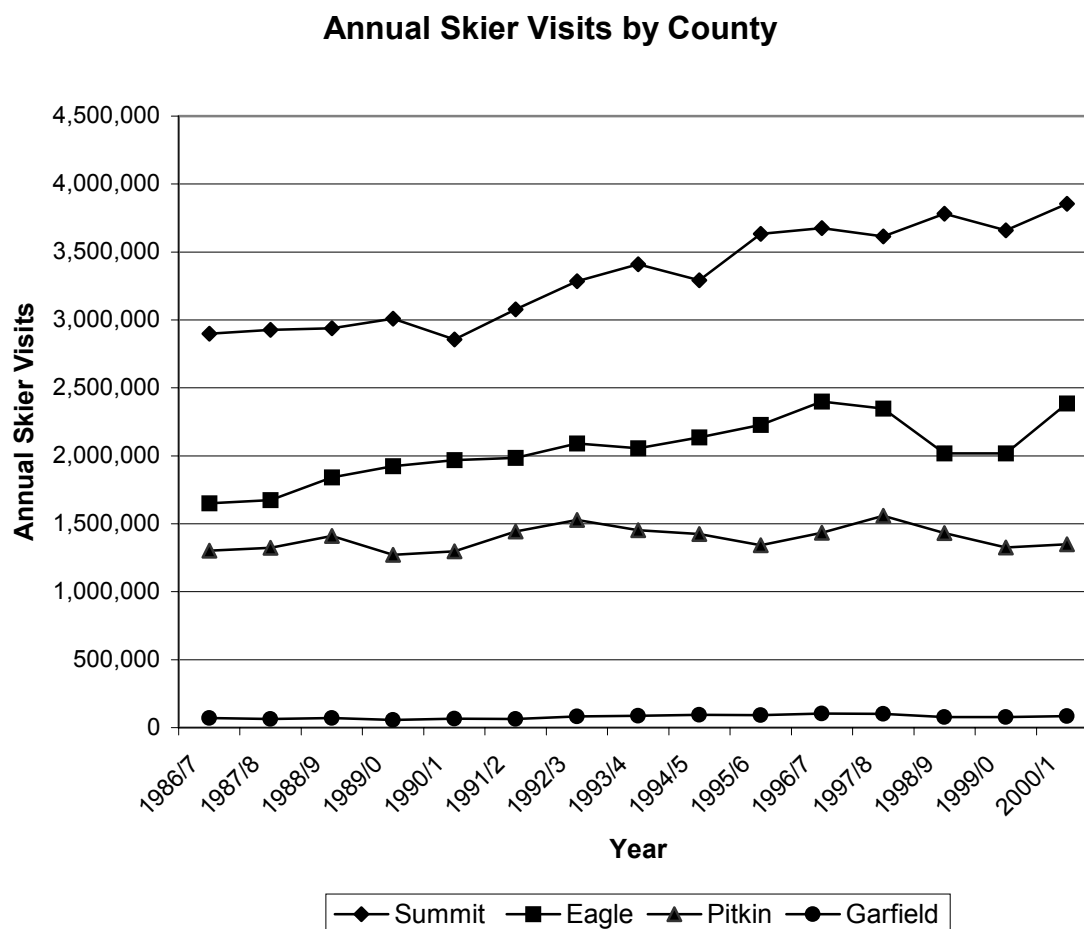
Pitkin County

The four ski areas in Pitkin County, Aspen Mountain, Aspen Highlands, Buttermilk, and Snowmass, receive about 1.3 million skier visits annually or 18 percent of the total for the White River National Forest. This level of use has been relatively constant since 1985. Mountain capacities and skier use are also expected to continue to remain flat in Pitkin County during the next planning period as a result of county and city restrictions on growth. Some increase in the bed base is expected at Snowmass and Aspen Highlands in the future as the resort villages mature.

Garfield County

Total skier visitation for Garfield County is about 1 percent of the forest total. Sunlight demonstrated an increase in skier visits from 61,092 skier visits in 1985 to 84,104 skier visits in 2001, an increase of 38 percent. Sunlight has an approved master development plan that will allow the ski area to increase lift capacity within its existing ski area boundary. Private lands are also available for four-season village support facilities at the base of the mountain.

Figure 42
Skier visits by county for the last 15-year planning period



CAPACITY

In analyzing the carrying capacity of ski areas, several factors are involved. For the purposes of master planning, the Forest Service considers mountain topography and ski trail layout to estimate the carrying capacity of a given trail system. For example, conventional trails with beginner and intermediate grades can handle 10-15 skiers per acre, advanced terrain 4-6 skiers per acre, and open bowl skiing terrain may handle 2-5 skiers per acre. The trail system capacity should be in balance with chairlift carrying capacities and other on mountain facilities such as restaurants, rest areas, and warming shelters. Master planning considers the balance between base area infrastructure and on-mountain capacities. For this analysis, the capacity figures and utilization rates should be considered as a measure of the quality of the skiing experience.

Table 86
The capacities of the ski areas on the White River National Forest between 1987 and 2000

Ski Area	SAOT 1987	SAOT 2000	SAOT change
Summit County			
<i>Arapahoe Basin</i>	2,800	2,800	0
<i>Breckenridge</i>	11,166	13,500	2,334
<i>Keystone</i>	10,400	12,700	2,300
<i>Copper Mountain</i>	10,000	11,340	1,340
Total	34,366	40,340	5,974
Eagle County			
<i>Vail</i>	14,750	19,900	5,150
<i>Beaver Creek</i>	5,400	10,069	4,669
<i>Ski Cooper</i>	1,400	1,400	0
Total	21,550	31,369	9,819
Pitkin County			
<i>Aspen Mountain</i>	4,300	4,300	0
<i>Snowmass</i>	9,000	11,500	2,500
<i>Buttermilk</i>	2,760	2,760	0
<i>Aspen Highlands</i>	3,000	3,500	500
Total	19,060	22,060	3,000
Garfield County			
<i>Ski Sunlight</i>	1,400	1,400	0
Total	1,400	1,400	0
White River National Forest total	76,376	95,169	18,793

The number of acres identified as suitable for skiing provides an indication of the daily skiing capacity for each ski area. The capacity of roads, mass transportation systems, aerial trams, and the number of parking spaces also have potential to limit overall ski area capacities. The daily skiing capacity figure provides a target level for balancing the capacities of all resort facilities on public and private lands, including parking, restaurants, restrooms, utilities, lodging, and guest services. In order to operate efficiently, ski areas and resort communities need to work together to balance the capacities of all facilities throughout the entire integrated resort regardless of land ownership. Daily skiing capacity is sometimes referred to as the number of skiers-at-one-time (SAOT). The combined daily skiing capacity of ski areas administered by the White River National Forest increased from 76,376 SAOT in 1987 to 95,169 SAOT in 2000. The majority of the increase occurred in Eagle County where 9,819 skiers per day were added at Vail and Beaver Creek ski areas. Breckenridge, Keystone, Copper Mountain and Snowmass also added capacity.

SKIABLE ACRES

Skiable acres are lands open and available for skiing that include open meadows, alpine areas above timberline, and cleared openings in forested areas. A portion of each ski area is typically not skiable due to physical constraints, such as geologic stability, cliffs, or poor snow conditions. Water, vegetation, or wildlife concerns may also limit use in specific locations. Physical constraints to development vary depending on elevation, aspect, slope, vegetation cover, and other site-specific considerations. For these reasons, the percentage of skiable acres within each individual ski area boundary varies. The

percentage of skiable acres is the relationship between the number of acres open and available for skiing and the total number of acres allocated for skiing. Suitability is determined based on a variety of factors described in the master development plan and accompanying NEPA analysis.

Between 1987 and 2000, the number of skiable acres on the White River National Forest increased from 9,336 acres to 19,427 acres. Some of the increase in skiable terrain resulted from widening existing ski trails or thinning forested interstices between existing ski trails. In other locations, new ski lifts provided better skier access to areas that were previously difficult for skiers to reach. A large number of skiable acres were added when China Bowl and Blue Sky Basin were opened for skiing at Vail, Cirque Basin and Burnt Mountain were opened at Snowmass, Highlands Bowl was opened at Aspen Highlands, and the Outback opened at Keystone.

Table 87
Percentage of ski areas that are skiable

Ski Area	Total Acres 1987	Total Acres 2000	Skiable Acres 1987	Skiable Acres 2000	Skiable % 2000
Summit County					
<i>Keystone</i>	5,250	5,571	700	1,861	31.2
<i>Copper Mountain</i>	7,113	7,343	951	2,433	31.6
<i>Breckenridge</i>	2,947	3,156	1,480	2,043	64.0
<i>Arapahoe Basin</i>	1,220	825	490	490	59.3
<i>Breck Nordic</i>	0	1,535	0	0	0
Total	16,530	16,895	3,481	6,827	45.7
Eagle County					
<i>Vail</i>	12,510	12,590	1,890	5,289	42.0
<i>Beaver Creek</i>	2,720	2,695	800	1,625	37.8
<i>Ski Cooper</i>	920	468	400	400	43.5
<i>Adam's Rib</i>	2,840	0	0	0	0
Total	18,990	15,753	2,690	7,314	46.4
Pitkin County					
<i>Aspen Highlands</i>	3,689	1,561	425	714	45.7
<i>Aspen Mountain</i>	1,050	233	620	675	64.3
<i>Buttermilk</i>	689	691	410	420	60.8
<i>Snowmass</i>	5,552	4,530	1,400	3,010	66.4
Total	10,980	7,832	2,855	4,819	62.5
Garfield County					
<i>Ski Sunlight</i>	2,001	2,081	310	467	22.4
Total	2,001	2,081	310	467	22.4
White River National Forest total	48,501	41,744	9,476	19,427	46.3

The area of all ski areas that is skiable increased from 20 percent to 46 percent in the last 15 years. Some ski areas are now at or near full development based on the lack of additional terrain that can be developed for skiing and snowboarding. Forty-six percent of the 41,744 acres administered by the White River National Forest within existing ski area boundaries, or 19,427 acres, is currently skiable. The total acres column applies to National Forest System lands, except for Aspen Mountain in 1987, which is shown as gross acres. Most ski areas on the White River National Forest are a mixture of public and private lands with the majority of ski trails on National Forest System lands.

The Forest Service and ski area operators determine optimum capacities and use levels for each resort after careful consideration of a variety of site conditions, resource constraints, and customer preferences. Primary considerations include the need to balance the capacity of the skiing terrain and other infrastructure components with the preferences of specific user groups. This is determined based on site-specific analysis. Several of the ski areas on the White River National Forest are approaching build-out of their permit boundaries and now have limited potential for future development.

SKIER DENSITY

Colorado has remained competitive at the national and international levels based on the quality of the skiing experience most ski areas are able to provide. The number of skiers per acre is a quantitative factor that can be used to measure skiing quality. The number of skiers per acre is a figure used for estimating overall crowding on a ski area.

The number of skiers per acre is calculated by dividing the daily skier capacity by the number of skiable acres. The number of skiers per acre per year is calculated by dividing the number of annual skier visits by the number of skiable acres. The number of skiers per acre per day is calculated by dividing the number of annual skier visits by days open and then by skiable acres for each resort. Keystone and Breckenridge have the highest skier densities on both a daily capacity basis as well as on an annual basis. Crowding during peak periods is most likely to be evident at these ski areas. At an average skier density of 565 skiers per acre per year, Summit County ski areas are well above the forest average of 395 skiers per acre per year. Ski Cooper, Ski Sunlight, Snowmass, and Aspen Highlands have the lowest average daily skier densities and from a crowding standpoint, provide a higher quality skiing experience.

Table 88
Skiers per acre

Ski Area	SAOT	Skiable Acres	Skiers Per Acre Daily Capacity	Ski Tickets 2000-2001	Skiers Per Acre Per Year	Days open	Skiers Per Acre per day actual '00-'01
Summit County							
Breckenridge	13,500	2,043	6.61	1,403,000	687	180	3.81
Keystone	12,700	1,861	6.82	1,216,198	653	181	3.61
Copper Mountain	11,340	2,433	4.66	992,888	408	171	2.38
Arapahoe Basin	2,800	490	5.71	244,000	498	200	2.48
Total	40,340	6,827	5.91	3,856,253	565		3.07
Eagle County							
Vail	19,900	5,289	3.76	1,645,902	311	158	1.97
Beaver Creek	10,069	1,625	6.19	676,528	416	151	2.75
Ski Cooper	1,400	400	3.50	65,000	163	132	1.23
Total	31,369	7,314	4.29	2,387,430	326		1.98
Pitkin County							
Snowmass	11,500	3,010	3.82	740,241	246	157	1.57
Aspen Mountain	4,300	675	6.37	319,343	473	157	3.01
Aspen Highlands	3,500	714	4.90	140,640	197	108	1.82
Buttermilk	2,760	420	6.57	148,826	354	108	3.28
Total	22,060	4,819	4.58	1,349,050	280		2.42
Garfield County							
Ski Sunlight	1,400	467	3.00	84,104	180	130	1.38
Total	1,400	467	3.00	84,104	180	130	1.38
White River National Forest Total	95,169	19,427	4.90	7,676,472	395		2.44

ANNUAL CAPACITY

Annual capacity is the number of skiers a resort can accommodate in one season. The elements of annual capacity are daily capacity and the number of days the ski area is open for skiing and snowboarding. Annual capacity is not an abrupt or exact number that cannot be exceeded and beyond which a ski area cannot succeed. The closer a ski area comes to achieving capacity, the more evident crowding becomes. Intuitively, as crowding increases the more likely it is a portion of users will decide not to participate in skiing.

Increasing the number of days in the operating season increases the amount of available capacity, but the number of skier visits each area receives is primarily a factor of weather and snow conditions, competing seasonal opportunities, and individual preferences. In an average year, the majority of ski areas operate at their highest efficiency levels during the core ski season between mid-December and mid-March. The number of days in the operating season selected by each ski area operator is primarily based on snowfall and availability of potential skiers. Theoretically, snowmaking allows ski area operators to lengthen the number of days in their operating season, but in reality the number of days in most operating seasons is dictated by elevation and natural snowfall. Over the last 15 years, the number of days in the combined operating seasons of the four resorts in Pitkin County actually decreased, while the resorts in Summit County were slightly increased.

ANNUAL UTILIZATION

No method of calculating annual utilization is universally accepted by all of the resorts administered by the White River National Forest, but for uniformity and consistency the same method was applied to all of the ski areas. Annual utilization is used by the White River National Forest for comparison purposes, but should not be perceived as applying equally to all ski areas. The 7.6 million annual skier visits the White River National Forest received in 2001 represents an annual utilization level of about 50 percent.

Table 89
Annual use and capacity in 2001

Ski Area	Daily SAOT	Days open	Annual Capacity	Skier Visits 2000-01	Annual Utilization
Summit County					
Breckenridge	13,500	180	2,430,000	1,403,000	58
Keystone	12,700	181	2,298,700	1,216,198	53
Copper Mountain	11,340	171	1,939,140	992,888	51
Arapahoe Basin	2,800	200	560,000	244,000	44
Total	40,340		7,227,840	3,856,253	53
Eagle County					
Vail	19,900	158	3,124,300	1,645,902	53
Beaver Creek	10,069	151	1,520,419	676,528	44
Ski Cooper	1,400	132	184,800	65,000	35
Total	31,369		4,829,519	2,387,430	49
Pitkin County					
Snowmass	11,500	157	1,805,500	740,241	41
Aspen Mountain	4,300	157	675,100	319,343	47
Aspen Highlands	3,500	108	378,000	140,640	37
Buttermilk	2,760	108	298,080	148,826	50
Total	22,060		3,156,680	1,349,050	43
Garfield County					
Ski Sunlight	1,400	130	182,000	84,104	46
Total	1,400	130	182,000	84,104	46
White River National Forest total	95,169	162	15,396,039	7,676,472	50%

Note: Annual capacity is calculated by multiplying the planned daily capacity (skiers-at-one-time) by the number of days open during the winter operating season. Annual utilization is calculated by dividing the number of annual skier visits by the annual capacity.

Annual utilization rates provide an indication of the overall financial health for the skiing portion of a resort's overall investment. Ski areas with high annual utilization rates are more likely to have lower operating expenses per skier. From a planning standpoint, ski areas with higher annual utilization rates are more likely to experience crowding during peak periods. Ski areas with the highest annual utilization rates are less able to accommodate all of the potential skiers and snowboarders wanting to use these areas.

Breckenridge, Keystone, Copper Mountain, and Vail have high annual utilization. Ski Cooper and Aspen Highlands have the lowest annual utilization.

The percent of destination skiers to day skiers affects annual utilization. Destination skiers travel longer distances and are more likely to ski on weekdays. Day skiers typically ski closer to home and are more likely to participate in the sport on weekends. Crowding on a daily basis is an indicator of high annual utilization. The higher the annual utilization rate, the more likely it is a ski area will exceed its daily planned carrying capacity on a higher number of days. It is assumed that ski areas with high annual utilization rates will suffer a loss of market share due to crowding.

Table 90
Summary of changes between 1987 and 2000

Category	1987	2000	Explanation
<i>Ski Area Acres</i>	48,211	41,961	Ski area boundaries were reduced 15%. Aspen Highlands, Snowmass, Adam's Rib and Arapahoe Basin had reductions.
<i>Skiable Acres</i>	9,546	19,427	Skiable acres doubled. Trail widening was a factor in the increase forest-wide. Highlands Bowl, China Bowl, and Blue Sky Basin provided major increases.
<i>% Skiable</i>	20%	46%	The % of non-forested lands increased 26%. Opportunities to create additional skiable terrain are limited at some areas.
<i>Daily Skier Capacity</i>	74,976	95,169	Daily capacity increased 27%. Technology improvements lead to increased chairlift speeds and overall uphill capacity.
<i>Annual Skier Capacity</i>	7,017,754	9,237,623	Annual capacity increased 34%. Capacities of some ski areas like Vail are constrained by infrastructure and parking limitations.
<i>Annual Skier Visits</i>	5,719,980	7,674,945	Skier visits increased 34%. Future increases in skier visits will parallel changes in the Colorado population.

The number of acres within ski area boundaries has reduced by 15 percent from the 1984 Forest Plan. This is primarily due to reductions in the number of allocated acres at Aspen Highlands, Snowmass, Adam's Rib, and Arapahoe Basin. The number of skiable acres doubled, primarily due to the additions of China Bowl and Blue Sky Basin at Vail and Highlands Bowl at Aspen Highlands. The percent of skiable terrain within ski area boundaries increase from 20 to 46 percent. Some White River ski areas have very few remaining acres that can be made available for skiing due to physical and environmental constraints. Daily skier capacity was increased at most White River National Forest ski areas in the last 15 years for a combined increase of 27 percent. Annual skier capacity was increased 34 percent, primarily as the result of increased chairlift capacity. The number of annual skier visits also increased 34 percent. Over the last twenty-five years,

the relationship between use and capacity at most ski areas remained relatively constant. Most ski areas provided new capacity in a timely manner based on anticipated growth.

OTHER WINTER RECREATION

Some ski areas provide opportunities for ice-skating, ski biking, bobsledding, and tubing as part of the expanded mountain recreation experience. Other ski areas provide groomed cross-country, snowshoe, or snowmobile trails. Others use snowcats to provide public access into remote areas for skiing. Several ski areas provide night-skiing or other evening activities. Many ski areas provide guided and self-guided nature trails and organized snowshoe treks or guided skiing excursions. Nature discovery centers and interpretive signs are available at some areas to enhance visitor experiences. Others have organized naturalist programs that provide information about natural resources. At some areas, Forest Service snow rangers provide guided informational tours.

SUMMER RECREATION

During the last 15 years, recreation use grew dramatically during the summer season at White River National Forest ski areas. Many ski areas now offer summer recreation programs that provide a variety of outdoor recreation experiences. Use of existing skiing facilities to provide natural resource-based outdoor recreation opportunities during the summer season is encouraged by the Forest Service. Gondola and chairlift rides, hiking, horseback riding, and mountain biking are offered at most ski areas. Interpretive programs and visitor information services that provide information about nature are popular. Many of the recreation activities provided by the ski areas in the summer take place on other National Forest System lands or private lands adjacent to the ski areas. A description of planned summer uses is included in annual operating plans.

SKIER VISIT FORECAST

As discussed in the National Overview section, skier visit forecasting is generally based on ski industry and demographic trends. Ski areas on the White River National Forest are actively pursuing new marketing strategies as outlined in the NSAA Model for Growth. Because the White River National Forest resorts are located at high elevation, and have significant infrastructure investments in snowmaking, high speed chairlifts, transportation, bed base, access to capital, and innovative marketing strategies, it is assumed that they will be successful at implementing the NSAA Model for Growth.

Colorado residents accounted for 40 percent of the state's 11.5 million skier visits in the 2001 season. This was primarily in the day skier market segment and amounts to 4.6 million skier visits. Colorado's population in 2001 was 4.3 million, resulting in a skier visitation rate of 1.06 visits per person in the state's population. By 2010, Colorado's population is projected to be 5,095,347, which will generate 5,415,647 skier visits or an additional 804,723 skier visits above the 2001 level. The White River National Forest resorts are expected to capture 64 percent of these additional skier visits, based on their historic 64 percent of the Colorado market resulting in 515,022 additional skier visits in 2010.

Pitkin and Garfield counties are expected to capture the additional skier visits generated by population growth in these counties. Pitkin County's projected population increase of 3,774 should generate an additional 4,075 skier visits by 2010 and Garfield County's

projected population increase of 13,674 should generate an increase in skier visits of 14,725.

Summit and Eagle counties are likely to capture the remaining additional skier visits because of their advantageous access to the increasing Front Range population. Their respective market share is expected to be proportionate to historic market share, with Summit County gaining 65 percent of the remaining additional skier visits (320,064 skier visits) and Eagle County gaining 35 percent skier visits (176,159 skier visits).

Table 91
Skier Visits Projected for 2010

	Average Annual Skier Visits	Increased Annual Skier Visits	Projected Annual Skier Visits
	1996-2001	2010	2010
<i>Summit</i>	3,717,159	320,064	4,037,223
<i>Eagle</i>	2,233,861	176,159	2,410,020
<i>Pitkin</i>	1,419,881	4,075	1,423,956
<i>Garfield</i>	88,891	14,725	103,616
White River National Forest	7,459,792	515,023	7,974,815

FUTURE EXPANSION

Each potential expansion area and development site included in the forest plan alternatives is listed by name and included in at least one of the following categories:

- National Forest System land with good physical potential for skiing previously assigned a 1B (8.25) prescription in the 1984 Forest Plan that remains undeveloped. The majority of sites listed in the alternatives are in this category.
- National Forest System land adjacent to existing ski areas where avalanche danger is high and in which an increasing amount of use from out-of-bounds skiers and snowboarders occurs. Management of these areas would reduce life-threatening hazards and improve search and rescue efforts.
- National Forest System lands with potential to serve as aerial transportation corridors that could help reduce ground transport miles and travel times. Aerial trams operated directly by ski areas to interconnect or expand them would be assigned the 8.25 management prescription.
- National Forest System lands adjacent to existing roads that were originally not inventoried or planned for skiing by the forest but now have a significant concentration of dispersed skiers and snowboarders. Some of these sites, which currently receive intensive use, may benefit from management practices to improve user experiences, protect natural resources, reduce avalanche and other public risks, and assign responsibility for search and rescue. In most cases, this would result in a conversion of these lands from dispersed sites to developed sites within ski area boundaries.

EAGLE COUNTY

Adam Mountain

Adam's Rib is located 15 miles south of Eagle at the confluence of East and West Brush Creeks. In 1982, the Forest Supervisor made the decision to allow development of this site as a ski area for 9,000 skiers per day. A special use permit was issued to HBE Corporation in 1986 to develop Adam's Rib as a major destination ski area, but the special use permit was voluntarily terminated in 1997. The current management prescription is 1B, downhill skiing.

Vail

East Vail Chutes This area is located immediately east of Vail Ski Area above the eastbound lanes of Interstate 70 and the East Vail residential community. In recent years, the Forest Service has recognized the area as one with a high level of dispersed winter recreation use by backcountry skiers and snowboarders who access it from Vail ski area. An access point was established to allow access for dispersed skiing outside the ski area boundary. Potential avalanche and safety risks to the public are high and could be reduced if this area was developed as part of Vail Ski Area. Four fatalities occurred in East Vail Chutes between 1992 and 2001. The current management prescription is 7E, wood fiber production.

South Game Creek This area is located west of Game Creek Bowl. South Game Creek is popular with backcountry skiers. Use estimates between 1995-2001, average between 5,000-10,000 skier trips per year. One fatality occurred in the North Game Creek drainage and there have been several search and rescue missions conducted in the South Game Creek drainage in recent years. Potential avalanche and safety risks to the public could be reduced if this area was developed as part of Vail Ski Area. The South Game Creek drainage also has potential as an aerial transportation corridor linking Minturn with Vail Mountain in the vicinity of the vacant railroad property. An access point has been established in Game Creek Bowl to allow access for dispersed skiing outside the existing special use boundary. The current management prescription for this area is 3B, primitive recreation in an unroaded setting.

Beaver Creek

Grouse Creeks (Meadow Mountain) is located between Minturn and Beaver Creek. This site was recognized as a potential new ski area prior to the opening of Vail in 1962. The White River National Forest inventoried this site in 1968 and 1972. The long intermediate slopes were considered to be ideally suited for skiing. Minturn has potential to be connected with Beaver Creek, Bachelor Gulch, and Arrowhead as another ski village if this site were used to link Minturn with the other existing villages via aerial tram. The current management prescription is 4B, habitat for management indicator species.

McCoy Park is operated as a Nordic ski area with groomed ski trails, a roped and signed boundary, a warming hut, telephone, roads, ski patrol services, skiing instruction, and signing. McCoy Park is physically and operationally integrated with the overall Beaver Creek, Bachelor Gulch, and Arrowhead resort and skiing complex. Beaver Creek ski area provides all services. McCoy Park is a large open bowl with ideal beginner alpine skiing

terrain. Much of the timber in the upper basin was clear-cut a hundred years ago. McCoy Park is accessible from the upper ski lift terminals of Larkspur Chairlift #11, Strawberry Express Chairlift #12, and Bachelor Gulch Chairlift #16.

Mud Springs is located west of McCoy Park above Arrowhead Village. This site was allocated for skiing in 1984. Mud Springs has potential to provide good skiing on additional north-facing skiing terrain similar to the Arrowhead and Bachelor Gulch portion of Beaver Creek ski area. Development of Mud Springs for alpine skiing would reduce skier densities on the existing ski trails and provide incentives for skiers originating from Arrowhead and Bachelor Gulch to remain on the west side of the mountain. Development of Mud Springs as part of Beaver Creek ski area may result in fewer daily skiing descents into Beaver Creek village and, consequently, less congestion in the main village. From a physical standpoint Mud Springs provides a logical skiing connection between Arrowhead Village and upper McCoy Park. The current management prescription is 1B, downhill skiing.

Upper Stone Creek is immediately east of Beaver Creek Ski Area and is accessed from existing lifts and trails. There is no designated access point into Upper Stone Creek from the ski area. Skiers must leave the existing ski area boundary to access this area and then return back into the ski area boundary at a lower elevation. Stone Creek is avalanche prone. Safety risks to the public could be reduced if this area was included within the ski area boundary and developed for skiing.

Ski Cooper

Chicago Ridge This 1,500-acre ridge is located north of Ski Cooper in Eagle County on the White River National Forest. Ski Cooper provides snowcat-assisted powder skiing. Nearly all of the days in the operating season are filled to capacity with an advanced reservation system. Portions of Chicago Ridge are physically suitable for lift-served skiing as a logical expansion of the existing ski area. The current management prescription is 1B, downhill skiing.

GARFIELD COUNTY

Rifle

Rifle Ski Area is located two miles southeast of Battlement Mesa. In 1983 a site-specific Environmental Impact Statement was completed and Forest Service issued a decision to allow Rifle to be developed as a destination ski area for up to 9,000 skiers per day. This operator failed to meet Forest Service financing requirements for the initial phases of development. The high cost needed to develop a new ski area is a key constraint to every new ski area. The current management prescription is 1B, downhill skiing.

Sunlight

Sunlight North is located 10 miles south of Glenwood Springs above the Oak Meadows Subdivision, Delaney Ranch, and Black Diamond Mine. Skiing terrain on Sunlight North is primarily intermediate with a northeasterly aspect. Neither the City of Glenwood Springs nor Garfield County has expressed interest in retaining this site as a future expansion of Sunlight. The development potential of Sunlight North is a logical expansion of Sunlight Mountain Resort, but of secondary importance when compared to

full build-out of the existing ski area. The top of Sunlight Peak is a designated electronic site. The current management prescription is 1B, downhill skiing.

Sunlight South is a minor site in lower Freeman Creek below the summit of Compass Peak. The skiable terrain is primarily south-facing. Snow conditions are fair-to-average due to elevation and aspect. Freeman Creek is currently accessible from Sunlight through an access point that allows dispersed skiing outside of the ski area boundary. The current management prescription is 6B, livestock grazing.

PITKIN COUNTY

Aspen Mountain

Little Annie is located south of Aspen Mountain on Richmond Hill. In 1981, the site was approved for development as a resort for 4,500 skiers per day. The permit-holder failed to obtain financing and the ski area was never developed. The skiing terrain is interspersed with mining claims of mixed ownership that would be costly to consolidate. There is good potential for skiing as evidenced by an existing snowcat touring operation and the high levels of dispersed winter use currently taking place on this site. Physically, Little Annie is a logical expansion of the Aspen Mountain ski area. The current management prescription is 1B, downhill skiing.

Redstone

Coal Basin is located west of the Town of Redstone in the Crystal Valley. Coal Basin was an industrial coal mining site for more than 100 years. Evidence of past coal mining operations is still highly visible. Many of the hillsides have high-standard roads constructed across steep slopes. Most of the roads have not been in use since mining operations ceased in 1990. Since then, considerable reclamation work has been undertaken. The Forest Service inventoried Coal Basin as a potential ski area in 1969. The mine owners and White River National Forest later conducted additional feasibility studies. In 1984 local residents supported the concept of establishing a small ski area in Coal Basin after the mine closed. Recent observations confirm that some portions of Coal Basin are suitable for skiing and snowboarding, either in the form of guided snowcat tours or lift-served skiing. Many of the upper slopes have high avalanche risk that could be partially mitigated through avoidance or by an area operator in conjunction with permitted recreation activities. Highly variable avalanche conditions at upper elevations indicate that Coal Basin has good potential as an avalanche-training site. Physical attributes of Coal Basin indicate there is also good potential for a managed winter skiing operation. Some existing facilities, structures, roads, and parking areas on private land could be used to enhance a managed winter sports operation on National Forest System lands with either an alpine, Nordic, or combined emphasis. Summer recreation opportunities could also be incorporated into the operation to round out the recreation experience and help support private investment in a managed year-round recreation operation. The current management prescription is 1B, downhill skiing.

Aspen Highlands

Maroon Valley is located south of Buttermilk Ski Area. The base of Aspen Highlands could be connected with the summit of Buttermilk Ski Area if an aerial tram were constructed in Maroon Valley. Steep south-facing slopes with rocky outcrops

characterize the Maroon Valley corridor. Although it is physically possible to construct a gondola in this location, lift evacuations would be difficult due to steep rocky slopes, crossing of Maroon Creek Road, and possible interference with adjacent private property. Poor snow conditions, steep slopes, and rocky terrain features preclude opportunities for skiing in this corridor. Protection of scenery in the Maroon Valley corridor and mitigation of impacts to private property are key considerations. The current management prescription is 2B, recreation opportunities in a rural or roaded natural setting.

Buttermilk

Southwest is located above the summit of West Buttermilk. There is potential for some additional skiing at higher elevations above the existing ski area. Expansion into this location would provide some additional acres similar to the existing site. If developed, the longer lengths of the ski trails and the ability to separate beginner skiers from intermediates would enhance the skiing experience. The current management prescription is 1B, downhill skiing.

Snowmass

Owl Creek is located between Snowmass and Buttermilk ski areas. Interest was shown in the development of this site for skiing in the 1960s and 1970s as an expansion of Buttermilk and Snowmass ski areas. Skiers could move directly between the two resorts if an aerial tram and skier egress route were constructed in this location. Owl Creek currently is popular with cross-country skiers, mountain bikers, and hikers. Government Trail traverses the area and is also popular with hikers and mountain bikers. A designated ski trail from the top of Burnt Mountain to lower West Buttermilk may reduce the number of end-of-day bus riders and ground traffic on Owl Creek and Brush Creek roads. Local residents in the communities of Aspen and Snowmass have a high interest in the future uses of the Owl Creek site. The current management prescription is 1B, downhill skiing.

SUMMIT COUNTY

Arapahoe Basin

The Beavers is located on the west side of Arapahoe Basin ski area. The site was previously inside the ski area boundary. The Beavers are popular with backcountry skiers and snowboarders who access the site from Arapahoe Basin ski area. Steep north-facing chutes above treeline with numerous rock outcrops characterize the terrain. Most skiers hike or hitchhike uphill to return to their vehicles. Avalanche risk to the public is potentially high. The risk could be partially mitigated if the Beavers site was developed for skiing as part of the ski area. The current management prescription is 1B, downhill skiing.

Marjorie Bowl is located adjacent to East Wall of Arapahoe Basin ski area. There is some concern about dispersed skiers entering this area. Skiers and boarders would benefit from some avalanche control and management if this area were developed for skiing as part of the ski area. Steep chutes with numerous rock outcrops characterize the terrain. The current management prescription is 1B, downhill skiing.

Montezuma Bowl lies immediately south of Arapahoe Basin and is a logical expansion of the ski area. The site was previously inside the ski area boundary. The 800-acre bowl

has long been recognized as having excellent potential for skiing and snowboarding. High altitudes generally assure quality snow conditions throughout the majority of the ski season. This area has potential to provide a back-bowl skiing experience on the sunny side of the mountain. The site has good views of surrounding National Forest System lands. The upper portion of Montezuma Bowl is above timberline and has good characteristics for skiing. Montezuma Bowl is used on a daily basis by skiers and boarders who access the top of the mountain via existing ski lifts. Skier access is currently permissible through an access point located at the summit of Arapahoe Basin ski area. If Montezuma Bowl were included within the ski area boundary and developed for skiing, potential risks from avalanches may be reduced. A new Snake River portal to Arapahoe Basin via Montezuma Bowl may provide more convenience access between Keystone and Arapahoe Basin ski areas and reduce traffic on State Highway 6, if an aerial tram and skier egress route were constructed between Montezuma Bowl and the Snake River drainage. The current management prescription is 1B, downhill skiing.

No Name is located on the west side of Loveland Pass between Loveland and Arapahoe Basin ski areas. The No Name area currently receives the highest amount of dispersed backcountry skiing and snowboarding use on the White River National Forest. Snow conditions at this altitude are colder and drier than at lower elevations. The snow season starts earlier and last longer than at other Colorado resorts. Skiers are attracted to the open bowl skiing above timberline, which is only available at a few of Colorado's developed ski areas. Most users access the various bowls from U.S. Highway 6 and return to the summit of Loveland Pass by hitchhiking or car shuttling. Night use by skiers and snowboarders during full moon cycles is high. The backcountry skiing experience for some users terminates several miles west of Loveland Pass on Highway 6, but the majority of dispersed users remain on the east side of the ridge above the Widow Maker and Little Professor avalanche slide paths. The Colorado Department of Transportation uses artillery on a portion of this area to control avalanches that threaten highway users. Although this site is adjacent to Loveland ski area, a skiing or aerial tram connection is difficult due to inherent physical and geologic constraints. The current management prescriptions are 3A, semi-primitive non-motorized recreation in a roaded or unroaded setting, and 3B, primitive recreation in an unroaded setting.

Porcupine is located south of Loveland Basin ski area and west of the No Name drainage. The skiable terrain is primarily above timberline and is characterized by a mixture of steep pitches, rock outcrops, and flat slopes. Snow depths and conditions vary primarily by aspect due to the variable effects of wind and sun. A portion of the upper basin adjacent to Loveland ski area could be used to provide a back bowl experience for skiers. The high altitude assures cold snow conditions and an extended season of operation. Snowmobiling occurs in some portions of Porcupine in areas above treeline. The current management prescription is 3B, primitive recreation in an unroaded setting.

Keystone

Brewery and Swan Mountains are located in Swan Valley, east of Breckenridge Golf Course, and between the existing ski areas of Keystone and Breckenridge. Together, they contain about 2,500 acres. Both sites were originally inventoried as independent stand-alone ski areas. The skiing potential of these mountains has declined over the years as the nearby resorts of Keystone and Breckenridge increased in size and quality. Brewery Hill now is considered too small by most entrepreneurs to compete with other resorts in

Summit County as a stand-alone site. Some potential exists to connect these sites with Keystone, if the private real estate component was integrated with the overall resort plan. The current management prescription is 1B, downhill skiing.

Independence Mountain is located east of Keystone Ski Area. It was considered to have excellent potential for skiing by the Forest Service and U.S. Olympic Committee in the 1960s and 1970s. Independence Mountain was given serious consideration as the site of the showcase downhill event of the 1976 Winter Olympics. The north face of Independence Mountain is dissected into several bowls with open bowl skiing above treeline at the upper elevations and timbered slopes at lower elevations. Several roads, abandoned mines, utilities, and structures are readily evident at middle and lower elevations. Snow conditions on the south, east, and west-facing portions of the upper mountain peaks vary from good to poor, depending on exposure to wind and sun, while north-facing slopes are generally very good. In some locations skiing opportunities are severely constrained by steep slopes, rock outcroppings, or snow conditions. Backcountry skiers utilize portions of Independence Mountain for skiing. Special use permits have been issued in the past for guides and outfitters as well as for helicopter and snowcat skiing. Snow quality and overall skiing potential for portions of this site are excellent when compared to other inventoried sites and existing resorts. Scenic vistas from the summit are outstanding. Access points are established along the existing Keystone ski area boundary to allow access for dispersed skiing on Independence Mountain. Independence Mountain has potential to be connected by lifts with the existing ski area in several locations or directly from the Snake River. Physically, Independence Mountain has excellent skiing potential and is a logical expansion of Keystone ski area. The current management prescription is 1B, downhill skiing.

Breckenridge

Peak 8 is one of the peaks along the Tenmile Range above Breckenridge. Adjustments to the ski area boundary between Peaks 7, 8, and 9 to provide managed skiing in some of the areas already used by dispersed skiers and boarders would provide more open terrain at high elevations above treeline with powder snow and a safer experience. Snow conditions are similar to other existing locations within the existing special use boundary with similar elevations and aspects. The current management prescription is 1B, downhill skiing.

Peak 10 is adjacent to the southwest corner of Breckenridge Ski Area. Skiers willing to access this area by hiking currently utilize this area. The skiing terrain is primarily above treeline. Snow conditions are similar to other existing locations within the existing special use boundary. The current management prescription is 3B, primitive recreation in an unroaded setting.

North Barton is located north of Breckenridge Ski Area. Snow conditions are similar to other locations at the same elevations and aspects within the developed ski area. Bowl skiing at high elevations above treeline on the Tenmile Range is increasing in popularity. A designated access point allows skiers and snowboarders to reach these slopes from Breckenridge ski area. Skiing conditions at lower elevations are also similar to existing ski slopes at Breckenridge at the same elevations. Avalanche risk to the public is potentially high in some locations. The risk could be partially mitigated if the North

Barton site was developed for skiing as part of the ski area. The current management prescription is 1B, downhill skiing.

Gold Hill is located north of Breckenridge ski area. In the 1984 Forest Plan, Gold Hill was considered a logical extension of the ski area with an emphasis on combined Nordic and alpine facilities with access to the upper Ten Mile Range for alpine skiers, and Nordic access to Frisco and Breckenridge. The current management prescription is 1B, downhill skiing.

Copper Mountain

Tenmile Range separates Breckenridge and Copper Mountain ski areas. An aerial tram from Copper Mountain to the top of the Ten Mile Range could transport people directly to Breckenridge ski area, thus eliminating the 32-mile roundtrip drive between the two resorts. This connection could provide a new portal to both ski areas. Skiers could be transported between resorts via an aerial tram or ski down from the summit, if a satisfactory route were constructed. Non-skiing pedestrians, sightseeing tourists, and workers originating from Leadville may benefit from the opportunity to be transported directly between resorts. Evening use, sightseeing, and summer uses are also possible. An aerial tram in this location could significantly reduce the driving time between resorts, reduce traffic congestion in Breckenridge, and improve access to Copper Mountain from the Town of Breckenridge. There may be fewer vehicle miles driven on existing highways, with a resulting reduction in air polluting emissions from automobiles and buses if this opportunity was provided. The current management prescription is 3B, primitive recreation in an unroaded setting.

Guller Creek is located west of Copper Mountain. This area is currently skied by dispersed alpine skiers from Copper Mountain and cross-country skiers entering from a variety of directions. Forested slopes and quality snow conditions similar to existing ski trails at the same elevations and aspects at Copper Mountain characterize the terrain. The current management prescription is 1B, downhill skiing.

Searle Creek is located southwest of Copper Mountain. Sunny south-facing intermediate slopes above treeline with breath-taking views characterize the Searle area. Upper Searle Creek is accessible by private road and is a mixture of National Forest and private land. The intermediate level quality skiing experience on south-facing slopes at high elevations that could be provided in Searle Creek is currently not available on Copper Mountain or at other ski areas in Summit County. Snow conditions throughout the majority of the basin are very good but somewhat variable along the upper ridges due to the effects of wind. Distribution of skiers and snowboarders into this area may help to reduce crowding on the existing mountain. In recent years Searle Creek has been heavily used by snowmobiles, including guided tours. The current management prescriptions are 2A, semi-primitive motorized recreation, and 3A, semi-primitive non-motorized recreation in a roaded or unroaded setting.

Jacque Peak is southwest of Copper Mountain. Jacque Peak is inside the existing boundary. The upper mountain is above treeline and in some locations not skiable due to steep rocky cliffs, frequent winds, and drifting snow. Other portions of Jacque Peak that are skiable have potential to provide outstanding views and challenging descents. Distribution of skiers and snowboarders onto lower Jacque Peak may help reduce crowding on Copper Mountain's existing lifts and trails. Jacque Peak has potential to

provide a good mix of terrain ranging from steep challenging terrain at high elevations to gentler intermediate slopes at lower elevations. The current management prescriptions are 2A, semi-primitive motorized recreation, and 1B, downhill skiing.

Tucker Mountain is located on the south side of Copper Bowl. The majority of this area is inside the ski area boundary and planned for development. A snowcat provides skier access to the top of the mountain. The current management prescriptions are 2B, rural or roaded natural recreational opportunities, and 1B, downhill skiing.

Environmental consequences

GENERAL EFFECTS

Recreation use at ski areas in Colorado is predicted to increase due to increases in population at the state level. Between 1990 and 2000, Colorado had the third-fastest growth rate in the nation. Local and regional populations increased significantly within the resort counties and Denver Front Range metropolitan area. The population of Colorado is expected to continue to increase rapidly in the next decade. Summit and Eagle counties experienced higher rates of population growth and skier visits than Pitkin and Garfield counties. Competition for national and international visitors is intensifying because the total number of participants at the national level is expected to remain about the same. Older skiers from the baby-boom generation are dropping out of the sport at higher rates as they age. In the next decade, national participation rates in the sport of skiing at the national level will be greatly influenced by the gap between the number of older skiers dropping out of the market and the number of new skiers and snowboarders taking up the sport.

Transportation and access to the mountain communities is a key concern from a planning and tourism standpoint. Interstate 70 (I-70) is a vital transportation corridor linking the Denver International Airport, the Denver metropolitan area, and other Front Range population centers to the resorts. The I-70 corridor is experiencing increasing congestion. According to the Colorado Department of Transportation, “Under current conditions, travel time from C-470 to Vail is 1 hour 55 minutes. If nothing is done to relieve congestion, the same trip will take 3 hours and 5 minutes by 2020.” Growth in skier visits on the White River National Forest may eventually be limited by the capacities and convenience of Colorado’s overall transportation systems used to deliver skiers to the mountain resorts. The Forest Service is aware of this issue and is partnering with CDOT to analyze alternative ways to expand the capacity of the I-70 corridor. At the national level, ski areas in other regions that are located within reasonable distances of airports with good ground transportation systems are likely to become increasingly competitive with Colorado resorts due to lower transportation costs, reduced travel times, and greater convenience.

In locations where conflicts may exist with water or wildlife, implementation of forest plan standards and guidelines will assure protection for these resources.

Alternatives that allocate the highest number of acres to the 8.25 management prescription are expected to provide the most opportunities for outdoor recreation during the winter and summer seasons. Alternatives B, E, and F provide the most opportunity to expand recreation use. Alternatives D and I confine ski areas to their current boundaries.

Alternatives C and K allocate additional acres for skiing, primarily in Summit County where the demand for skiing is highest and the population is expected to grow rapidly.

Eagle County A range of opportunities for future development was considered in response to the need to balance terrain by skier type, reduce avalanche exposure, and accommodate expected increase in population. The population of Eagle County increased rapidly over the last ten years and is expected to continue to increase. Improvements to the Eagle County Airport improved access for national and international visitors. Minturn could become a central village in the Vail-Beaver Creek skiing complex, if linked to the ski areas with light rail and ski lifts. Parking limitations and infrastructure issues tend to limit access to the ski areas. Well-managed innovative transportation systems with adequate capacities and appropriate number of portals are important considerations for the next decade to provide access to National Forest System lands. Most potential ground-based transportation routes, including light rail, are located on private lands. The majority of potential gondola routes between the existing towns and the ski areas are located on National Forest System lands. Skiing on Chicago Ridge at Ski Cooper is popular and has potential to be developed for skiing.

Garfield County A range of opportunities to provide additional skiing was considered in response to projected population increases and prior interest in the development of several inventoried sites. Sunlight satisfies a special niche in the regional skier market but does not have the terrain needed to attract a large number of national and international visitors. Although visits to Sunlight increased in the past decade, overall skier capacity remains low and the majority of users are day skiers. Sunlight North located on the north side of the existing ski area is a large site with good physical potential. Rifle ski area was intensively studied in the 1970s.

Pitkin County A few additional opportunities for skiing on National Forest System lands were identified in the alternatives. Some of the environmental impacts from the existing ground-based transportation systems between Buttermilk, Aspen Highlands, and Snowmass have potential to be reduced if gondolas were used to transport some of the skiers between resorts. The White River National Forest allocated Coal Basin as a future ski area in 1984 to be developed after the Mid-Continent Coal Mine closed. Little Annie on Richmond Hill was approved by the Forest Service for development as a ski area in the 1984 Forest Plan.

Summit County A range of new opportunities for skiing is considered in response to expected increases in population and skier visits, and the high utilization levels the four existing ski areas are currently experiencing. Summit County attracts a large number of destination visitors from North America and foreign countries, and a large number of day skiers from Denver's expanding Front Range population. All of the existing ski areas show evidence of crowding at current use levels and would benefit from the allocation of more acres to reduce skier densities during peak periods.

The population of Summit County grew rapidly in the last 10 years at a rate of about 5 percent per year and is expected to continue to grow significantly in the future. The limited capacity of I-70 is a regional planning concern and an increasingly significant constraint to tourism in Summit County. Several locations on National Forest System lands were identified where ski lifts could be used to move people to, from, or between locations within existing resorts. Some of these locations have potential to reduce the

amount of time people spend in automobiles driving between key locations, traffic congestion, and demand for multiple parking locations. Aerial trams have potential to reduce the number of riders on public bus systems and overall traffic congestion, as well as, lowering the volume of polluting air emissions from internal combustion engines. It is assumed aerial trams on National Forest System land, as alternative people movers within the resort communities will take on increased significance in the future.

Summer use A range of alternatives was considered in response to high annual increases in summer visitations to ski areas. Current figures show higher numbers of residents and tourists spending more time during the summer season and participating in a wider range of activities. This trend is increasing the need to manage recreation use during the summer season on National Forest System lands both within and adjacent to permitted sites. Most ski areas provide limited chairlift rides, hiking, use of facilities, and other natural resource-based recreation opportunities for summer visitors.

RATIONALE FOR THE ALTERNATIVES

All alternatives

- No alternatives revoke existing special use permits already in place. All of the alternatives allow continued operation of the twelve existing ski areas. No alternatives intentionally reduce the capacity of the existing ski areas. Capacities are determined at the site-specific level.
- In all of the alternatives except D and I, ski area boundaries are adjusted to be consistent with the forest plan allocation. Areas not allocated 8.25 in the 2002 Forest Plan are removed from existing special use permit boundaries. These changes are separate administrative actions, not forest plan decisions.
- All of the alternatives only consider skiing opportunities on National Forest System lands. The Forest Service has no authority or jurisdiction on private lands. It is assumed very few opportunities for skiing exist outside national forest boundaries. Lands administered by others are outside the scope of the analysis.
- Each ski area is administered independently, regardless of ownership.

Alternative B allocates a sufficient number of acres for skiing and snowboarding to meet foreseeable demand for the next twenty-five years and beyond. Expansion of existing ski areas and allocation of some new resorts are allowed. Tourism is a priority. An ample number of opportunities to meet skier demand are provided. This alternative demonstrates a longer-term planning vision than the other alternatives by allocating enough lands to meet future demands beyond the 15-year forest plan horizon. Additional acres are allocated to address a variety of qualitative and physical considerations. Several new ski areas are allocated for development where physical conditions are good and interest has been expressed.

Alternative C addresses a variety of qualitative and physical considerations. Aerial trams could be used for moving people to, from, between and within resort communities in selected locations to abate vehicle congestion, air pollution, and resource impacts.

Alternative D emphasizes protection of wildlife and natural resources. It is consistent with existing permits and provides half the number of acres allocated in the 1984 Forest Plan.

Alternative E addresses a variety of qualitative and physical considerations. Recreation and tourism are emphasized. New ski areas are allowed in several locations where physical opportunities for skiing are good and historic interest has been shown. Aerial trams are allowed.

Alternative F allocates additional acres to meet increased demands for skiing based on increased populations, customer expectations, user safety, crowding, and meet a variety of qualitative and physical considerations. Recreation and tourism are emphasized. In addition to providing more skiing terrain, aerial trams are used to transport people to, from, between and within resort communities.

Alternatives I emphasizes management prescriptions where natural landscape conditions predominate. The number of acres available for skiing is consistent with existing permits and half the number of acres allocated in the 1984 Forest Plan.

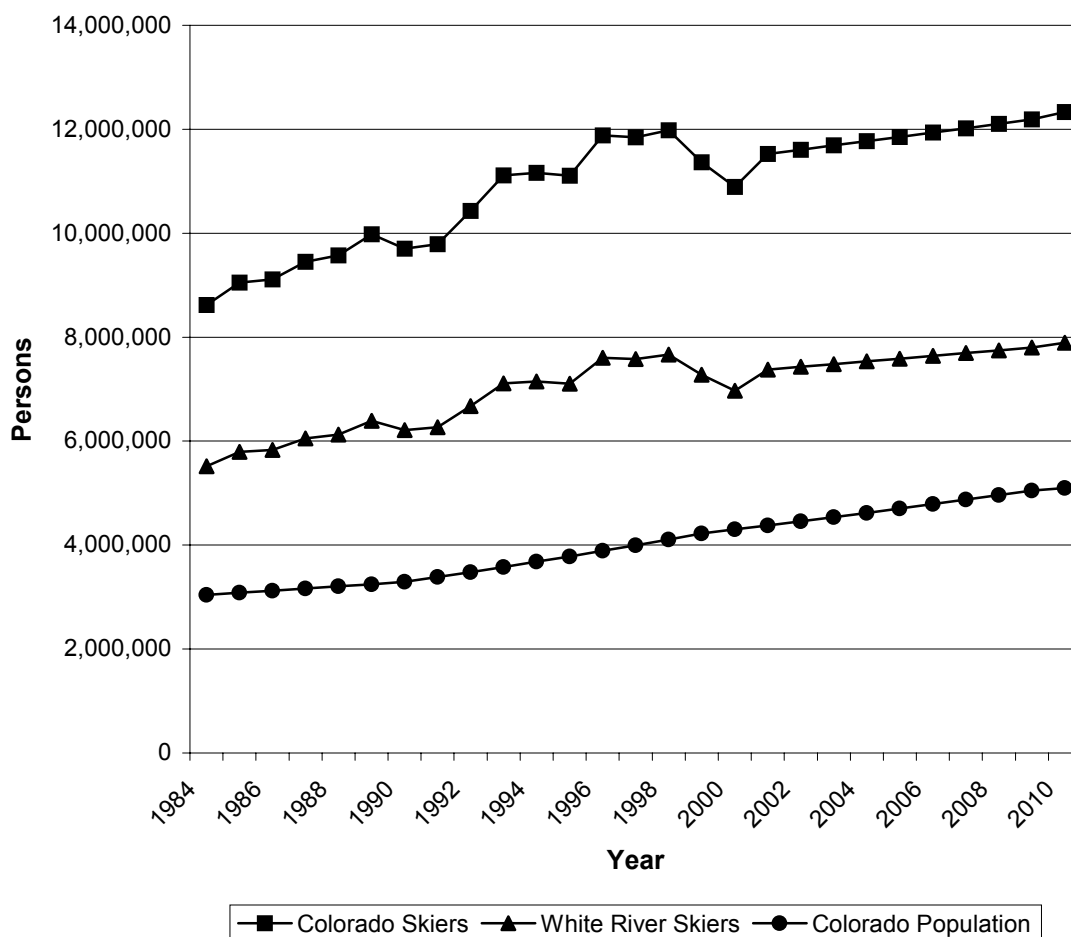
Alternative K allocates a sufficient number of acres for skiing and snowboarding to meet expected demand for the year 2010. Ski area boundaries are adjusted in some locations to lower skier densities, avoid potential impacts to wildlife habitat, provide the types of terrain that best meet customer and market preferences and mix of terrain by skier ability levels, and meet other qualitative or physical needs.

FUTURE NEEDS

Skier Visit Forecast

It is forecast the White River National Forest will provide about 8 million skier visits in 2010 based on the State Demographers Census 2000 data and projected increases in population. Based on this forecast, Summit County can be expected to provide 4,037,223 skier visits; Eagle County 2,410,020 skier visits; Pitkin County 1,423,956 skier visits; and Garfield County 103,616 skier visits in 2010.

Figure 43
Skier visit forecast to 2010



Skiable acres needed

The White River National Forest averages 395 skiers per skiable acre per year. The recommended number of skiable acres needed per county in 2010 is based on the number of skiers expected divided by 395 skiers. By this measure, additional acres need to be allocated in Summit County to meet the expected increase in skier visits. Pitkin and Garfield Counties have enough skiable acres to meet demand for the next ten years. In Alternative K, ski areas with excess skiable acres already in place retain their current amounts, although some adjustments may be made to refine ski area boundaries taking this surplus into consideration, if a portion of an existing ski area is not planned for future development.

Table 92
Skiable acres needed 2010

	Available Skiable Acres 2001	Additional Skiable Acres Needed 2010	Total Skiable Acres Needed 2010
<i>Summit</i>	6,827	3,306	10,221
<i>Eagle</i>	7,314	0	7,314
<i>Pitkin</i>	4,819	0	4,819
<i>Garfield</i>	467	0	467
<i>White River National Forest total</i>	19,427	3,306	22,821

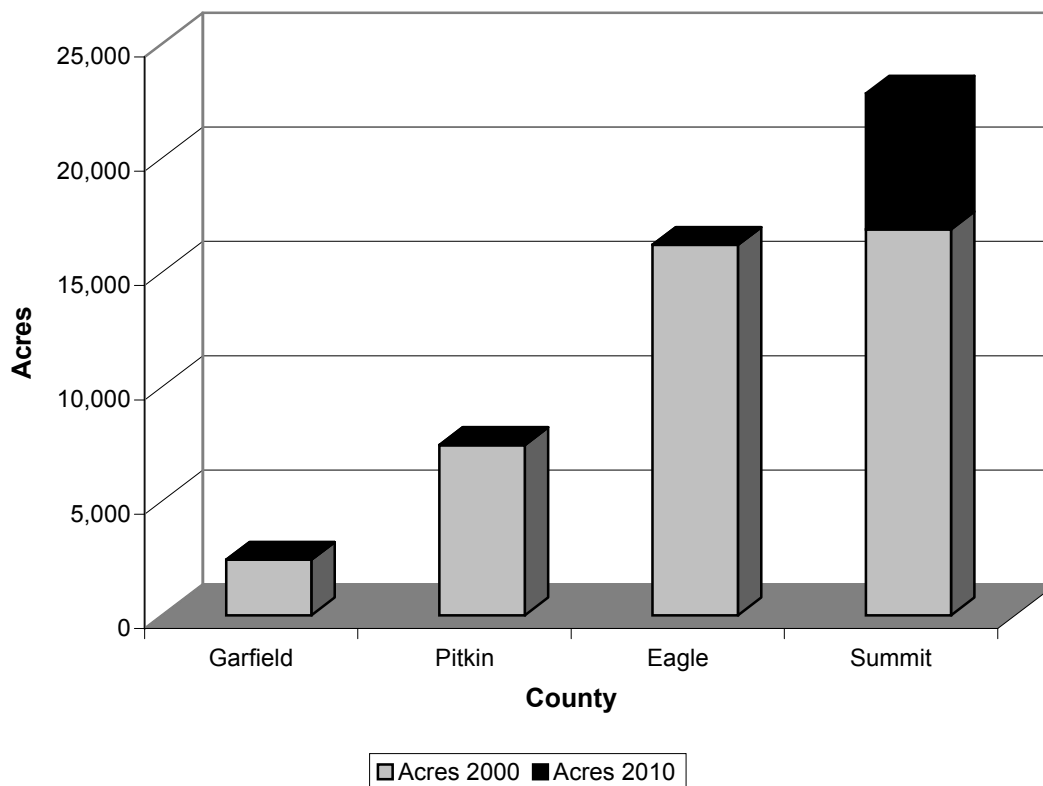
Total acres needed

It is estimated that about 45 percent of the available acres allocated to each ski area can be developed for skiing, based on current conditions. The exact number of skiable acres that can be made available is determined at the site-specific level after detailed analysis. Some flexibility in the total number of acres allocated is needed to be sure the planned number of skiable acres can be achieved. The total number of acres the forest needs to allocate to the 8.25 management prescription at the forest plan level was calculated by dividing the number of skiable acres needed by 45 percent.

Table 93
Total acres needed by 2010

County	2001	Increase	2010
<i>Summit</i>	16,881	5,940	22,821
<i>Eagle</i>	16,204	0	16,204
<i>Pitkin</i>	7,448	0	7,448
<i>Garfield</i>	2,432	0	2,432
<i>White River National Forest total</i>	42,965	5,940	48,905

Figure 44
Total acres needed by 2010 compared with the current allocation



ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL

Reduced number of existing sites: No alternatives were analyzed in detail that would require termination of any of the twelve existing ski areas.

Private lands. The White River National Forest did not inventory or analyze in detail any sites on private lands that may be suitable for skiing. The Forest Service has no authority or jurisdiction over the use of private lands for skiing. It is assumed few quality sites with good physical potential could be found on private lands.

Reduced capacities: No alternatives were considered or analyzed in detail that limit the existing capacities of the existing ski areas. All sites are self-limiting based on facility capacities and crowding. The capacity of each ski area is determined at the site-specific level. Limitations on some sites may be imposed by the Forest Service to meet specific environmental or social objectives at the site-specific level. None of the alternatives impose reduced parking, ski lift, restroom, or restaurant constraints below current levels.

Maximum potential: No alternatives display the full potential of skiing on the White River National Forest. Numerous additional inventoried sites on the White River National Forest known to have good physical potential for skiing were not included or analyzed in the alternatives. Some sites identified by the Forest Service during the last planning period known to have good physical potential were not considered in any of the

alternatives because there is no active proponent and public support for these sites is not evident at this time.

Stimulate competition: No alternatives were considered or analyzed in detail that would intentionally adjust ownership or competition between existing resorts.

Prospectus: No alternatives were considered or analyzed in detail that would create new ski areas by issuing prospectuses to competing bidders. The prospectus process would require a bidding process to determine the most feasible sites, fair market value, and the most qualified bidders.

Land Exchange: No alternatives were considered or analyzed in detail that would sell or transfer ownership of National Forest System lands to the private sector in order to facilitate development of new ski areas or discontinue Forest Service administrative responsibilities. The current special use permit process allows the private sector to provide skiing on National Forest System lands in return for a fair market value fee. Public benefits will continue as long as the ski areas remain on public lands. Returns to the United States Treasury exceed the cost of ski area administration.

Helicopter and snowcat skiing: No alternatives were considered or analyzed in detail that provide a comprehensive inventory of quality skiing terrain in remote locations that could be used by skiers using private or commercial helicopters, snowcats, or snowmobiles for access.

DIRECT AND INDIRECT EFFECTS

COMPARISON OF ALTERNATIVES

Alternative B reflects current forest plan direction and 91,243 acres are allocated for skiing and snowboarding. It is assumed only a portion of the sites made available in this alternative would be developed and that the rate of development will be controlled by market conditions. Most existing ski areas are allowed to expand beyond their current boundaries to provide more opportunities for skiing and snowboarding. Some ski areas are encouraged to convert dispersed use to developed use by adding adjacent National Forest System lands into their ski area boundary to better manage potential hazards. Several new ski areas are allowed, including Adam's Rib in Eagle County; Rifle and Sunlight North in Garfield County; Little Annie and Coal Basin in Pitkin County; and Swan Mountain and Brewery Hill in Summit County.

In Alternative B sufficient terrain could be made available for many types of users and special interest groups with unique needs. This allows resorts to be flexible and responsive to changing use trends by offering more opportunities to provide the types of terrain and recreational experiences that best meets emerging trends and needs.

Alternative B provides the highest number of expansion opportunities and more opportunities to separate user groups based on specific physical terrain characteristics, more powder snow available within ski area boundaries, and lower skier densities. There would be a higher probability customer service could be improved for most segments of the skier and snowboard market. Changes in technology, such as high-speed detachable chairlifts, grooming equipment, snowboards and shaped skis were not fully considered when the 1984 Forest Plan was conceived.

Some customer preferences for the type of terrain that is desired have also changed as a result of the new technology and evolution of the sport. For example, high-elevation open bowl skiing above treeline is much more popular today than it was 15 years ago. For details, refer to *Report from the White River National Forest Four-Season Resorts on Resort Trends and Their Potential Impact on forest planning*. The mixture and type of terrain allocated for skiing in 1984 was completed before snowboarding became a major segment of the winter sports market. It was also uncertain how some skiing terrain adjacent to the existing ski areas would be used and managed where natural hazards and high avalanche risks were present. The large amount of skiing and snowboarding taking place on steep terrain with high avalanche potential was not anticipated in 1984. More opportunities for summer activities are also provided in this alternative on more acres of National Forest System lands.

Alternative C emphasizes recreation and wildlife values. The number of acres allocated for skiing is reduced by 33,603 acres (37 percent) from the 1984 Forest Plan to 57,640 acres. This alternative was developed to meet projected use through the next planning period based on historic use trends. Fewer sites would be made available for expansion and with less flexibility than under Alternatives B, E, and F.

Alternative D emphasizes protection of wildlife habitat. The number of acres allocated for skiing and snowboarding is reduced by 48,048 acres (53 percent) from the 1984 Forest Plan to 43,195 acres. No expansion of existing sites outside existing ski area boundaries is allowed. Skiing and snowboarding are confined to existing ski area boundaries. Some ski areas could provide a limited amount of additional capacity within their existing ski area boundaries. No new ski areas are allowed. Facility capacities would generally remain the same. Crowding and higher skier densities would discourage some users. The number of annual skier visits would increase more slowly in this alternative due to the effects of crowding and less capacity being made available.

Alternative E emphasizes winter and summer tourism. The number of acres allocated for skiing and snowboarding is reduced by 7,264 acres (8 percent) from the 1984 Forest Plan to 83,979 acres. An attempt is made to meet the special needs of each unique user group by providing a wide variety of special opportunities, types of terrain, and landform features. Ski areas would benefit from the allocation of more terrain to reduce overall densities, provide special areas for those seeking a variety of experiences. The result would be less density, a greater separation of users, and a higher quality of experience provided to each group.

During the past decade changes in many forms of snow sliding equipment resulted in significant shifts in user profiles and the percent of users within each group. There are many more snowboarders at most resorts today than in the past. As the percent of snowboarders at each resort increases, the need to provide specialized terrain such terrain parks has increased. As the percent of users within each user profile changes, the amount of terrain desired by each user group also changes. Snowboarders have a different set of terrain priorities, experiential desires, and circulation needs than others. From this standpoint, more snowboarders are not just additional skiers. Most ski areas continue to survey their guests annually to determine the effects of new technology on each user group to better understand the evolving winter and summer tourist markets and to make appropriate adjustments.

Alternative E recognizes long-term trends in recreation by allowing ski areas to provide the additional capacity needed to meet projected skier demand for the next 25 years and beyond. It acknowledges changing customer preferences, the role of new technology, and other evolving market elements. Locations, rates of growth, and site priorities for expansions would remain flexible and responsive to local conditions and area operator intentions.

Alternative F allows additional opportunities for skiing and snowboarding. The number of acres allocated for skiing and snowboarding is reduced by 23,143 acres (25 percent) from the 1984 Forest Plan to 68,100 acres. Alternative F provides enough capacity to meet projected demands for skiing for the next twenty-five years and beyond. Aerial trams are allowed on about 1,398 acres.

Alternative I limits human uses and attempts to minimize disturbances to natural resources. The number of acres allocated for skiing and snowboarding is reduced by 48,281 acres (53 percent) from the 1984 Forest Plan to 42,962 acres. No aerial transportation corridors are allowed. Ski area boundaries remain the same. No new ski areas are allocated and no expansion of existing ski areas is allowed outside existing ski area boundaries. Crowding and higher skier densities would discourage some users. The number of annual skier visits would increase more slowly in this alternative due to the effects of crowding and less capacity being made available.

Alternative K allows expansion of some existing resorts in response to projected increases in skier demand and to reduce crowding. It also includes boundary adjustments designed to reduce conflicts with wildlife. The number of acres allocated for skiing and snowboarding is reduced by 39,721 acres (44 percent) from the 1984 Forest Plan to 51,522 acres. It is assumed in this alternative that the number of skier visits will increase at the same rate as Colorado's population in the next ten years. Since the majority of the increase in population is expected to occur in Summit County and Denver's Front Range, most of the increase in skier visits on the White River National Forest is also expected to occur in Summit County. The allocation of some additional acres will also reduce crowding at the four existing ski areas. In Eagle County some adjustments in ski area boundaries are needed in response to specific user needs, the need to balance terrain type with skier ability levels, and resource protection issues. In Pitkin County an adequate amount of terrain is already available to accommodate the number of skiers expected in 2010. In Garfield County a sufficient number of acres is allocated to Sunlight Mountain Resort to meet projected skier visits until 2010.

ACRES ALLOCATED

Table 94 displays the number of acres allocated to the 8.25 management prescription by alternative. Acreage allocated to 8.21 for Nordic skiing is also included in these figures, but not acreage allocated to 1.32, which still allows for certain permitted ski activities in Coal Basin. The exact amount of capacity that can be provided on these acres in each alternative is not known until detailed analysis at the site-specific level is completed. It is assumed that over longer periods of time the theme of each alternative may also affect future priorities and capacities. Figure 45 shows a graphical comparison of the number of acres allocated to the 8.25 management prescription.

Table 94
Acres allocated to MA 8.25 by alternative

County	ALTERNATIVE						
	B	C	D	E	F	I	K
Eagle	24,359	19,097	16,204	24,600	21,465	16,205	16,496
Garfield	10,872	2,665	2,432	7,110	2,432	2,432	2,390
Pitkin	27,724	8,452	7,447	13,103	7,549	7,296	7,705 ¹
Summit	30,015	27,450	16,882	38,937	36,829	17,349	24,928
White River National Forest total	92,970	57,664	42,965	83,750	68,275	43,282	51,519

Notes:

¹These figures do not include 1,885 permitted acres for Nordic skiing at Ashcroft allocated to MA 8.21.

Summit County 30,015 acres of National Forest System lands were allocated for skiing in 1984. Alternative K reduces the previous forest plan allocation for skiing in Summit County by 17 percent to 24,928 acres. Between 1996 and 2001, Summit County averaged 3.7 million skiers per year. It is projected that by 2010 there will be an additional 320,064 skier visits per year raising the number of annual skier visits to over 4 million. It is estimated Summit County needs about 23,000 acres of National Forest System land to meet this level of expected use. In Alternative K, acres are allocated based on the need to meet projected use levels, provide quality skiing by keeping skier densities at acceptable levels, and to make boundary changes needed to accomplish administrative and safety objectives. The primary reason for the 17 percent reduction in the number of acres allocated for skiing and snowboarding in Alternative K is the removal of Swan Mountain and Brewery Hill from the 8.25 management prescription and a reduction in the number of acres north of Breckenridge in the Ten Mile Range between North Barton and Gold Hill.

Eagle County 24,359 acres of National Forest System lands were allocated for skiing in 1984. Alternative K decreases the previous forest plan allocation for skiing and snowboarding by 32 percent to 16,496 acres. Between 1996 and 2001, Eagle County averaged 2.2 million skiers per year. It is projected that by 2010 there will be an additional 176,159 skier visits per year, raising the number of annual skier visits to about 2.4 million. It is estimated Eagle County needs about 16,000 acres of National Forest System land to meet this level of expected use. In Alternative K adjustments in the locations of ski area boundaries are justified based on the need to meet specific planning objectives, provide a balance of terrain type to meet market conditions, and make boundary changes needed to accomplish administrative and safety objectives. The primary reason for the 32 percent reduction in number of acres allocated for skiing and snowboarding in Alternative K is the removal of Adam Mountain from the 8.25 management prescription.

Pitkin County The 1984 Forest Plan allocates 27,724 acres of National Forest System lands for ski area development in Pitkin County. Alternative K decreases this allocation by 72 percent to 7,705 acres. Between 1996 and 2001 Pitkin County averaged 1.4 million

skiers per year. It is projected that by 2010 there will be a minimal increase of about 4,075 skier visits per year in Pitkin County. The number of skier visits is expected to remain static at about 1.4 million skier visits for the next ten years, and therefore it is assumed that a sufficient number of acres are allocated in Alternative K to meet demand. The 72 percent reduction in the number of acres allocated for skiing in Pitkin County is the result of removing Coal Basin from the 8.25 management prescription and a reduction in the size of Snowmass and Aspen Highlands ski areas.

Garfield County 10,872 acres of National Forest System lands were allocated for skiing in 1984. Alternative K decreases the previous forest plan allocation for skiing in Garfield County by 78 percent to 2,390 acres. Between 1996 and 2001, Garfield County averaged 90,000 skiers per year. It is projected that by 2010 there will be an additional 14,725 skier visits per year, raising the average number of annual skier visits to about 104,000. It is estimated that a sufficient number of acres are allocated in Alternative K to meet projected demand for skiing in Garfield County for the next ten years. The 78 percent reduction in the number of acres allocated for skiing in Garfield County resulted from the removal of Rifle ski area and Sunlight North from the 8.25 management prescription.

CONSEQUENCES BY COUNTY

Summit County

Table 95 shows the number of national forest system acres allocated to the 8.25 management prescription. Summit County will be more heavily impacted by increases in population in the future than other counties on the White River National Forest. All of the existing ski areas show signs of overcrowding and would benefit from the allocation of additional terrain to lower skier densities. The Forest Service identified potential expansion terrain with excellent physical characteristics for skiing adjacent to each of the four ski areas in Summit County. It is estimated that the four ski areas in Summit County will exceed 4 million skier visits by 2010. In order to meet this level of use, at least 22,713 acres will need to be allocated for skiing and snowboarding in Summit County. All of the existing ski areas would also benefit from the allocation of additional acres to reduce crowding at current utilization levels. In some alternatives, the White River National Forest will encourage ski areas adjacent to National Forest System lands with high avalanche potential and frequent dispersed use to expand to include these lands inside their ski area boundary. The purpose is to provide developed skiing opportunities and lower avalanche risk to skiers. Ski area operators only have authority to develop and manage lands inside their ski area boundaries and cannot manage these lands unless boundary adjustments are made.

Table 95
Acres allocated to MA 8.25 by alternative for Summit County ski areas

Ski area	ALTERNATIVE						
	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
<i>Arapahoe Basin</i>	2,479	3,230	773	11,138	6,821	773	1,913
<i>Breckenridge</i>	6,967	5,197	3,096	8,966	5,851	3,041	5,553
<i>Breckenridge Nordic</i>	1,488	0	0	1,535	1,535	9	1,535
<i>Brewery Hill</i>	4,189	0	0	0	0	0	0
<i>Copper Mountain</i>	6,525	9,578	6,989	10,331	10,456	7,502	7,551
<i>Keystone</i>	8,367	9,445	6,024	6,967	12,166	6,024	8,376
<i>Summit County total</i>	30,015	27,450	16,882	38,937	36,829	17,349	24,928

Alternative B allocates 30,315 acres to the 8.25 management prescription. Alternative B allows Arapahoe Basin, Breckenridge, Copper Mountain, and Keystone ski areas expand outside their existing ski area boundaries. Each of the four ski areas in Summit County will be more intensively used and developed for skiing. Independence Mountain, Swan Mountain, and Brewery Hill are available as expansions of Keystone. Breckenridge Ski Area is expanded in a northerly direction to include the North Barton drainage and beyond. Breckenridge Nordic and alpine facilities are integrated with Breckenridge ski area, the Town of Breckenridge, and adjacent private lands. Montezuma Bowl and the Beavers are added to Arapahoe Basin.

Alternative C allocates 27,450 acres to the 8.25 management prescription, a 9 percent reduction from the 1984 Forest Plan allocation. Arapahoe Basin is expanded to include the Beavers, East Wall, and Montezuma Bowl. Breckenridge is expanded to include additional terrain on Peak Ten. Copper Mountain is expanded to include Searle Creek. Keystone is expanded to include Independence Mountain. The NW portal can also be developed to reduce crowding and reduce base area congestion. Brewery Hill and Swan Mountain are assigned other management prescriptions and are not developed for skiing. Breckenridge Nordic Center is no longer allocated to the 8.25 management prescription for skiing.

Alternative D allocates 16,882 acres to the 8.25 management prescription, a 44 percent reduction from the 1984 Forest Plan and the fewest acres of all the alternatives. None of the four existing ski areas are allowed to expand outside their current boundaries. Crowding would be evident on the ski slopes at each of the four existing ski areas. The level of use provided may discourage participation by potential users. Alternative D does not allocate enough acres to meet projected skier demand for 2010. Some of ski areas will reach full utilization within the life of the forest plan. The 8.25 management prescription for Breckenridge Nordic Center is removed and the emphasis on skiing reduced.

Alternative E allocates 38,937 acres to the 8.25 management prescription, a 28 percent increase from the 1984 Forest Plan. This alternative places importance on meeting long-term demands for tourism and skiing in Summit County. It places priority on long-term planning by setting aside more skiable terrain for the future with the recognition that it may take many years to fully optimize the use of potentially available skiing terrain.

There is a recognition that some excellent skiing terrain exists immediately adjacent to all four existing ski areas that could further enhance public enjoyment and recreation opportunities. Alternative E allows the four resorts to improve the quality of skiing offered by providing new skiing terrain that is not available in most of the other alternatives. Alternative E also identifies opportunities for new transportation corridors on National Forest System lands where it may be possible to construct aerial trams to transport people directly between resorts and other key locations within Summit County. The existing ski areas are allowed to expand to meet skier demand, including special market niches to satisfy customer preferences. Arapahoe Basin is expanded to include the Beavers, Montezuma Bowl, No Name, and East Wall. Breckenridge is expanded to include upper Peak 7, Peak 10, and North Barton and is integrated with the Breckenridge Nordic Center to allow shared parking, lifts, trails, egress, and facilities. Copper Mountain is expanded to include Searle Creek, Guller Creek, and a lift connection with Breckenridge over the saddle between Peak 9 and 10 is provided. Keystone is allowed to develop Independence Mountain.

Alternative F allocates 36,829 acres to the 8.25 management prescription, a 21 percent increase from the 1984 Forest Plan. This alternative recognizes the need to meet long-term demands for tourism and skiing in Summit County by allowing expansion of each of the existing resorts. Arapahoe Basin is expanded to include Beavers, Montezuma Bowl, No Name, East Wall, and Porcupine. Breckenridge is expanded to include Peak 7 and North Barton. Keystone is expanded to include Independence Mountain. Copper Mountain is expanded to include Searle Creek.

Alternative I allocates 17,349 acres to the 8.25 management prescription, a 43 percent decrease from the 1984 Forest Plan. None of the four existing ski areas are allowed to expand. Some of the existing resorts reach full utilization within the life of the forest plan. Crowding would be evident on the ski slopes at each of the four existing ski areas. This level of use may discourage participation by potential users. Alternative I does not allocate enough acres to meet projected skier demand for 2010. Protection of wildlife habitat and natural resources are given priority over skiing within the Breckenridge Nordic Center.

Alternative K allocates 24,928 acres to the 8.25 management prescription, an 18 percent decrease from the 1984 Forest Plan. Arapahoe Basin is expanded to include Montezuma Bowl and the Beavers. Both of these expansion areas were previously included within the ski area boundary. The majority of terrain is above treeline. Skiers and boarders will benefit from increased protection from avalanches, if these areas are included within the ski area boundary and developed for skiing. Some minor adjustments to the ski area boundary are made at Copper Mountain in response to wildlife concerns and to simplify boundary management. Wider distribution of skiers at higher elevations on more remote terrain will reduce crowding at the existing base portals. Breckenridge is allowed to expand above treeline and to the north and south. Breckenridge will be able to reduce crowding and disperse skiers further from the existing base portals through development of new terrain. Breckenridge Nordic Center is allocated the 8.25 management prescription. This management prescription allows flexibility to adapt to future needs for alpine and Nordic skiing and encourages integration of facilities with Breckenridge Ski Area, Town of Breckenridge, and adjacent landowners. Keystone is allowed to expand onto Independence Mountain. This will help lower existing skier densities and crowding

on the existing terrain. Brewery Hill and Swan Mountain are assigned other management prescriptions and are not developed for skiing. Alternative K allows the existing resorts in Summit County to lower skier densities by allocating a sufficient number of acres to meet future demands for skiing and snowboarding for the year 2010.

Eagle County

Table 96 shows the respective acreages of the 8.25 management area prescription in Eagle County. The areas identified in the table are described individually in the affected environment discussion earlier in this section. Transportation and access are key issues that will help determine the future of all of the resorts in Eagle County. The capacities of the existing portals to Vail and Beaver Creek ski areas are currently constrained by the existing infrastructure, such as parking, transit, and tramway capacity. Minturn and Avon have the potential to become key portals to the existing ski areas of Vail and Beaver Creek. Requests for aerial trams or new portals have potential to affect National Forest System lands. Consequently, the Forest Service identified several alternatives that allow new access portals to the existing ski areas from Minturn. It is estimated that skier demand in Eagle County will exceed 2.4 million skier visits by 2010. The existing 16,205 acres is adequate to meet projected demand, but Vail, Beaver Creek, and Ski Cooper would also benefit from some changes in boundary locations to manage existing use, balance terrain with skier ability levels, improve skier circulation, provide better skiing opportunities, and reduce impacts to wildlife habitat.

Table 96
Acres allocated to MA 8.25 by alternative for Eagle County ski areas

Ski area	ALTERNATIVES						
	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
<i>Beaver Creek</i>	4,809	3,124	2,900	7,820	5,312	2,900	3,801
<i>Vail</i>	14,188	13,944	12,836	14,821	13,935	12,836	12,226
<i>Ski Cooper</i>	1,751	2,029	469	1,959	2,218	469	469
<i>Adam's Rib</i>	3,611	0	0	0	0	0	0
<i>Eagle County total</i>	24,359	19,097	16,205	24,600	21,465	16,205	16,496

Alternative B allocates 24,359 acres to the 8.25 management area prescription, the most of all the alternatives. Beaver Creek is expanded to include Mud Springs above Arrowhead. Adam Mountain is retained as a future ski area. Infrastructure issues, such as parking, transit, and aerial trams, which may affect ski area capacity will need to be addressed in the future in order to accommodate expected use.

Alternative C allocates 19,097 acres to the 8.25 management area prescription, 22 percent less than the 1984 Forest Plan. East Vail Chutes and South Game Creek are added to Vail ski area. Upper Stone Creek is added to Beaver Creek ski area. Skiers and snowboarders temporarily leave the ski area and then return at a lower elevation. Adding this area to Beaver Creek allows the ski area to perform avalanche control and patrol the area as part of the developed ski area. At Ski Cooper, Chicago Ridge is allocated for

skiing to support an existing snowcat-served powder skiing operation that is highly popular.

Alternatives D and I allocate 16,205 acres to the 8.25 management prescription, the fewest of any of the alternatives. This is a 33 percent decrease from the 1984 Forest Plan. Vail and Beaver Creek would be intensively used within their existing boundaries. Protection of wildlife and natural resource values take priority over recreation. Boundary adjustments are not made in response to the need to reduce avalanche exposure.

Alternative E allocates 24,600 acres to skiing, slightly more than the 1984 Forest Plan. This alternative attempts to meet long-term demand for skiing in Eagle County. East Vail Chutes and South Game Creek are added to Vail ski area. Stone Creek, McCoy Peak, and Meadow Mountain are added to Beaver Creek. Chicago Ridge adjacent to Ski Cooper is allocated for skiing.

Alternative F allocates 21,465 acres to the 8.25 management prescription, a 12 percent reduction from the 1984 Forest Plan allocation. Alternative F attempts to meet long-term demand for skiing in Eagle County. East Vail Chutes and South Game Creek are added to Vail ski area. Stone Creek is added to Beaver Creek. Chicago Ridge is added to Ski Cooper.

Alternative K allocates 16,495 acres to the 8.25 management prescription, a reduction of 32 percent from the 1984 Forest Plan allocation. Benchmark, Mushroom, and Commando Bowls are removed from Vail ski area to address wildlife concerns. South Game Creek is added because good skiing opportunities are available. Upper Stone Creek is added to Beaver Creek to reduce avalanche exposure. Skiing operations in McCoy Park continue and are integrated with Beaver Creek. Alternative K attempts to allocate a sufficient number of acres to meet skier demand for the year 2010.

Pitkin County

Table 97 shows the acreage of the 8.25 management area prescription by alternative in Pitkin County. The number of acres allocated for skiing in Pitkin County is reduced in all of the alternatives except Alternative B. It is estimated the four Aspen resorts will provide about 1.4 million skier visits in 2010. It is estimated this level of use can be accommodated on the 7,448 acres currently allocated for skiing and snowboarding in Pitkin County. Some minor adjustments to existing ski areas boundaries could provide additional benefits, such as better skier circulation, boundary management adjustments that are consistent with existing use, reduction of avalanche hazards on adjacent terrain, and improved skier egress off the mountains.

Table 97
Acres allocated to MA 8.25 by alternative for Pitkin County ski areas

Ski area	ALTERNATIVE						
	B	C	D	E	F	I	K
Aspen Mountain	1,949	381	232	1,708	232	81	255
Aspen Highlands	3,427	1,620	1,620	2,222	1,620	1,620	1,620
Buttermilk	633	762	705	762	705	705	833
Snowmass	6,670	5,689	4,890	6,677	4,992	4,890	4,997
Ashcroft ¹	1,028	0	0	1,736	0	0	0
Coal Basin	13,987	0	0	0	0	0	0 ³
MA 8.25 total	27,694	8,452	7,447	13,105	7,549	7,296	7,705
Ashcroft ²	0	0	0	0	0	0	1,885
Pitkin County total	27,694	8,452	7,447	13,105	7,549	7,296	9,590

Notes:

¹8.25 prescription, which allows for more intensive development as a Nordic center.

²8.21 prescription, which allows for continued operation as a Nordic center.

³Coal Basin is allocated to the 1.32 prescription in Alternative K, which allows for certain permitted ski activities. Any actual permitted acreage will be determined at the site-specific level.

Alternative B allocates the greatest number of acres to the 8.25 management prescription of any of the alternatives. Aspen Mountain, Aspen Highlands, Buttermilk, and Snowmass are fully developed over time. Adjustments to permit boundaries and expansions are allowed. Highland Bowl is fully developed for skiing. West Buttermilk could be extended slightly higher to the top of the ridge. Little Annie is allocated for skiing as a logical expansion of Aspen Mountain. Coal Basin is allocated as a ski area. The Forest Service is responsive to changing conditions and the need for more terrain to satisfy a variety of market conditions. A lift and skiing connection between Buttermilk and Snowmass is allowed. Ashcroft is allowed to develop within the constraints of the 8.25 management prescription.

Alternative C allocates 8,452 acres to the 8.25 management prescription. This is a 70 percent reduction in the number of acres allocated for skiing in Pitkin County. Buttermilk is allowed to expand on the west side. A lift and skiing connection between Snowmass and Buttermilk is allowed. The number of acres allocated for skiing to Aspen Highlands and Snowmass are substantially reduced from the 1984 allocation.

Alternative D allocates 7,447 acres to the 8.25 management prescription. This is a 73 percent reduction in the number of acres allocated for skiing in Pitkin County from the 1984 Forest Plan. Existing ski area boundaries remain the same. The number of acres allocated for skiing to Aspen Highlands and Snowmass are substantially reduced.

Alternative E allocates 13,103 acres to the 8.25 management prescription. This is a 53 percent reduction in the number of acres allocated for skiing in Pitkin County from the 1984 Forest Plan allocation. This alternative recognizes tourism as an important use of

National Forest System lands in Pitkin County. Highlands Bowl and Temerity are developed for skiing. West Buttermilk is extended uphill to the top of the ridge to lengthen the vertical rise and take advantage of quality skiing terrain. Little Annie is available for skiing as an expansion of Aspen Mountain. The number of acres allocated for skiing to Aspen Highlands and Snowmass are substantially reduced. Ashcroft is developed within the constraints and theme of the 8.25 management prescription that allows more intensive use and development than currently exists.

Alternative F allocates 7,549 acres to the 8.25 management prescription. This is a 73 percent reduction in the number of acres allocated for skiing in Pitkin County. The number of acres allocated to Aspen Highlands and Snowmass are substantially reduced.

Alternative I allocates 7,296 acres to the 8.25 management prescription. This is a 74 percent reduction in the number of acres allocated for skiing in Pitkin County, the fewest number of acres allocated to skiing in any of the alternatives. Protection of natural resources, wildlife habitat, and wilderness character are emphasized rather than skiing. The number of acres allocated for skiing to Aspen Highlands and Snowmass are substantially reduced.

Alternative K allocates 7,705 acres to the 8.25 management prescription. This is a 72 percent reduction in the number of acres allocated for skiing in Pitkin County from the 1984 Forest Plan allocation. The number of acres allocated to Aspen Highlands and Snowmass for skiing is substantially reduced from the 1984 Forest Plan. . In addition to the four existing alpine ski areas in Pitkin County, permit holders are also allowed to charge fees for providing managed skiing in Castle Creek and Coal Basin. The existing Ashcroft Ski Touring Center is allocated the 8.21 management prescription and allowed to continue its current operations as a Nordic Center. Managed skiing on a limited basis is also allowed in a portion of Coal Basin in the area allocated the 1.32 management prescription. If managed skiing is provided by a permit holder operating in Coal Basin in the future, either snowcat-assisted alpine skiing or Nordic skiing on designated routes or a combination of both is allowed in the 1.32 management prescription. Aspen Mountain is expanded slightly to include Pandora's. Pitkin County has a sufficient number of acres allocated to meet skier demand for the year 2010.

Garfield County

Table 98 shows the acreage of the 8.25 management area prescription by alternative. All of the alternatives satisfy projected demand for skiing at Sunlight Mountain Resort through 2010. All of the alternatives except B represent major reductions in the number of acres allocated to skiing. The primary difference between the alternatives is the removal of Sunlight North and Rifle from the 8.25 management prescription in all of the alternatives except B and E. It is estimated that skier demand in Garfield County will exceed 100 thousand annual skier visits by 2010. The 2,432 acres currently allocated to Sunlight Mountain Resort is adequate to meet projected use for the year 2010.

Table 98
Acres allocated to MA 8.25 by alternative for Garfield County ski areas

Ski area	ALTERNATIVE						
	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
<i>Sunlight</i>	6,419	2,665	2,432	2,432	2,432	2,432	2,390
<i>Rifle</i>	4,453	0	0	4,678	0	0	0
<i>Garfield County total</i>	10,872	2,665	2,432	7,110	2,432	2,432	2,390

Alternative B allocates 10,872 acres to the 8.25 management prescription, the highest amount of any of the alternatives. Sunlight North above Oak Meadows subdivision in Glenwood Springs is available for skiing as an expansion of Sunlight. Rifle ski area southeast of Battlement Mesa is allocated for skiing.

Alternative C allocates 2,665 acres to the 8.25 management prescription, a 75 percent decrease in acres from the 1984 Forest Plan. A minor increase in acres is allowed in the southeast corner of Sunlight ski area. Sunlight North is not retained as an expansion area. Rifle is not retained as a new ski area for future generations.

Alternatives D, F, and I allocates 2,432 acres to the 8.25 management prescription, an 88 percent reduction in acres from the 1984 Forest Plan. Minor adjustments to Sunlight's ski area boundary are made.

Alternative E allocates 7,110 acres to the 8.25 management prescription, a 35 percent reduction in acres from the 1984 Forest Plan. Sunlight is allowed to reach full potential within their existing boundary. Rifle ski area southeast of Battlement Mesa is allocated for skiing and snowboarding as a new ski area.

Alternative K allocates 2,390 acres to the 8.25 management prescription, a 78 percent decrease in the number of acres allocated for skiing. Sunlight has a sufficient number of acres available to meet skier demand for the year 2010.

DIRECT AND INDIRECT EFFECTS

Effects from other resources on skiing will occur on National Forest System lands within areas allocated the 8.25 management prescription in locations where conflicts between skiing and other resources may exist. At most existing ski areas about 55 percent of the acres allocated to the 8.25 management prescription remain undisturbed and the other 45 percent are eventually developed for skiing and snowboarding. In the future a substantial portion of the new acres developed for skiing on the White River NF are expected to occur on areas above treeline, on exposed rocky areas, in avalanche paths, and across naturally occurring alpine meadows. These areas are characterized as treeless. In areas that are naturally open it is possible to provide new opportunities for developed skiing and snowboarding without removing trees or modifying landforms. The exact number of acres that are currently forested that may eventually be developed for skiing is determined at the site-specific planning level after the Forest Service receives a detailed proposal.

Alternative D is the baseline from which the other alternatives are compared because no additional acres are allocated to the 8.25 management prescription outside existing ski area boundaries in this alternative. About 145 more skiable acres are allowed in Alternative I. Alternative K provides about 3,859 new skiable acres, Alternative C 6,615 acres, and Alternative F 11,390 acres. Alternative E and B allocated the highest number of acres to the 8.25 management prescription and would allow about 18,000-20,000 additional skiable acres to be developed.

Table 99
New 8.25 acres outside existing ski areas

Alternative	New 8.25 Acres Outside Existing Ski Area Boundaries	New Skiable Acres Outside Existing Ski Area Boundaries
<i>D</i>	0	0
<i>I</i>	317	145
<i>K</i>	8,577	3,859
<i>C</i>	14,702	6,615
<i>F</i>	25,312	11,390
<i>E</i>	40,791	18,355
<i>B</i>	50,002	22,500

Effects on ski areas from watershed management

The effects of limiting available water for snowmaking is a reduction in the quality of the skiing experience that may affect skier safety by leaving more ground hazards exposed on developed ski trails. Local communities and businesses may be financially affected when ski areas cannot guarantee a skiable surface during the winter season. The effects of watershed management practices on ski areas may result in a reduction in the number of acres that is developed for skiing. Furthermore, the need to avoid impacting wetlands may result in a need to change the design or location of planned ski area facilities. In order to create more skiable acres, soils may be disturbed by construction activities such as earth grading that is needed to provide a smooth surface for skiing, and from the removal of trees from forested areas. These actions usually require implementation of best watershed management practices that may result in the need to limit the number of acres cleared or graded or place constraints on the timing of construction, the type of equipment used, or the methods used for ski trail construction. Some constraints needed for watershed protection may increase the cost of construction or in the most extreme case limit the amount of use that is acceptable.

Effects from watershed management are highest in Alternatives B (22,050 acres), E (18,355 acres), and F (11,390 acres) because these alternatives allow the highest number of skiable acres to be developed. Alternatives D (0 acres) and I (145 acres) impact the fewest number of acres and have the fewest effects on skiing. Alternative C (6,615 acres) and K (3,859 acres) have moderate effects. Because many of the acres likely to be developed for skiing are in natural open spaces above treeline or in open meadows, the exact effects on skiing from watershed management is not known until detailed development proposals are received by the Forest Service for site-specific analysis.

Effects on ski areas from elk habitat management

Effects of elk habitat on ski areas include seasonal closures that restrict human occupancy and recreation use during deer and elk spring calving seasons, fall migration periods, and during the summer months in rearing habitat. Effects also include restrictions on the timing of maintenance, operations, facility construction, and road closures. Other effects include higher costs of signing and law enforcement. In addition, adjustments to the planned locations of lifts, trails, roads, structures, and utilities are sometimes required in response to wildlife habitat needs. In some cases, specific facilities or other improvements may not be allowed. Specific construction methods may not be allowed in order to mitigate potential impacts to wildlife. During big game hunting season, roads and trails may be closed to mountain biking. Potential exists for accidental shootings of ski lifts, resort equipment, structures, utilities, vehicles, and people. Effects from elk habitat management are highest in Alternatives B (50,002 acres), E (40,791 acres), and F (25,312 acres) because these alternatives allocate the highest number of acres for skiing. Alternatives D (0 acres) and I (317 acres) allocate the fewest number of acres to skiing and would have the fewest effects on skiing. Alternative C (14,702 acres) and K (8,577 acres) would have moderate effects. Because not all areas proposed for developed skiing are elk habitat, the exact effects on skiing from elk habitat management is not known until detailed ski area development proposals are received by the Forest Service for site-specific analysis.

Effects on ski areas from threatened, endangered, and sensitive species habitat (TES) management

Historic operations inside existing ski areas will generally not be affected. Effects of threatened, endangered, and sensitive species management in undeveloped areas allocated the 8.25 management prescription occur when a portion of the habitat needs of TES species exist. Special mitigation measures for these types of species may be in conflict with long-term development plans of some ski areas and resort communities. As a result, facility development and recreation uses may be reduced, altered, or eliminated in order to meet wildlife objectives. Effects from threatened and endangered forest carnivores and other species proposed for listing include restrictions on skiing opportunities due to area closures and use restrictions, and the higher management costs of signing and enforcement. Seasonal restrictions on facility maintenance, operational activities, and new construction may be needed to minimize impacts to forest carnivores and their habitat. Restrictions on travel may limit public use, operator access, and opportunities for public recreation, and may shorten operating seasons.

Effects from TES habitat management may result in limitations on new opportunities for night skiing, evening recreation activities, and restrictions on general night maintenance. Restrictions may be imposed to alter the construction and location of roads, timing of access, or change the methods of access. Restrictions may be imposed on the amount and timing of new snowmaking proposals and the amount and timing of grooming in new expansion areas. These restrictions may result in reductions in the length of the operating season by reducing early and late season use of new expansion areas, and may require temporary closure of selected ski trails. Boundary management restrictions may need to be imposed to prevent hikers, mountain bikers, and skiers from accessing National Forest System lands adjacent to the ski areas. This results in higher annual operating costs to

resort operators to provide additional fencing, signing, regulations, agency coordination, and patrols needed to enforce boundary management policies. TES management might reduce the potential of some ski areas to increase revenues because of limitations on the number of people allowed in new expansion areas during periods when closures are in effect.

Effects from TES habitat management are assumed to be highest in Alternatives B (50,002 acres), E (40,791 acres), and F (25,312 acres) because these alternatives allocate the highest number of acres to the 8.25 management prescription. Alternatives D (0 acres) and I (317 acres) allocate the fewest number of acres to skiing and would have the fewest effects on skiing. Alternative C (14,702 acres) and K (8,577 acres) would have moderate effects. Because not all areas proposed for developed skiing provide TES habitat, the exact effects on skiing from TES management is not known until detailed ski area development proposals are received by the Forest Service for site-specific analysis.

Effects on ski areas from roadless areas

Ski area development within inventoried roadless areas will be guided by the forest-wide guideline for development in roadless areas. Management activities will emphasize the maintenance of roadless characteristics and habitat improvement for threatened, endangered, proposed or sensitive species; or maintenance or restoration of ecosystem composition and structure, such as reducing the risk of uncharacteristic wildfire effects. It is feasible to provide additional acres of developed skiing without constructing roads. In Pitkin County, constraints imposed by the 2002 Forest Plan guideline for inventoried roadless areas may effect development of Pandora's Gulch on Aspen Mountain, a gondola connection between Buttermilk and Aspen Highlands, a proposed Buttermilk skier bypass and a proposed Burnt Mountain skier egress trail at Snowmass. In Eagle County, Mud Springs and McCoy Park at Beaver Creek and South Game Creek at Vail are within inventoried roadless areas. In Summit County, Montezuma Bowl at Arapahoe Basin and a portion of the Ten Mile Range at Breckenridge are inventoried as roadless areas.

Effects on ski areas from research natural areas

The effect of research natural areas on ski areas is elimination of expansion opportunities, avalanche controls, summer recreation use, and routine motorized rescues. Restrictions on dispersed skiing and hiking on Loveland Pass may be imposed as a result of this designation. Designation of Porcupine Gulch as a research natural area has potential to limit opportunities to provide developed skiing in Alternatives C, D, and E.

Effects on ski areas from wilderness

The Wilderness Act describes wilderness as an "area of undeveloped Federal land retaining its primeaval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions." Wilderness designated by congress is not available for ski area development. Examples of sites on the White River National Forest sites with excellent physical potential for skiing and development as large destination resorts that are within designated wilderness areas and are no longer available include Haystack Mountain, Hayden Peak, Marble, and Meadow Mountains. Expansion of Beaver Creek into the area known as the Bald Spot south of the existing ski area and West Willow Basin south of

Snowmass is not allowed due to their locations in the Holy Cross and Maroon Bells Wilderness areas, respectively.

When ski areas are adjacent to designated wilderness, personnel frequently assist the local sheriff's office in search and rescue. When motorized rescues in wilderness areas are needed, authorization may be limited to "emergencies where the situation involves an inescapable urgency and temporary need for speed beyond that available by primitive means." (FSM 2326.1).

Effects on ski areas from timber management

Timber removal provides recreational benefits in the form of cleared openings for skiing and snowboarding. Selective cutting and thinning of tree stands usually causes fewer visual effects than clear-cutting. Timber management practices that create noise, dust, and smoke may detract from visitor enjoyment of the national forest setting. Timber management practices may also lower the scenic integrity for some areas if seen by large numbers of people from key viewpoints. Cleared openings in the forest canopy, slash piles, and construction of new timber roads that are visually evident detract from visitor experiences. During construction, there may be conflicts between tourists and log trucks, machinery, or other construction vehicles, although most ski areas are closed during construction to prevent such impacts. Effects are less when tree removal occurs over snow during the winter or spring seasons when recreation use is low and skidding causes less damage to ground cover and soil. When logging activities take place during the summer season impacts to recreation users and local residents is usually higher. Logging trucks may interfere with traffic on local roads within resort communities. The visual effects of tree clearing for ski trails and roads may produce long-term effects, if the changes are evident from key viewpoints.

Effects from timber management are assumed to be highest in Alternatives B (22,050 acres), E (18,355 acres), and F (11,390 acres) because these alternatives will provide the highest number of skiable acres. The majority of trees are removed from forested areas to provide skiable terrain. Alternatives D (0 acres) and I (145 acres) would clear the fewest number of acres to provide skiable terrain and have the fewest effects on skiing. Alternative C (6,615 acres) and K (3,859 acres) would have moderate effects. Because many of the acres likely to be developed for skiing are in natural open spaces above treeline or in open meadows, the exact effects on skiing from timber management is not known until detailed development proposals are received by the Forest Service for site-specific analysis.

CUMULATIVE EFFECTS

The number of ski areas operating on National Forest System lands administered by the White River National Forest grew from four in 1960 to twelve in 2001. During this same period of time the number of skiers and snowboarders increased dramatically from 200,000 to 7.6 million, making skiing the most popular recreation activity on the forest. The entire ski industry in Colorado experienced rapid growth in skier visits in the 1970s and 1980s. By the 1990's skiing had changed from a sport to a commercial recreation industry. What previously were known as ski areas in the 1960s eventually evolved into four-season destination resorts with national and international clientele. Between 1990 and 2000 Colorado was the third fastest growing state in the nation and skiing continued

to grow in popularity in response to Colorado's rapid increase in population, especially along Denver's Front Range. According to the state demographer the population of Colorado is predicted to continue to grow rapidly for the next decade and beyond. Over time many of the residential areas on private lands close to the ski areas matured into full-service resort communities.

Summer recreation activities on National Forest System lands adjacent to the ski areas also began to flourish. In 1984, 92,967 acres of the White River National Forest were allocated for skiing. In Alternative K the number of acres allocated for skiing is substantially reduced by 45 percent from the 1984 Forest Plan to 51,522 acres, primarily to protect wildlife habitat and other natural resources and satisfy other forest priorities. Although skiing has grown rapidly in the past and is expected to continue to grow in the future in relation to increases in the state's population, the total land allocation for this use is limited to specific areas in Alternative K, which all together amount to about 2 percent of the total forest acreage. From a resource utilization standpoint, skiing provides more recreation use per acre than most other forest activities. Over the last 15 years the majority of expansion occurred within the boundaries of the twelve existing ski areas. This resulted in a higher concentration of use within more intensively developed areas. As a result of this concentration of use, annual utilization levels increased and the percent of terrain available for skiing within the twelve existing ski area boundaries more than doubled from 20 percent to 46 percent.

Summer recreational use at ski areas will continue to increase as local community populations grow and the demand for summer tourism expands. The Forest Service encourages year-round use of existing ski area facilities, as long as they are used to support natural resource-based recreation activities.

Transportation is a factor that may influence the amount of recreational use on the forest in the future. The White River National Forest is currently participating in the analysis of this issue with the Colorado Department of Transportation. The level of service provided by the Colorado Department of Transportation in the Interstate 70 corridor has the potential to either limit or increase visitation in the future depending on the types of improvements and changes in capacity that are made. The cost and timing of flights into Denver International Airport and Eagle County Airport are important factors influencing future use on the White River National Forest. Significant increases in winter use have occurred at the Eagle County airport in the last 5 years. Use of the Eagle Airport will continue to be an important factor influencing winter and summer visitation. Construction of a proposed monorail from the Denver International Airport to the Eagle Airport could significantly increase forest visitation.

Population growth at the state level, the Denver Metro area, and within the counties where the resort communities are located will generate increases in recreational use. This is another issue the White River National Forest cannot control. Annual population growth in Pitkin and Garfield Counties has been slower than Eagle and Summit counties. The Aspen community has a growth management quota system that effectively limits population growth. Community policies designed to restrict population growth have also influenced the demand for skiing and snowboarding in Pitkin County, where only a slight increase in skier visits has occurred and total use has remained relatively constant for the last 10 years. Based on the desires of the local community and static levels of use, the amount of ski area development in Pitkin County that is currently available is sufficient.

Annual population growth in Eagle and Summit counties averaged about 8 percent. In Eagle County, skier visits grew nearly 2 percent annually between 1990 and 2000. During the same time period skier visits in Summit County increased nearly 4 percent annually. Based on this growth trends, a wider range of ski area expansion opportunities were considered in Eagle and Summit Counties and a greater degree of cumulative impacts are anticipated.

Impacts to National Forest System lands as the result of **private land urbanization** associated with ski areas will increase. Some of the off-site socio-economic impacts associated with projected population growth in the resort communities are discussed in the socioeconomic section of the FEIS. As the resort communities become increasingly developed, it is likely that the White River National Forest will be subject to an increasing number of requests for land exchanges and alternative transportation facilities to accommodate growth as community infrastructure (parking lots, roads, etc.) become more crowded and overutilized.

Demand for **developed recreation facilities** will increase as a result of an increased state population. There will be added pressure on forest managers to increase the amount of opportunities on the developed end of the recreation opportunity spectrum, specifically facility development at the resorts. The resultant changes to the landscape intended to increase year-round developed recreational opportunities at the ski areas may decrease opportunities for other visitors seeking a more primitive environment. The greatest shift toward the developed end of the recreation opportunity spectrum would be in Alternatives B, E, and F. These alternatives would allow the development of more skier-related facilities and transportation corridors on the forest, with the resultant decrease of other values such as solitude. Alternatives C and K allow development of some new facilities based on use projections.

The highest increase in demand for new ski area facilities is expected to occur in Summit County primarily as a result of increases in the local and state population. In the 2002 Forest Plan, Alternative K allocates 24,929 acres for skiing in Summit County. This is a 17 percent reduction from the 30,013 acres allocated for skiing in the 1984 Forest Plan, but it is considered an adequate amount by the Forest Service to meet the state demographer's growth projections for the year 2010. The majority of the acres remaining to be developed in Summit County are located above treeline where access is difficult and recreation use is limited to small numbers of backcountry skiers and summer hikers. In Summit County there are numerous sites located outside the existing ski area boundaries with similar elevations, aspects, slopes, and snow depths, and other good physical characteristics for backcountry skiing and hiking where opportunities for solitude are readily available. During the winter season, effects to wildlife habitat and other humans from developed skiing tend to be less at higher elevations than in forested areas at lower elevations. Alternatives D and I emphasize semi-primitive recreation opportunities. Under these alternatives, ski areas would likely become intensively developed to accommodate additional tourism growth, but a strong emphasis would be placed on retaining a natural setting outside of existing ski area boundaries.

Conflicts between **competing winter recreational user groups** will likely increase. The number of search and rescue incidents will also increase as future use increases. This will be a result of the trend toward increasing numbers of people using developed ski area facilities to access backcountry terrain for skiing and snowboarding.

Topic 3, Part 3

Aerial transportation corridors

Introduction

Abstract

Transportation has emerged as one of the primary issues faced by resort communities in Colorado as a result of rapid increases in population and tourism. It is possible in the future that in some locations, aerial trams may be more desirable than traditional ground-based roadway systems used by cars and buses. Although the hourly capacities of most aerial trams are low, these types of systems may be appropriate in some locations where road and parking capacities are already fully utilized or to enhance existing transportation systems. Aerial trams may also be designed with a recreation component to provide scenic rides for non-skiers. The 8.31 management prescription was created in response to the need to transport pedestrians to, from, or between key locations in resort communities.

Summary

One of the primary issues associated with modern North American resort communities is transportation. Although most local transportation planning initiatives occur outside of Forest Service jurisdiction, many transportation systems have potential to impact National Forest System lands. One planning trend that has the potential to directly affect the White River National Forest is the use of aerial trams to transport people across National Forest System lands. For the 2002 Forest Plan, the 8.31 management prescription was established to identify potential locations where there may be a need for better public access. The analysis showed that aerial trams could be built in a variety of locations to connect resort communities that are adjacent to one another, or to provide new portals to existing ski areas.

Aerial transportation systems provide an alternative to traditional roads used by private automobiles and public bus systems. In some locations aerial trams may have potential to offer more efficient pedestrian circulation between and within resort communities. The 8.31 management prescription is appropriate in locations where aerial trams are funded and operated by entities other than ski areas, especially if the majority of users are non-skiers. Corridors that contain facilities to transport skiers across National Forest System lands that are owned or operated by ski areas are allocated the 8.25 management prescription. This section summarizes some of the existing uses of aerial trams as alternative forms of transportation in resort areas in the United States, as well as some of the current planning for tramways by local communities surrounding the White River National Forest.

Key indicators

- Acres allocated by alternative

Legal and administrative framework

- The **National Forest Ski Area Permit Act** (1986) allows the Forest Service to issue special use permits to the private sector to construct and operate ski areas on a limited number of acres of National Forest System lands for a period of up to 40 years.
- The **Act of March 4, 1915**, as amended July 28, 1956, previously authorized the issuance of term permits for structures or facilities on National Forest System lands on up to 80 acres for up to 30 years.
- The **Organic Administration Act** (1897), as amended, authorized annual permits for land occupied by ski runs as well as undeveloped portions of the ski areas.

Affected environment

INTRODUCTION

The 8.31 management prescription is intended for locations where mass transportation pedestrian movers are needed and when the preponderance of users is non-skiers, at least during part of the day or season. The 8.31 management prescription is also appropriate when the proponent or operator of the conveyance is not a ski area. In this case, a new special use permit may be issued to a separate entity other than a ski area to construct or operate the facility. The 8.31 management prescription is intended to accommodate aerial trams within narrow corridors, easements, or restricted rights-of-way where minimizing potential impacts to natural resources and wildlife is important.

To date, no aerial transportation systems have been constructed on the White River National Forest. However, numerous opportunities exist to improve existing ground-based transportation systems and lower air emissions from automobiles. Aerial transportation systems have proven to be reliable alternatives to automobiles in many locations in the European Alps and several good examples now exist in North America.

The related 8.25 management prescription is appropriate for conveyances owned and operated by ski areas used primarily for transporting skiers and snowboarders during the winter season. All aspects of a ski area's operation are appropriate within the 8.25 management prescription, including aerial trams. The 8.25 management prescription is typically used to allocate large areas of National Forest System land for skiing. If broad areas of land do not need to be allocated for skiing in a particular location, the 8.25 management prescription can also be allocated as a narrow corridor when necessary to construct ancillary ski area facilities on the periphery of designated ski areas, such as lifts, trams, gondolas, egress ski trails, catwalks, utilities, or access roads.

Prior to creation of the 8.31 management prescription in the 2002 Forest Plan, new gondola routes were automatically assigned the 8.25 management prescription. For example, in Pitkin County, Owl Creek was originally inventoried and conceived by the Forest Service as a potential expansion of Buttermilk and Snowmass ski areas. Development of ski lifts in the Owl Creek area was first considered feasible in the 1960s and was addressed over the years in informal studies, ski master development plans, NEPA documents, and wildlife analyses reports. In 1984, the Forest Service assumed Aspen Skiing Company would eventually provide developed skiing in Owl Creek. Consequently, Owl Creek was officially allocated the 8.25 management prescription in

the 1984 Forest Plan and analyzed in Alternatives C and F in the 2002 Forest Plan revision as a connecting area between Buttermilk and Snowmass ski areas.

Examples

Several examples of aerial trams as people movers include the following resorts. Telluride constructed a gondola that links the Town of Telluride to the upper mountain village. This is an excellent example of the type of system that could be used to move people at other resorts in Colorado. Skiers primarily use the Telluride gondola during the day. In the evenings, tourists and employees wishing to transfer between the town and the mountain village use it. The Telluride gondola is used primarily by skiers during the day. In the evenings, it is used by tourists and employees wishing to transfer between the town and the mountain village. Skiers primarily use the Telluride gondola during the day, but it is also highly popular in the evenings with tourists and employees wishing to transfer between the old town center and the new mountain village. The gondola serves as an alternative to private automobiles and buses, which are also used to transport persons between these two locations at the resort. The gondola has been effective at mitigating the effects of average daily traffic and parking congestion (Final Environmental Impact Statement, Telluride Ski Area, February 1996).

Another example of an aerial transportation system used to move people is planned for Heavenly Valley, Lake Tahoe, California. The ski area recently completed a master development plan that includes a 3,000 person-per-hour gondola to connect the heart of South Lake Tahoe's commercial core with a new lodge that contains complete skier services. The new gondola and lodge will be used as a summer recreational hub for activities such as hiking, interpretive opportunities, dining, and summer concerts (Ski Area Management Magazine, September 1997).

As ski areas on the White River National Forest have matured, along with the resort communities surrounding them, the need for better access portals with adequate parking, skier services, and adequate lift capacity has also increased. Most ski areas, community planners, and tourists recognize the advantages of pedestrian-oriented villages with reduced automobile traffic. This approach to resort planning is driven by increased concerns about air quality, transportation circulation, and parking as key elements of resort planning and guest demands.

BUTTERMILK/SNOWMASS

The concept of linking the Aspen ski areas with fixed rail systems or gondolas has been discussed many times over the years by local residents, skiers, developers, and elected officials ever since the four Aspen resorts were originally conceived in the 1950s and 1960s. In 1984, the Forest Service allocated the entire Owl Creek area between Buttermilk and Snowmass the 8.25 management prescription. This forest plan allocation meant that ski lifts and trails could potentially be constructed throughout the entire Owl Creek drainage. Under this Forest Service management prescription, ski lifts, gondolas, ski trails, and other ancillary facilities normally associated with ski areas are allowed. Although the Aspen Skiing Company had the potential to provide developed skiing opportunities in Owl Creek when it was allocated the 8.25 management prescription by the Forest Service in 1984, little public support for such a proposal existed then or now. If Owl Creek was developed for skiing, skiers and snowboarders could move freely between Buttermilk and Snowmass ski areas.

In 1994, the possibility of linking Snowmass and Buttermilk ski areas with a gondola was disclosed as a potential foreseeable action in the Burnt Mountain EIS. A potential gondola route originating from upper Buttermilk and terminating at Café Suzanne at Snowmass was identified during the analysis process. A skier egress trail from upper Burnt Mountain to lower Buttermilk was also surveyed as an element of the same alternative. The gondola and ski trail were identified as potential mitigation measures to reduce impacts to air quality and public transportation. Car and bus engines produce air emissions that have negative effects on air quality. Cars and buses also have potential to collide with and kill animals crossing roadways and are more likely to be used during the summer season and evenings. However, the 1994 Burnt Mountain EIS also disclosed that a large portion of Owl Creek contains important elk habitat, the protection of which may be in direct conflict with ski area development. During forest plan scoping, Snowmass Town Council members expressed strong support for the protection of elk habitat and scenery as their highest priorities for Owl Creek. Concern was also expressed that a gondola in this location would have limited capacity, very high cost, complex engineering due to the horizontal characteristics of the proposed route, and fluctuating seasonal demand.

To address the air quality issue, the Aspen Skiing Company presented a preliminary gondola design at a transportation linkages workshop in April 1997. According to the information presented at the workshop, the benefits of such a system would be reduced traffic and reduced air pollution problems. If any community exceeds national ambient air quality standards for a particular pollutant twice in one year, it is designated a “non-attainment area.” Aspen and a portion of Pitkin County surrounding the city were designated a PM-10 non-attainment area. The primary source of this pollutant is re-entrained dust from street sanding. The Colorado Department of Health has developed a state implementation plan to address the air quality issue with the primary emphasis of reducing vehicle miles traveled.

BUTTERMILK/ASPEN HIGHLANDS

The Maroon Valley Corridor was allocated 8.31 for the forest plan analysis in Alternatives C and F because a need to transport skiers from Buttermilk to Aspen Highlands in the winter and pedestrians in the summer to Maroon Valley was identified in various “Entrance to Aspen” scenarios and ski area master development plan studies. The idea of linking Aspen Highlands with Buttermilk by ski lift was also disclosed in the Aspen Highlands EIS prepared by the Forest Service in 1997. In the Aspen Highlands master development plan, a gondola connecting the base of Aspen Highlands with the top of Buttermilk ski area was disclosed as a possible future action. This opportunity could provide greater convenience, quicker access, and additional skiing for residents and guests staying at Aspen Highlands if direct lift access to Buttermilk was provided. Another consultant’s study suggested that the primary need for an aerial tram was to transport passengers between the base of Buttermilk and base of Aspen Highlands along a direct route on private land. It was suggested this alternative would more efficiently move summer visitors going to the Maroon Bells and employees from down-valley that work at Aspen Highlands. This solution focused on moving non-skiers and was primarily located on private lands and, therefore, not addressed in detail by the Forest Service.

Private land owners living in Maroon Valley suggested a third location for a gondola that would link the base of Aspen Highlands with lower Tiehack Ridge with a turn station at the mid-way point of the Racer's Edge ski trail. The purpose of this alternative was to avoid impacts to adjacent property owners living in Maroon Valley. This group also identified as concerns impacts to scenery in Maroon Valley, noise, visibility, wildlife, and lift evacuation issues.

Key potential benefits in Pitkin County related to ski area connections are potentially lower auto emissions and fewer impacts to air quality, reduced traffic and parking impacts, and the opportunity to provide a unique recreation experience. However, other potential concerns related to aerial trams include limited seasonal attractiveness, low hourly capacity, high cost of development, impacts to wildlife habitat and scenery, and disturbances to adjacent landowners. Neither the Commissioners of Pitkin County or Snowmass Town Council indicated during forest plan scoping that there is an immediate need to construct ski lifts in either Maroon Valley or Owl Creek within the next five years, between Buttermilk and Aspen Highlands, or between Buttermilk and Snowmass, respectively. During scoping many local residents expressed strong concerns about potential impacts to Maroon Valley and Owl Creek if aerial trams are constructed. Snowmass Town Council representatives expressed a strong desire to protect wildlife habitat and recommended against allocating Owl Creek to either the 8.25 or 8.31 management prescriptions.

BRECKENRIDGE

In 1996, Breckenridge Ski Corporation installed the Snowflake lift, which runs from the edge of town to the ski area. This is a fixed-grip double chair with a capacity of 1,200 people per hour, designed to relieve some of the pressure on the current bus shuttle system. This lift provides skier access to the mountain from remote parking near the base of the mountain. Several opportunities exist in the Breckenridge area to improve public transportation by installing aerial people movers.

AVON/BEAVER CREEK 8.25

Beaver Creek Resort is located two miles south of Avon. Because there is limited parking at the base of the ski area, most day skiers and employees must park in Avon and ride shuttle buses to the resort. Based on projected predicted growth trends in skier visits to Beaver Creek, the current bus system is projected to be inadequate to transport the number of skiers anticipated. Beaver Creek's current bus system can only transport about 2,000 persons per hour and is costly to operate. Avon's 1996 transportation plan update discusses the need for a new 1,000-space parking lot with gondola access to Beaver Creek from Avon. If constructed, a gondola connection to Beaver Creek from a centralized parking facility would create an opportunity for Avon to create a multi-modal facility (Town of Avon, 1996). A gondola or aerial tram could be constructed on private lands and within the existing ski area boundary on National Forest System lands that are currently allocated the 8.25 management prescription.

MINTURN/VAIL

Minturn is centrally located between Vail and Beaver Creek ski areas. Several opportunities exist to change how Minturn is linked to Vail and Beaver Creek ski areas and other adjacent resort communities. Currently, the only access during the winter season between Minturn, Vail, and Beaver Creek is by automobile on congested and often icy roads. Minturn revised its community plan in August 1998 with an increased emphasis on potential connections to the ski areas. The Game Creek Draw is located at the north end of Minturn and the Two Elk drainage is at the south end. Both the Game Creek and Two Elk areas are mentioned in this community plan. For the Game Creek area, Minturn's plan notes, "the possibility of ski area access expansion into Game Creek should be diligently monitored. A proactive community-oriented planning process should be undertaken in conjunction with the joint funding planning project referred to in Resolution No. 2, Series 1993, in order to elicit community desires and encourage community awareness." In the Two Elk area, "... the possibility of ski area access expansion into this area should be investigated and policies developed to anticipate this possibility" (Town of Minturn, 1998). The language in the community plan indicates that planners have considered the future possibility of linking the town directly to Vail Mountain via an aerial tramway in either the Game Creek drainage or the Two Elk drainage. Such a proposal is likely to generate considerable debate within local communities before any consensus is reached. Because any aerial connection between Minturn and Vail Mountain will cross National Forest System lands, potential alignments are displayed within the range of alternatives.

MINTURN/BEAVER CREEK

Linking Minturn with Beaver Creek via an aerial transportation system may significantly increase real estate values and commercial opportunities for residents of Minturn. Minturn has potential to be viewed as a fourth ski-to village within the Beaver Creek, Bachelor Gulch, and Arrowhead complex. The value of using aerial trams to transport skiers between key locations at Vail was conceived during initial planning phases in the early 1960s, prior to the construction of the ski area or Interstate 70. One alternative identified by Vail's early pioneers was an aerial transportation corridor between a parking area located on the top of Shrine Pass (west of Vail Pass) and Vail Ski Area. A new portal originating from Shrine Pass could drastically reduce skier traffic on Interstate 70 on the west side of Vail Pass. As traffic and parking problems have increased within the Vail, Minturn, Avon, and Arrowhead resort communities, the need to consider alternative solutions such as new portals and aerial trams also has increased.

COPPER MOUNTAIN/BRECKENRIDGE

The roundtrip driving distance between Copper Mountain and Breckenridge is 32 miles. An aerial tram between these resorts has potential to reduce annual ground miles driven by thousands of miles. Localized traffic congestion, parking problems, and air emissions from automobiles may be substantially reduced as a result. Sightseeing opportunities could also be provided by a lift in this location during the summer season and evenings. Access to Breckenridge from Copper Mountain as new portal to the mountain has potential to decrease automobile traffic and congestion in the Town of Breckenridge. If an aerial tram were constructed in this location, Denver residents could stay on Interstate 70 until the Copper Mountain portal and then access both Copper Mountain and

Breckenridge from this unified location. Skiers, tourists, and workers could move between these two locations more easily.

BRECKENRIDGE/KEYSTONE

Driving distance between Breckenridge and Keystone could be considerably shortened if a new portal was developed between Keystone and Horseshoe Gulch. Skiers have potential to be transported between Breckenridge and Keystone more quickly, conveniently, and at lower costs if there was a shuttle bus between the Town of Breckenridge and a new Horseshoe Gulch portal connecting South Peak at Keystone with Breckenridge's Horseshoe Gulch. A new aerial tram access portal in this location has potential to more quickly spread out the total number of skiers at Keystone Ski Area onto all of the available terrain. Skier access and resort services are currently only provided on the north side of Keystone Mountain. A portion of the skiers currently accessing Keystone Mountain from the existing base area could enter the mountain from the south if an aerial tram was constructed in this location. A new portal to Keystone Mountain providing access from the south would reduce pressure on the existing front-side ski lifts and trails in the morning, provide a more uniform distribution of skiers throughout the day, and reduce skier traffic on primary skier egress trails in the evening if a portion of the skiers lodged at Breckenridge were transferred to and from Keystone via a new portal in this location. This access point would be particularly convenient for skiers originating from lodging units in Breckenridge.

ARAPAHOE BASIN/INDEPENDENCE

Arapahoe Basin and Independence Mountain could be connected with ski lifts at the base of both mountains. A gondola between Montezuma Basin on the south side of Arapahoe Basin and the Snake River drainage would eliminate the need for many skiers to drive to Arapahoe Basin's existing base area near the summit of Loveland Pass and would provide an alternative portal to the existing mountain. A new portal in the Snake River drainage would reduce the amount of parking needed at Arapahoe Basin and make it more convenient for resort guests staying at lodging units at Keystone to access Arapahoe Basin as an alternative skiing opportunity. In 1984 the Forest Service allocated the south side of Arapahoe Basin and north side of Independence Mountains the 8.25 management prescription for skiing. It was assumed Montezuma Bowl and Independence Mountain would eventually be developed for skiing and connected by ski lifts originating in the Snake River drainage, thus providing a skiing connection without creating additional roads or need for private land development. Commercial development of the effected private lands in the Snake River drainage is not necessary to complete the lift connection. The opportunity to link two ski areas together would provide a unique winter recreation experience that is highly popular in the European Alps but seldom available at North American ski resorts.

Environmental consequences

GENERAL EFFECTS

Table 100 summarizes the potential aerial transportation corridors on the White River National Forest by alternative.

Table 100
Potential aerial transportation corridors

County	Alternative			
	Acres	Alt C	Alt E	Alt F
Summit County				
<i>Frisco/Peak One</i>	65	-	Yes	-
<i>Frisco/Breckenridge via Miner's Creek</i>	344	-	Yes	-
<i>Copper Mountain/Breckenridge via Peak 6</i>	281	Yes	-	-
<i>Keystone/Swan Valley via Horseshoe Gulch</i>	366	Yes	Yes	-
Eagle County				
<i>Vail Pass/Vail via Shrine Pass</i>	839	-	Yes	-
<i>Minturn/Vail via Game Creek</i>	217-310	-	Yes	Yes
<i>Minturn/Vail via Two Elk Creek</i>	477	-	Yes	-
<i>Minturn/Beaver Creek via Meadow Mountain</i>	483	-	-	Yes
<i>Eagle-Vail/Beaver Creek via Stone Creek</i>	159-163	-	Yes	Yes
Pitkin County				
<i>Buttermilk to Aspen Highlands via Maroon Valley</i>	75	Yes	-	Yes

Note: Alternatives B, D, I, and K are not displayed as they allocate no acreage to MA 8.31.

Aerial transportation systems across National Forest System lands have potential to significantly reduce travel times between key locations. The number of miles driven per year between resorts could be reduced by thousands of miles in some locations if aerial trams were allowed. **Table 101** shows the number of acres allocated to the 8.31 management area prescription for aerial transportation corridors, by county and alternative. **Table 102** shows the number of roundtrip driving miles between locations that could be connected by aerial transportation corridors. Although aerial trams appear to have potential benefits from a transportation standpoint, they also have potential to stimulate development of private lands, impact scenery, and disturb wildlife.

Table 101
Acres allocated to management area 8.31, by county and alternative

County	ALTERNATIVE						
	B	C	D	E	F	I	K
Eagle	0	0	0	1,672	956	0	0
Garfield	0	0	0	0	0	0	0
Pitkin	0	75	0	0	75	0	0
Summit	0	346	0	1,076	366	0	0
Total	0	421	0	2,748	1,397	0	0

Table 102
Number of roundtrip miles on existing roads

Route	Miles	Route	Miles
Buttermilk to Highlands	5	Tenmile	32
Horseshoe	24	Meadow Mountain	12
Two Elk	16	Vail Pass	24
Miner's Creek	8	Stone Creek	2
Game Creek	12	Frisco	4
		Total	139

Table 103 summarizes other locations on the White River National Forest where some existing ski areas could be connected with new portals, other ski areas, or adjacent towns. These sites are National Forest System lands allocated the 8.25 management prescription. Other facilities in addition to aerial trams, such as ski trails, roads, catwalks, parking, and ski lifts may also be authorized in these locations in the following alternatives.

Table 103
Potential Skiing Connections by Alternatives Allocated 8.25

County	Alternative			
	Alt B	Alt C	Alt E	Alt F
Summit County				
Keystone/Arapahoe Basin via Independence Mountain	Yes	Yes	Yes	Yes
Copper Mountain/Breckenridge via Peak 10	-	Yes	Yes	-
Eagle County				
Beaver Creek/Minturn via Meadow Mountain	-		Yes	-
Pitkin County				
Buttermilk/Snowmass via Owl Creek	Yes	-	Yes	-

Note: Alternatives D, I, and K are not displayed as they allocate no acreage for this potential use.

The following section discusses the locations of possible 8.31 allocations by alternative. Opportunities to address transportation and air quality concerns differ by alternative depending on the sites of 8.31 allocations. Allocation of National Forest System lands in the Forest Plan to the 8.31 management prescription does not mean that an aerial tram is approved for these locations. Future proposals for the construction of aerial trams during the lifetime of the 2002 Forest Plan will require additional site-specific analysis and separate approval. Aerial tramways may also be considered in lands allocated to the 8.25 management prescription. Ski lifts, gondolas, or trams that will eventually become part of an existing ski area operation after construction are considered ski area facilities. National Forest System lands used for these purposes are allocated the 8.25 management prescription rather than the 8.31 management prescription.

Alternative B. The need for a unique management prescription to specifically allocate areas of National Forest System lands for aerial trams was not considered in the 1984 Forest Plan. However, two locations where aerial trams could be constructed to link existing ski areas with other ski areas, new base area portals, or adjacent communities were allocated 8.25 in Alternative B as shown in **Table 103**. The two areas are Owl Creek between Buttermilk and Snowmass and Independence Mountain between Keystone and Arapahoe Basin. Also, in Breckenridge and Avon, suggestions to improve mountain access from the towns by providing additional lifts or skier egress routes were considered integral to the existing ski area operation as part of the 8.25 management prescription allocation.

Alternative C. Two aerial transportation corridors are allocated in Summit County and one in Pitkin County. In Pitkin County, a connection between Buttermilk and Aspen Highlands is allowed. An inter-modal transportation center is currently planned at the base of Buttermilk ski area. This opportunity would enhance access to Buttermilk ski area from Aspen Highlands and allow skiers parked at Buttermilk the opportunity to ski more than one mountain. In Summit County an aerial tram between Copper Mountain and Peak 6 at Breckenridge is identified as a potential opportunity. A tram in this location would reduce driving time between the two resorts and offer skiers originating from Denver a new western portal to Breckenridge ski area. Some of the existing traffic in Breckenridge would likely be attracted to the convenience of a new portal in this location. In this alternative an aerial tram could also be constructed in Horseshoe Gulch in Swan Valley to provide a closer connection between the Town of Breckenridge and Keystone. A new portal to Keystone ski area from the south would reduce skier crowding and traffic congestion during peak times at the existing Keystone portals in the Snake River. In combination with a public bus system, travel times between Breckenridge and Keystone could be greatly reduced. The current roundtrip driving distance around Dillon Reservoir between Breckenridge and Keystone is 36 miles. The roundtrip driving distance from Breckenridge to Horseshoe Gulch is 13 miles. Alternative C also allows lift and skiing connections between Keystone and Arapahoe Basin via Independence Mountain and Copper Mountain to Breckenridge via the Peak 10 saddle. These areas are allocated 8.25 rather than 8.31 because a skiing component is also considered feasible.

Alternative D. No 8.31 aerial transportation corridors are allocated in Alternative D.

Alternative E. In Summit County, aerial trams could be constructed to connect the town of Frisco with Peak One and the Town of Breckenridge with Miner's Creek with a possible connection to a proposed 1-70 monorail system. An aerial transportation corridor between Miner's Creek and Breckenridge has potential to reduce traffic on State

Highway 9. Both routes were conceived as corridors for moving people between locations that would reduce traffic on Highway 9 between Frisco and Breckenridge. Keystone could also be connected with the Town of Breckenridge via Horseshoe Gulch in Alternative E, if a new south portal were constructed to improve skier access from Breckenridge to South Peak at Keystone. In Eagle County, an aerial tram could be constructed between Shrine Pass and Vail to eliminate traffic on Interstate 70 between Vail Pass and Vail. Minturn could be directly connected to Vail ski area by ski lift if aerial trams were constructed in Game Creek between North Minturn and Lionshead, and in Two Elk Creek between Two Elk Flats south of Minturn and Blue Sky Basin. An inter-modal transportation center with auto parking, light passenger rail service, and aerial tram portal at either location could be combined on one site. At Beaver Creek, an aerial tram in Stone Creek could connect the community of Eagle-Vail directly to Beaver Creek ski area. All of the aerial transportation systems identified in Alternative E would provide pedestrian access and have the potential to reduce impacts to existing highways, parking, and village entrance portals. Some of adverse consequences may include impacts to adjacent private property owners, scenery, or wildlife. Alternative E allocates the following areas the 8.25 management prescription that also allows ski lift and skiing connections- Keystone to Arapahoe Basin via Independence Mountain; Breckenridge to Copper Mountain via Peak 10 Saddle; Beaver Creek to Minturn via Meadow Mountain; and Buttermilk to Snowmass via Owl Creek.

Alternative F. In Eagle County an aerial tram could be constructed between North Minturn and Lionshead at Vail in the Game Creek drainage. At one central location on vacant land north of Minturn near the mouth of Game Creek, auto parking, a light rail passenger train station, and an aerial tram terminal could be combined on one site as an inter-modal transportation center. Direct passenger access could be provided to Vail ski area for Minturn residents, local workers, and tourists arriving by private auto, buses, or passenger train. Persons not traveling to the ski area could also transfer between private vehicles and passenger train in this location, if this alternative were selected. Allocation of Lower Stone Creek as an aerial transportation corridor would allow direct access between Eagle-Vail and Beaver Creek. Construction of an aerial tram between the Town of Minturn and Beaver Creek would provide direct passenger access between Minturn and Beaver Creek ski area. Construction of both the Meadow Mountain and Game Creek connections, between Beaver Creek and Minturn and Vail and Minturn would allow passengers to circulate directly between Beaver Creek and Vail on aerial trams without using traditional ground transportation systems. In Pitkin County, an aerial tram could be constructed between the base of Aspen Highlands and Buttermilk ski area. Future site-specific analysis would be needed to determine if use of these tramways would result in reductions of traffic congestion and improvements to air quality. Some of the adverse consequences may include impacts to adjacent private property, scenery, and wildlife habitat.

Alternative I. No 8.31 aerial transportation corridors are allocated in Alternative I.

Alternative K. No aerial transportation corridors are allocated in Alternative K. However, based on the success of many existing European ski resorts, it is anticipated that interest in constructing aerial trams as alternative transportation systems will increase in the future in response to limited parking, increased traffic congestion, increased travel times, and a need to protect air quality at existing resorts. Although aerial trams appear to have some advantages as people movers over other transportation systems within most resort communities, no transportation authorities, city councils, boards of county commissioners, or others expressed an urgent need during forest plan scoping to construct an aerial tram within their area of jurisdiction in the near term. In the future, if a local community, county, ski area, or other transportation authority requests permission to construct an aerial tram on National Forest System lands, the forest plan will first have to be amended to identify the area of use by changing the management prescription to 8.31 or 8.25 prior to the Forest Service granting approval for this type of use. All proposals for aerial trams not approved in previous documents are analyzed in site-specific NEPA documents. Ski area facilities authorized under the 1986 Ski Area Permit Act are confined to the 8.25 or 8.31 management prescriptions exclusively and not issued within areas allocated to other management prescriptions.

Local citizens expressed concerns about construction of aerial trams in some locations due to perceived negative impacts to wildlife, scenery, and other natural resources, and disturbances to local residents that may occur as a result of construction of these types of facilities. Local EPA representatives were generally dismissive about the advantages of aerial trams as transportation and air quality solutions. In comparison with other transportation systems, most aerial trams have low hourly capacities. They are also expensive to construct and operate. In most of the areas allocated the 8.31 management prescription in the forest plan alternatives, the majority of use is expected take place during the winter season when the resort communities are most highly populated.

For most regional, national, and international tourists, travel time and travel convenience between airports, resorts, train and bus stations, parking areas, and lodging units are part of the overall recreational experience. Tourists that have a bad experience related to transportation and parking at one resort may favor other resorts for future visits. Resort towns that provide convenient pedestrian access to, from, and between key locations at their resorts are more likely to provide a better experience for tourists, workers, and residents, and be favored over other resorts that are congested, crowded, or polluted with automobile exhaust. In communities with pressing local ground transportation needs, such as worker commuter traffic and general life needs of locals such as getting to schools, grocery stores, Denver, and places of employment and entertainment, aerial lifts may contribute little practical capacity due to low volumes and fixed routes. In the future, most resort communities will need to address all of their transportation needs in a broad regional or county context to take advantage of the best opportunities and systems wherever they can be found. In addition, if the skiing portion of the overall number of annual riders on an aerial tram is low, there is little incentive for ski area operators to fund expensive or exclusive aerial trams needed to resolve tangential community transportation issues.

In most locations, it is the resort towns and counties that must assume responsibility for identifying transportation needs, solving regional and community transportation issues, and perhaps funding or operating a more diverse group of mass transportation systems. When the preponderance of users is non-skiers the 8.31 management prescription is appropriate, especially in locations where aerial trams are permitted to towns, public or private transportation companies, or entities other than ski areas. The 8.31 management prescription is also appropriate when the amount of land needed to construct an aerial tram is limited to a narrow right-of-way and there is no skiing component associated with it. The related 8.25 management prescription is appropriate if the proposed aerial tram is owned or operated by a ski area authorized under the 1986 Ski Area Permit Act. In contrast to the 8.31 management prescription that is specifically justified based on transportation needs, the intent of the 8.25 management prescription is to provide enhanced winter recreation experiences.

DIRECT AND INDIRECT EFFECTS

Direct and indirect effects from aerial trams occur only in Alternatives C, E, and F. Alternatives B, D, K, and I, do not allocate any acres to the 8.31 management prescription.

Effects on aerial transportation corridors from wildlife management

Potential impacts from wildlife management practices include seasonal restrictions on the timing of construction, changes to normal daily operations, and timing restrictions to accommodate threatened, endangered, and sensitive species. The construction and operation of aerial trams may have less effect on big game species than do traditional roadway systems where collisions between automobiles and animals are a growing problem.

Effects on aerial transportation corridors from landownership

Normally, a key concern of adjacent landowners is the effects to private property. Some of these concerns are increased noise and visible motion in the landscape, reduction in property values, and a loss of privacy, solitude, or deterioration of the ambience of the landscape setting. Residents living immediately adjacent to potential terminal sites may oppose future development of aerial trams in their backyard. Private land owners may have the ability to prevent actions supported by the community from taking place. Other landowners may support development of an aerial tram if construction of the facility will increase their property values or enhance development opportunities. If construction of an aerial tram creates new incentives for landowners to develop adjacent private lands, construction of an aerial tram may result in increased urbanization of those lands.

Effects on aerial transportation corridors from scenery management

Some mitigation measures required to protect National Forest scenery may increase construction or operating costs or change the configuration or exterior appearance of aerial trams. Examples include re-vegetation-of disturbed sites, design and shaping of openings in forested areas caused by tree removal, limits on tower heights, location of tramway alignments, type and appearance of exterior materials and colors for structures to reduce visibility, and the recommended placement of associated utilities underground. From a positive standpoint, aerial trams in some locations may have potential to provide new quality opportunities for viewing national forest scenery.

CUMULATIVE EFFECTS

A need for clean non-polluting new mass transportation systems is likely to increase over time in all alternatives. In many locations, the lack of alternative pedestrian transportation systems will lead to increased traffic congestion, decreased levels of service, crowded highways, high-priced parking, and more traffic emissions. Because no 8.31 aerial transportation corridors were allocated in Alternative K, future proposals for aerial trams on the White River National Forest will require an amendment to the 2002 Forest Plan before facilities of this type can be authorized. Many of environmental effects associated with aerial trams, such as increased urbanization of adjacent lands, are likely to occur on private lands outside the jurisdiction of the Forest Service.

Scenery

Some people may consider visible changes to the landscape resulting from vegetation removal or structures as negative. On the other hand, aerial trams may also provide new opportunities for viewing national forest scenery.

Wildlife

Wildlife management concerns may include restrictions on the timing of construction of gondolas and tramways, limitations on the length of use seasons, special treatments of vegetation to improve habitat conditions for wildlife, change in span distances between towers, and limitations on the heights and locations of tramway components. In some locations the use of gondolas and trams may have reduced effects to big game animals compared to traditional ground transportation systems. In some locations aerial trams may increase opportunities to view wildlife.

Population Growth

The cumulative effect of regional population growth on aerial tramways is an increased demand for all forms of transportation. In the past decade regional populations have increased rapidly while very few improvements to existing road systems between urban centers and Colorado's ski areas have been completed. Rapid increases in summer visits, lodging, and retail sales are key evidence of the attractiveness and popularity of ski areas and mountain communities.

Tourism Promotion

Tourism promotion by the State of Colorado, local ski towns, media, communities, counties, event organizers, sponsors, realtors, chambers of commerce, and individual business owners helps generate a higher awareness of the need for better transportation systems, some of which may need to occur on National Forest System lands. Private businesses and resort communities will continue to promote tourism and encourage visitation to ski areas and their communities, regardless of whether aerial tramways are constructed on National Forest System lands. Alternative E was developed in response to tourism as the primary management theme for public lands. Cumulative effects would be highest in Alternative E because tourism would be encouraged through partnerships with the private sector, resort operators, special user groups, and communities, and more opportunities would be provided on National Forest System lands than in the other alternatives.

Air quality

The effect of air pollution requirements will be an increased awareness about the advantages of reducing traditional ground-based transportation systems in favor of aerial systems. Alternatives that attempt to meet community and ski area objectives for air quality by providing new lift portals, parking, mass transit, and aerial trams to connect key locations at ski areas will have the fewest effects on air quality. In some alternatives, there may be a significant effect on the selection of appropriate community transportation systems, land use plans, and the development of private lands adjacent to National Forest System lands. Alternatives that require forest visitors to drive the fewest miles in personal automobiles will have the fewest effects to air quality. Alternatives E and F allow new mountain access points to some existing mountains, new aerial transportation systems for connecting selected existing ski areas, and encourage mass transportation solutions. Air pollution related to ground-based transportation systems is likely to be more evident in alternatives which do not allocate National Forest System lands for alternative transportation systems.

Private land values

Aerial transportation corridors might result in high competition for acquisition of adjacent lands for real estate development and higher costs to acquire them. Real estate prices are likely to be highest on lands located nearest to primary portal locations. Competition for the ownership of private lands adjacent to mountain portals could easily raise prices to levels beyond which they could reasonably be acquired for public purposes. Beyond certain price levels, opportunities to develop new portals for public aerial transportation systems would be lost forever. Opportunities to construct gondolas and trams across National Forest System lands could also be lost forever, if other competing uses were constructed on private lands within potential easements or on potential terminal sites.

Topic 3, Part 4

Scenery management

Introduction

Abstract

Scenic resources vary by location; by natural features such as vegetation, water features, landforms and geology; and by human-made elements. Scenic forest settings contribute to all recreational experiences. Benefits derived from scenic settings include identity, self-image of communities and individuals, and enhanced quality of life—including the conservation of the positive cultural landscape. The composition of these attributes is what gives a landscape its character or image.

Summary

Scenery is a forest resource. Sightseeing, driving for pleasure, and outdoor photography are among the nation's leading recreational activities, and public demand for them is expected to continue. The **Scenery Management System (SMS)** is used by the Forest Service to determine the relative value and importance of scenery on National Forest System lands. The system is used in the context of ecosystem management to inventory and analyze scenery, assist in developing natural resource goals and objectives, monitor scenic resources, and ensure that attractive landscapes are sustained for the future.

SMS provides a framework in the context of ecosystem management to inventory and analyze scenery on National Forest System lands, to assist in establishment of overall resource goals and objectives, and to monitor scenic resources. This framework ensures that landscapes and other visual resources are protected for future enjoyment.

Managing for scenic quality benefits the regional economy in several ways. Properties that offer scenic views command much higher prices than similar properties without them.

Tourism plays a major role in the economy of western Colorado, and the region's outstanding scenery is a key attraction. Viewing scenery is considered to be the nation's most popular outdoor activity, and in 1997, 1,037 million sightseeing excursions were made to national forests throughout North America (Cordell 1997).

In total recreation visits, the White River National Forest ranks among the top five national forests in the U.S., and the forest's landscapes are one of its main amenities. Providing a natural-appearing, scenic landscape is therefore an important element of forest management.

Management of multiple resources of the national forest can alter scenic resources. Such activities as timber management, mining, oil and gas extraction, roads and trails, campgrounds and picnic areas, utility corridors, fire management, livestock grazing, and ski areas can change the character of natural landscapes. Therefore, the effects these activities and facilities may have on associated scenic resources are relevant for consideration.

Key indicators

- Scenic integrity levels
- Acres allocated to management areas 4.2 and 4.23
- Scenic integrity levels in utility corridors
- Acres of natural-appearing landscapes

Legal and administrative framework

- The **National Environmental Policy Act** (1969) sets forth a national policy for the environment that provides for the enhancement of environmental quality. It states that it is the “continuing responsibility of the federal government to use all practicable means to assure for all Americans, aesthetically and culturally pleasing surroundings.” NEPA directs agencies to develop practicable methodologies for scenery management of “aesthetically and culturally pleasing surroundings.” It also requires “a systematic and interdisciplinary approach which will insure the integrated use of the natural and social sciences and the environmental design arts into planning and decision-making which may have an impact on man’s environment.”
- The **Wilderness Act** (1964) directs that a designated wilderness area be managed to retain its primeval character and influences, in its natural condition, with the human imprint in substantially unnoticeable form.
- The **Wild and Scenic Rivers Act** (1968) stipulates that the outstandingly remarkable scenic values of rivers eligible or suitable for inclusion in the system be carefully managed. Any management activities that could negatively affect the “outstandingly remarkable” scenic resources should not be conducted.
- The **National Trails System Act** (1968) states that trails should be established within scenic areas and along historical travel routes of the nation, which are often more remotely located.
- The **Forest and Rangeland Renewable Resources Planning Act** (1974) provides direction to conduct aesthetic analysis and assess the impacts on aesthetics of timber harvesting. It also provides the framework for natural resource conservation.
- The **National Forest Management Act** (1976) directs that the preservation of aesthetic values be analyzed at all planning levels. Part 219.21 requires visual resources to be inventoried and evaluated as an integral part of evaluating alternatives in the forest planning process, addressing both the landscape’s visual attractiveness and the public’s visual expectations.
- The **Surface Mining Control and Reclamation Act** (1977) states that “a surface area may be designated unsuitable for certain types of surface coal mining operations if such operations will result in significant damage to important aesthetic values and natural systems.”
- The **Public Rangelands Improvement Act** (1978) declares “Unsatisfactory conditions on public rangelands reduce the value of such lands for recreational and aesthetic purposes.”

Affected environment

INTRODUCTION

General description The White River National Forest provides a setting for spectacular scenery in the heart of the Rocky Mountains, with a wealth of landscapes, vegetation, and water features that range from a river canyon at about 5,800 feet of elevation to majestic mountain summits towering above 14,000 feet. The scenic qualities of the forest attract thousands of visitors every year. Foothills, mountains, plateaus, alpine peaks, and canyonlands provide a diversity of topography. Shrublands and grasslands, spruce-fir forests and aspen stands, meadows, wetlands, and alpine tundra form the vegetative mosaic of the forest. Thousands of small lakes, ponds, and streams are scattered across these lands. An aesthetic recreational setting is provided by the forest's large reservoirs, which include Green Mountain, Dillon, Homestake, and Ruedi. Major streams and rivers flowing through the national forest include the Colorado, Eagle, White, Roaring Fork, Fryingpan, Blue, and Crystal.

Sweeping panoramic vistas can be found at numerous locations on the forest. Distinctive features of the landscape are experienced at a smaller scale. This diversity of scenery varies from remote backcountry views that only a few visitors ever see to the international destination of the Maroon Bells, one of the most photographed scenes in the nation.

The eight wilderness areas managed by the White River National Forest contain some of the most outstanding natural landscapes in the Rockies. Many of these sites were also popular with Colorado's early settlers and pioneers. Thousands of people, for example, made religious pilgrimages to Shrine Pass to view or to climb the Mount of the Holy Cross, then the area's most revered attraction. Today, the Trappers Lake area of the Flat Tops Wilderness is known as the "Cradle of Wilderness" because this is where the concept of wilderness was conceived. In 1919, the magnificent scenery of the lake and surrounding area sparked the beginning of the modern wilderness preservation movement when Arthur Carhart, a Forest Service landscape architect, proposed that it not be developed as proposed, but rather that it be kept in its natural state for perpetuity for future generations to enjoy. This was a bold move in a period of time when the national forests were primarily used as places for cutting timber, grazing, mining, building new roads and trails, constructing dams and new developed recreation facilities, and places for building recreation summer homes, as originally proposed for the lands surrounding Trappers Lake. Carhart's efforts paid off and the Flat Tops was shortly thereafter designated an official Primitive Area by Congress. The Flat Tops was later designated as one of America's unique wilderness areas. Carhart achieved his goal.

Three modern scenic byways are on the national forest. The Flat Tops Centennial Byway over Ripple Creek Pass, Top of the Rockies, and the West Elk Scenic Loop over McClure Pass provide sightseers with exceptional views of the forest's scenic backdrop. Highway 82 over Independence Pass is the only scenic road historically designated by the State of Colorado.

Existing condition The SMS involves identification of scenic components as they relate to people. These components are mapped and assigned a value to generate SMS inventories, which then are used by planners to assist them in integrating scenic integrity objectives with ecosystem management. The five components of SMS implementation are:

- Landscape character description;
- Existing scenic integrity;
- Scenic attractiveness;
- Constituent analysis/visibility analysis; and
- Scenic classes.

Landscape character description **Landscape character** creates a “sense of place” and describes the image of an area. The ecological mapping unit used to describe the White River National Forest is the *subsection* (see FEIS Volume 3, Appendix E). An objective description of the combination of physical, biological, and human elements found in the subsection is combined with identified landscape character attributes to develop a landscape character description. The description provides the frame of reference for defining the scenic attractiveness classes and existing scenic integrity of the landscape by showing what makes each landscape identifiable or unique, including cultural landscapes. This document is included as Appendix P.

Existing scenic integrity The landscape character description is used as a reference for the **existing scenic integrity** (ESI) of all lands. ESI indicates the degree of intactness and wholeness of landscape character, and helps locate and rank areas in need of scenic rehabilitation. It serves as a benchmark for monitoring landscapes to assess changes associated with planned management activities. Conversely, ESI is a measure of the degree of visible disruption of landscape character. A landscape with very minimal visual disruption is considered to have high ESI. Landscapes with increasingly incompatible relationships among scenic attributes are viewed as having diminished ESI.

Six terms are used to describe the levels of existing scenic integrity and proposed scenic integrity as well as scenic integrity objectives. These levels are expressed and mapped as follows:

- 1) **Very high**—The valued landscape character is intact with only minute if any deviations. The existing landscape character and sense of place is expressed at the highest possible level.
- 2) **High**—The valued landscape character appears intact. Deviations may be present but must repeat the form, line, color, texture, and pattern common to the landscape character so that they are not evident.
- 3) **Moderate**—The valued landscape character appears slightly altered. Noticeable deviations must remain visually subordinate to the landscape character being viewed.
- 4) **Low**—The valued landscape character appears moderately altered. Deviations begin to dominate the valued landscape character being viewed, but they borrow valued attributes such as size, shape, edge effect, and pattern of natural openings, changes in vegetation types, or architectural styles outside the landscape being viewed. They should not only appear as valued character outside the landscape being viewed, but they should be compatible or complementary to the character within.

5) **Very low**—The valued landscape character appears heavily altered. Deviations may strongly dominate the valued landscape character. They may not borrow from valued attributes such as size, shape, edge effect, pattern of natural openings, changes in vegetation type, or architectural styles within or outside the landscape being viewed. However, deviations must be shaped by and blend with the natural terrain so that elements such as unnatural edges, roads, landings, and structures do not dominate the composition.

6) **Unacceptably low**—The valued landscape character being viewed appears extremely altered. Deviations are extremely dominant and borrow little if any form, line, color, texture, pattern, or scale from the landscape character. Landscapes at this level of integrity need to be rehabilitated. This level should only be used to inventory existing integrity. It must not be used as a management reference.

Table 104 shows the existing scenic integrity of the White River National Forest in terms of acres in each rating.

Table 104
Existing scenic integrity of the White River National Forest

Existing scenic integrity	Acres	% of forest
<i>Very high</i>	889,000	36
<i>High</i>	549,500	22
<i>Moderate</i>	950,700	38
<i>Low</i>	38,600	1.7
<i>Very low</i>	46,700	2
<i>Unacceptably low</i>	7,300	0.3

Source: White River National Forest GIS data

Scenic attractiveness

Scenic attractiveness is the primary indicator of the scenic beauty of a landscape and of the positive responses it generates for people. It helps determine which landscapes are valued for scenic beauty, based on commonly held perceptions of the beauty of landforms, vegetation pattern and composition, water characteristics, land-use patterns, and cultural features. Scenic attractiveness indicates varying levels of long-term beauty of the landscape character. The two scenic attractiveness classifications are (1) Class A—*distinctive*, and (2) Class B—*typical*.

In **Class A** areas (Figure 46), landforms, vegetation patterns, water characteristics, and cultural features combine to provide unusual, unique, or outstanding scenic quality. These landscapes have strong positive attributes of variety, unity, vividness, mystery, intactness, order, harmony, uniqueness, pattern, and balance.

In **Class B** areas (Figure 47), landforms, vegetation patterns, water characteristics, and cultural features combine to provide ordinary or common scenic quality. These landscapes have generally positive, yet common attributes of variety, unity, vividness, mystery, intactness, order, harmony, uniqueness, pattern, and balance.

Table 3-97 shows the scenic attractiveness in terms of acres in each class.

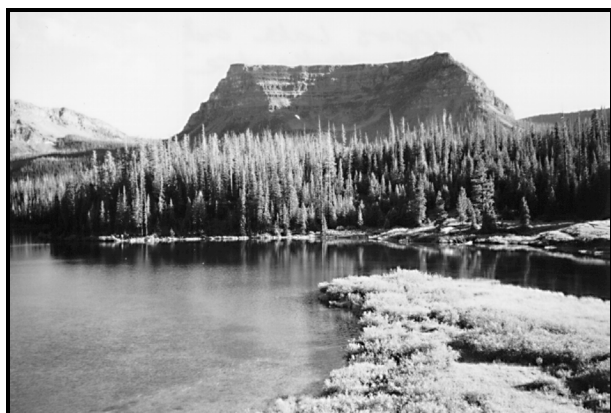
Figure 46
Examples of Class A areas



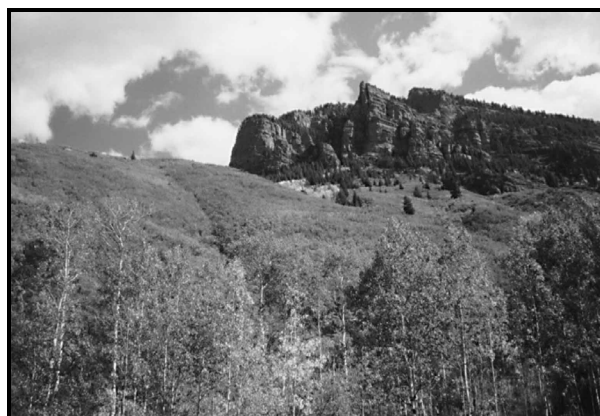
Maroon Bells



Eagles Nest Wilderness



Trappers Lake



Crystal River Corridor



Raggeds Wilderness



Hanging Lake

Figure 47
Examples of Class B areas



June Creek



South Wagonwheel



Spruce Fir Meadow

Table 105
Scenic attractiveness of the White River National Forest

Class	Acres	% of forest
A	947,990	41
B	1,338,450	59

Source: White River NF GIS data

Visibility analysis Landscape visibility consists of two parts: human values as they relate to the relative importance to the public of various scenes, and the relative sensitivity of scenes based on distance from an observer. Human values that affect perceptions of landscapes are derived from constituent analysis. Constituent analysis serves as a guide to perceptions of attractiveness, helps identify special places, and helps to define the meaning people give to the landscape. The public importance of the scenic attributes of the landscape is expressed as a concern level. Sites, travelways, special places, and other areas are assigned a concern level of 1, 2, or 3 to reflect the relative high, medium, or low importance of the area.

Seen areas and distance zones are mapped from these concern level areas to determine the sensitivity of scenes based on their distance from an observer. **Table 106** shows the distance zones and concern levels assigned to the national forest as a result of the visibility analysis.

Table 106
Visibility analysis of the White River National Forest

Distance zone—concern level	Acres	% of forest
<i>Foreground—level 1</i>	264,700	12
<i>Middleground—level 1</i>	1,324,600	58
<i>Background—level 1</i>	320,300	14
<i>Foreground—level 2</i>	188,100	8
<i>Middleground—level 2</i>	93,700	4
<i>Background—level 2</i>	20,800	1
<i>Seldom-seen areas—level 3</i>	70,200	3

Source: White River NF GIS data

Scenic classes Using the data gathered and mapped for scenic attractiveness and landscape visibility, a numerical **scenic class** value is assigned to national forest lands. The ratings 1 through 5 indicate the scenic importance of landscape areas. Mapped scenic class values are used during forest planning and project planning to compare the value of scenery with other resources.

Scenic classes represent the relative landscape value by combining distance zones, concern levels, and scenic attractiveness classes. They are a product of the inventory process that is used for analysis and forest planning purposes. Generally, scenic classes 1 and 2 have high public value, classes 3 through 5 have moderate value, and classes 6 and 7 have low value. **Table 107** shows the scenic classes of the national forest in terms of acres in each class.

Table 107
Scenic classes of the White River National Forest

Scenic class	Acres	% of Forest
1	1,053,000	42
2	1,292,900	52
3	135,700	6

Note: Scenic classes 4 and 5 both had less than 1 percent of national forest lands, so they were combined into scenic class level 3.

Source: White River National Forest GIS data

FUTURE TRENDS

Colorado is a major tourist destination area. As rapid growth in the state's population continues, more visitors will be attracted to the forest and there will be an increased demand for natural-appearing landscapes. Since 1982, the number of sightseers visiting the national forests in North America has grown by 39.5 percent, and this figure is expected to increase.

When compared to other recreation uses, opportunities to view national forest scenery are projected to generate the highest number of trips to the White River National Forest over the next 50 years. The primary activities associated with viewing scenery are sightseeing, driving for pleasure, and photography. A 1993 study, *Regional Projections of Future Demand and Potential Outdoor Recreation Shortages*, stated:

Examining the activities that are projected to have the largest gaps indicates that across all regions, a high degree of use pressure will be placed on trail and scenic resources near population centers. These are the resources that provide a primary resource base for activities, such as day hiking, backpacking, horseback riding, sightseeing, and pleasure driving. . . . For all regions resources near population centers are most important in providing effective recreation opportunities. These also are the resources that will undergo the most land conversion and use pressures as the United States population continues to grow." (Cordell, *Regional Demand and Supply Projections for Outdoor Recreation*, 1993)

In the future, demand for scenery-related activities will begin to exceed supply. **Table 108** reveals the shortage between demand and supply of scenery-related activities for the entire Rocky Mountain Region, including Colorado, Wyoming, South Dakota, Nebraska, Kansas, New Mexico, Arizona, Utah, Nevada, Idaho, Montana, and North Dakota. These activities require effective management of scenic resources into the future to meet public demand.

Table 108

The shortage between demand and supply of scenery-related activities for the entire Rocky Mountain Region, in millions of visitors

Activity	Year				
	2000	2010	2020	2030	2040
<i>Sightseeing</i>	4	10	17	26	39
<i>Driving for Pleasure</i>	5	9	14	21	29
<i>Photography</i>	8	17	26	40	57

Source: Cordell et al. 1993

Environmental consequences

GENERAL EFFECTS

The White River National Forest has a variety of landscape character types created by glaciers, rivers, continental uplifting, mass wasting, and volcanism. The forest contains many areas of outstanding scenic beauty unique to the Rocky Mountain Region. The American public generally recognizes that National Forest System lands with exceptional scenic resources are valuable public assets that should be protected and managed for the enjoyment of future generations.

To some degree most landscapes on the White River National Forest contain some degree of alteration from past human activities, including fire, mining, logging, and ranching, even though many of these changes are not readily visible to most forest visitors. The most visible effects to scenery from past human activities have generally been caused by the removal of vegetation in patterns that contrast with the natural forms, lines, colors, and textures of the natural landscape.

Today, typical routine forest management activities that require the removal of vegetation include the construction of developed recreation facilities, power lines, ski areas, and timber sales. Other activities that require alteration of landforms often result in more permanent changes to the landscape. Examples of these types of activities include roads, trails, buried utilities, gas wells, mines, reservoirs, antennas, and gravel pits. Structures such as power lines, antennas, buildings, fences, water tanks, and other structures located on National Forest System lands also have potential to be noticed and create negative visual changes.

The quality of the visitor experience may be affected by the condition of the forest environment she or he encounters depending on the number and types of manmade activities and the degree of deviation from the landscape's inherent natural condition that has taken place. In the future, each forest plan alternative will continue to affect landscape character to varying degrees over time based on the amount of change from the natural condition that is allowed. Alternatives that enhance or protect the inherent naturalness of scenic landscapes on the highest number of acres are most likely to provide

the greatest public benefits and develop the most appreciation from a scenic resources standpoint.

Scenery is an integral component of all national forest settings and must be considered in the analysis for all activities on every acre of National Forest System land. Environmental analysis is usually a tiered planning process. Each project when proposed at the site-specific level must be analyzed in detail to determine compliance with forest plan standards and guidelines, as well as to determine if additional mitigation measures specific to the project are also applicable.

The number of acres allocated to each management prescription varies by alternative, based on scenic integrity objectives that range from very high to very low. Management areas 4.2—scenery and 4.23—scenic byways, scenic areas, vistas, or travel corridors were specifically developed with a scenic component in mind. Needed infrastructure can be built within each management prescription area as long as the scenic integrity objectives are met. In both management prescriptions the scenic integrity objectives range from very high to low and the overall intent in these management prescriptions to provide opportunities for the enjoyment of national forest scenery. **Table 109** identifies the number of acres allocated to each of these two management prescriptions.

Table 109
Acres allocated to management areas 4.2 and 4.23, by alternative

Management area	ALTERNATIVE						
	B	C	D	E	F	I	K
4.2	0	2,183	2,339	2,019	0	0	7,400
4.23	0	15,750	13,542	8,704	12,800	30,948	6,050
Total acres	0	17,933	15,881	10,723	12,800	30,948	13,450

Source: White River National Forest GIS data

Proposed scenic integrity levels for each alternative

The scenic integrity levels (SILs) for each alternative (**Table 110**) are based on the theme, management areas, and composite scenery base map. Scenic class and existing scenic integrity level inventories were merged to create the composite scenery base map. In SMS terms, this combination of inventories represents the existing condition of the national forest, and provides a framework for analyzing the environmental consequences of the revised forest plan.

Each management area contains a range of proposed scenic integrity levels as described earlier in the Affected Environment section. The proposed scenic integrity levels vary by alternative based upon the allocation of the management areas. Each management area has a compatible range of SILs. Each alternative has a different amount of SILs because of the difference in the way the management areas were allocated.

In the 2002 Forest Plan, the proposed scenic integrity levels identified in Alternative K become the scenic integrity objectives that will serve as the guide for implementing the Forest Service scenery management system.

The DEIS for the forest plan revision displayed the 19,000 acres for utility corridors. The scenic integrity levels within each utility corridor have been defined and are included in Table 110. The forest land-status has also been updated between the DEIS and FEIS, which displays changes in some of the acreage that were previously unavailable.

Table 110
Acres and percent of proposed scenic integrity levels, by alternative

Level	ALTERNATIVE													
	B		C		D		E		F		I		K	
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Very high	465,000	20	481,000	21	473,000	21	485,000	21	434,000	22	509,000	22	544,000	24
High	499,000	22	590,000	26	476,000	21	640,000	28	420,000	18	670,000	29	458,000	20
Moderate	755,000	33	766,000	36	750,000	33	848,000	37	737,000	32	830,000	36	705,000	31
Low	529,000	22	407,000	18	541,000	24	268,000	12	650,000	28	203,000	9	533,855	23
Very low	42,000	2	43,000	2	47,000	2	45,000	2	45,000	2	45,000	2	46,000	2

Source: White River National Forest GIS data

Table 111 shows the forest-wide acreage and percent of each scenic integrity level. Areas identified as unacceptably low in the existing scenic integrity inventory need to be rehabilitated.

Table 111
Acres of existing scenic integrity levels forest-wide

Existing scenic integrity	Acres	% of forest
<i>Very high</i>	889,000	36
<i>High</i>	549,500	22
<i>Moderate</i>	950,700	38
<i>Low</i>	38,600	2
<i>Very low</i>	46,700	2
<i>Unacceptably low</i>	7,300	>1

Source: White River National Forest GIS data

The objective of SMS is to inventory scenic resources and describe methods for their protection. Opportunities for viewing scenery and impacts to scenic resources vary depending on the alternative selected. Each Forest Plan alternative has the potential to change the scenic character of the forest to varying degrees. Each alternative assigns a different number of acres to each management prescription. Management prescriptions

determine where new roads, trails, recreation facilities, and observation areas for viewing national forest scenery can be constructed. They also identify the standards and guidelines used for facility construction within each management prescription. Some management prescriptions allow more motorized access, driving for pleasure, and developed recreation opportunities than others. Other management prescriptions are designed to provide more backcountry recreation opportunities for hikers and non-motorized users. Some management prescriptions may require that roads, trails, or other existing facilities be closed to motorized or mechanized users.

Table 112 displays the extent of rehabilitation needed by alternative to reach a higher scenic integrity level. There is no time-frame allocated for the rehabilitation. Rehabilitation will occur as the forest budget allows and as project opportunities arise, depending on what management activities are proposed.

A complete table of areas that would need to be rehabilitated to achieve the proposed scenic integrity levels for each alternative is provided in Appendix Q.

Table 112
Acres of rehabilitation of unacceptably low areas to manageable scenic integrity levels

Level	ALTERNATIVE						
	B	C	D	E	F	I	K
Very high							
High							
Moderate		7,000	7,000	5,000		7,000	5,000
Low				2,000	7,000		2,000
Very low	7,000						

Source: White River National Forest GIS data

Under **Alternative B**, management of the forest would maintain its present course except for implementation of SMS, revision of the allowable sale quantity ASQ for timber, and the use of updated inventories of other resources. This alternative has the potential to moderately alter scenic resources.

The emphasis on recreation in **Alternative C** increases the importance of high-quality scenery as a component of the recreation experience and setting. This alternative limits management activities to areas that have been previously managed. This would help minimize the impacts on forest scenery in areas that currently are natural-appearing. This alternative, along with Alternative E, has the lowest ASQ and overall vegetation management. Some areas are recommended for wilderness. Several special interest areas and research natural areas will be established for ecological, biological, and cultural/social resources. These management area designations will maintain natural appearing landscapes. This alternative has the potential to moderately alter scenic resources.

Alternative D emphasizes wildlife habitat improvement and biological diversity, including forest health. To accomplish this goal, the forest would have lower mileages of open roads. Recreation use would be concentrated, and ski areas limited to their current

permit boundaries. ASQ would be at a moderate level. The emphasis on wildlife habitat improvement would contribute to the highest amount of vegetation treatment outside of areas that contribute to ASQ. Impacts on scenic resources may result from these projects. Under SMS, activities that improve forest health also improve forest aesthetics. This alternative has the potential to moderately alter scenic resources.

In support of tourist-based enterprises, **Alternative E** emphasizes all types of recreation opportunities. These activities occur in a variety of forest settings. The recreation emphasis in this alternative also emphasizes the importance of quality national forest scenery in order to provide quality settings. This alternative has the potential to develop the highest amount of new trails while keeping the current level of open roads. Ski area expansion would be at the highest level under all of the alternatives. Increasing the infrastructure for recreational activities would affect scenic resources because of the permanence of these facilities. This alternative has a low-to-moderate potential to alter scenic resources.

Alternative F places the highest emphasis in resource production. This alternative would allow the most timber production along with production of other resources such as livestock grazing, mineral development, and facilities to provide recreational experiences. Road miles on the forest would be similar to the current level. Total trail miles may increase. This alternative has the highest potential to alter scenic resources.

Alternative I allows for the highest level of natural processes to occur, and recommends the most wilderness and research natural areas. It has the third lowest level of ASQ and overall vegetation treatment. There also will be a reduction in the miles of roads and trails if funds are available to close roads. Alternative I most closely resembles the existing scenic integrity levels of the forest and has the lowest potential to alter scenic resources.

Alternative K provides a mix of recreational opportunities in quality settings along with sustaining the ecological capabilities of the national forest. Expansion of four season resorts may occur. Vegetation management will be concentrated in areas that have been previously developed. ASQ would be at a moderate level. The emphasis on wildlife habitat improvement would contribute to the second highest amount of vegetation treatment outside of areas that contribute to ASQ. Impacts on scenic resources may result from these projects. Under SMS, activities that improve forest health also improve forest aesthetics in order to reach the long-term desired condition of the management area. The highest amount of acreage managed under MA 4.2—scenery occurs in this alternative. Several special interest areas and research natural areas will be established for ecological, biological, and cultural/social resources. These management area designations will maintain natural appearing landscapes. This alternative has the potential to moderately alter scenic resources.

**Comparison of
alternatives**

The scenic integrity levels of very high, high, and moderate will result in a relatively natural-appearing landscape, which research has shown the public to prefer. **Table 113** displays the acres of these landscapes by alternative. All of the alternatives have the potential to alter the existing landscape in any of the scenic integrity levels. Changes in landscapes that have previously been altered usually are more acceptable than alterations made in undisturbed landscapes.

Table 113
Acres of natural-appearing landscapes, by alternative

	ALTERNATIVE						
	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
Acres	1,716,000	1,836,000	1,699,000	1,973,000	1,591,000	2,038,000	1,707,000

Source: White River National Forest GIS data

Management area prescriptions 1.11, 1.12, 1.13, 1.2, 1.5, 2.1, 2.2, 3.1, and 3.5 will maintain natural-appearing landscapes.

Prescriptions with the highest potential to affect scenic resources and existing natural-appearing landscapes are 5.12, 5.13, 5.4, 5.41, 5.43, 5.45, 8.21, 8.25, 8.31, and 8.32.

DIRECT AND INDIRECT EFFECTS

Effects on scenic resources from soil management

Soil erosion—whether caused by increased water flows or by development activities such as road construction, timber harvest, or mining—may result in a change in the scenic condition because of soil displacement and disturbance or removal of the existing vegetation. Soil erosion is a natural occurrence. Any developments or proposals for increased water yield will follow the procedures outlined in the Watershed Conservation Practices Handbook. The measures in the handbook protect the soil resource and reduce the potential to change existing scenic integrity. The effects are relatively the same in all alternatives.

Effects on scenic resources from air resource management

Deterioration of air quality may impair the visibility of scenery. However, air quality is expected to remain good over the next decade. There would be no direct effect on the visibility of the landscape in any alternative.

Effects on scenic resources from mineral and energy development

Mineral and energy exploration and the potential development of these resources could affect scenic resources in any alternative. There is little difference among alternatives in the potential to affect scenery.

Effects on scenic resources from wildlife habitat management

Habitat improvement projects have the potential to change the existing landscape. Prescribed burning and aspen regeneration may affect scenic resources. The highest amount of prescribed burning occurs in Alternatives D, C, K, and B. A moderate amount of prescribed burning occurs in Alternatives E and I. The least amount of prescribed burning occurs in Alternative F. The SMS recognizes that prescribed burning is a tool for improving forest health. As long as the prescribed fire moves the forest to the long-term desired condition of the management area, it is an accepted deviation to reach the desired

condition of the management area. Vegetation treatment in lynx habitat through the clearcutting of aspen and lodgepole stands may affect scenic resources of the area. Harvesting timber to increase forage for big game species has a potential to affect scenic resources.

The wildlife habitat emphasis of Alternative D would result in fewer roads and less motorized travel. However, it will have the greatest amount of vegetation treatment outside of ASQ, resulting in the most structural change of the forest canopy. This also places a high emphasis on prescribed fire. Alternative K has the second highest amount of potential vegetative treatments outside of ASQ. Under Alternative C, vegetation treatment would occur only in areas that have been previously managed. Alternatives E and I have a low degree of vegetation treatment. Alternative F has a high degree of vegetation treatment. The higher the degree of treatment, the greater are the potential impacts to scenery.

Effects on scenic resources from domestic livestock grazing

Depending on the intensity of forage utilization, livestock grazing may result in a landscape that appears altered. The most likely effects on scenic resources would be from seasonal trampling, overuse of bedding areas, and heavy forage use. The change to scenic resources is more evident in association with riparian areas. Structural improvements such as fences may be but are not always evident in the landscape. If not properly located, they could detract from the natural landscape. Generally improvements are small and localized and have a minor effect on the scenic quality of the surrounding area. The potential effects from livestock grazing management are similar in all alternatives.

Effects on scenic resources from noxious weeds

Forest management activities all have some level of risk of adding noxious weeds into the landscape. Although some noxious weeds are visually attractive, such as ox-eye daisy, the presence of noxious weeds is not aligned with ecological diversity or the natural landscape character. A noxious weed epidemic could change the natural patterns, and introduce non-natural colors and textures into the landscape. These changes may not always be noticeable to the average forest visitor but would be undesirable in the natural landscape character. Based on the level of management activities of each alternative, Alternatives F, D, and B have the highest potential for noxious weed infestations, while Alternatives C and E have a moderate potential; Alternatives K and I have the least potential for noxious weed infestations.

Effects on scenic resources from fire, insects, and disease

In all alternatives, natural and prescribed fires have the potential to alter the natural landscape character. Most forested stands currently are in a mature to overmature condition. Because of this, the impacts of fire, insects, and diseases will likely increase in the future with the potential to affect scenic resources.

Outbreaks of spruce beetles, mountain pine beetles, and lodgepole pine dwarf mistletoe will occur across alternatives at nearly the same rate as they do currently. These types of infestations have a high potential to affect scenic resources.

Effects on scenic resources from travel management

Alternatives B and F would require the most construction and reconstruction of roads, having the highest potential to change the existing landscape. Alternatives C, D, E, and K have a moderate potential for construction and reconstruction of roads, with a moderate potential to change the existing landscape. Alternative I has the lowest potential for construction and reconstruction of roads, with a low potential to change the existing landscape. Current levels of trail maintenance are generally sufficient to protect soil and stream banks, but there are potential scenic effects associated with erosion, multiple ‘braided’ trails, and damage to stream crossings. Development of new trails may occur in all alternatives. Road closures potentially can have both a negative and positive effect on scenic resources. Gates usually do not fit the characteristic landscape in terms of form, line, color, and texture. Recontouring roads can positively influence the forest setting by reducing contrasts in form, line, color, and texture. When road rehabilitation is necessary, consideration will need to be given to how the rehabilitation is accomplished and viewed from other roads, trails, and viewpoints.

Effects on scenic resources from utility corridors

Utility corridors have the potential to alter the characteristic landscape in all alternatives. The potential effects on scenery vary by the type and location of each corridor. A range of scenic integrity levels has been identified for each corridor in the 8.32 management area.

Effects on scenic resources from recreation management

Lands administered by the White River National Forest provide a spectrum of recreation opportunities for the public in both developed and dispersed settings. Dispersed recreation areas may be roaded or unroaded with motorized or non-motorized opportunities present. Alternatives B, E, and F emphasize roaded settings and motorized recreation. The potential for increased miles of roads in these alternatives generates a higher likelihood to change the existing landscape than in Alternatives C, D, K, and I.

Developed recreation is emphasized in Alternatives B, C, and E. Developed recreation sites can affect scenic resources. Steps can be taken to use landscape design and scenery management practices to develop recreation facilities and minimize impacts to scenic resources. Alternatives D and I promote the concentration of use in developed sites; Alternative I does not allow for additional developed sites. Alternative K emphasizes improving the quality of existing developed recreation sites, which will improve the scenic quality of the site.

Effects on scenic resources from ski areas

The removal of trees to construct ski trails and lifts, roads, utilities, and buildings may create openings in forested areas that contrast with the natural character of the landscape. Changes to scenic resources are typically less noticeable when they occur in alpine areas above treeline or in natural alpine meadows. In forested areas where developed skiing opportunities are allowed a variety of clearing methods could be used to soften the potential visual effects of skiing. Some of the techniques that can be used include partial tree clearing, thinning, glading, and designing ski trails with irregular shaped openings of

variable widths with intermittent islands. Alternatives B and E have the highest potential to alter scenic resources because they allocate the highest number of acres for skiing. Alternatives C, K, and F allocate a moderate number of acres to skiing and have a moderate effect on scenic resources. Alternatives D and I do not allocate any additional acres for skiing.

Effects on scenic resources from aerial transportation corridors

Alternatives C, E, and F allow for aerial transportation corridors to be built in several locations that would allow pedestrians to be transported to, from, or between key locations at ski areas. Generally, in forested areas it is necessary to remove trees for construction, to meet safety requirements, and conduct lift evacuations. Tree clearing methods that create linear corridors through forested areas that are visible from key viewpoints may have negative effects on scenery. Linear clearings for aerial trams may alter the appearance of some natural-appearing landscapes by creating obvious manmade changes in the landscape. In areas that are not forested and areas above treeline vegetation would not have to be cleared to construct aerial trams. The visual effects of constructing aerial trams in these locations would be less evident. In addition to providing a utilitarian transportation function, some aerial trams identified in the alternatives have potential to provide new and exciting recreation experiences for forest visitors, while providing close-up views of national forest scenery. When combined with interpretive visitor centers in the upper or lower lift terminals visitor experiences to the national forest could be even more enhanced.

Effects on scenic resources from timber management

Based on the number of acres treated in the low scenic integrity level for the first decade, the highest potential to change the existing landscape from timber harvesting would occur in Alternative F. A moderate potential for changing the existing landscape would occur in Alternatives D, K, and B. A lower potential to change the existing landscape occurs in Alternatives C, E, and I respectively.

Timber management may be used as a tool to enhance scenic resources. Opportunities may be available to create scenic vistas and to remove insect infestations and diseased vegetation. There may be opportunities to increase the types, ages, densities, and size classes of vegetation.

CUMULATIVE EFFECTS

Tourism in Colorado is partially based on visitors that are attracted to opportunities for viewing high-quality Rocky Mountain settings. As seen from many locations throughout the forest, the White River National Forest provides a scenic backdrop for tourists and residents alike. For many communities located adjacent to the White River National Forest scenery is a key attraction and source of identification for those communities. Over the long term, the management prescriptions assigned to National Forest System lands will determine the appropriate types of management activities that are allowed to occur on the forest, the degree of change that is acceptable, and to some extent the overall scenic attractiveness of the mountain communities.

Economists recognize that tourism is becoming the leading industry in many regions in the United States and in many foreign countries. In numerous communities adjacent to national forests, tourism and recreation are replacing the former leading roles of timber harvesting, mining, ranching, and farming. Scenic landscapes as recreational settings help to determine the success of recreation and tourism. (Landscape Aesthetics—A Handbook for Scenery Management, FSH 701)

Any activities detrimental to the scenic landscape—whether on National Forest System lands, private land, or other public lands—may negatively affect the quality of the tourist experience. Urbanization of private lands adjacent to the forest also has potential to affect the experience of residents and forest visitors. In many areas, housing developments are being constructed adjacent to the forest boundary on private lands. The locations, design, and exterior colors of buildings constructed on private lands have potential to negatively effect national forest scenery as seen from key public viewpoints. When buildings and other developments on private lands and management activities on National Forest System lands contrast with natural-appearing landscapes they have potential to negatively affect visitor enjoyment of national forest scenery.

In most cases, private landowners adjacent to National Forest System lands share a common desire to protect scenic values for their personal enjoyment and to enhance their real estate values. Private lands are generally more valuable when there is a scenic view of National Forest System lands from the property. Ultimately, the development of private lands adjacent to the national forest is the greatest threat to National Forest scenery when viewed from primary transportation routes and key public viewpoints. If management activities on either public or private lands detrimentally alter the overall appearance of the forest setting, property values have the potential to be reduced. When viewed together, both the real estate values of private property and the aesthetic values of public lands are likely to be increased or decreased depending how well scenic resources are protected.

Resource production such as vegetation treatment or livestock grazing may have an effect on the scenic condition of the area. Evident impacts on scenic resources are linked to permanent facilities such as reservoirs, natural gas facilities, ski areas, and campgrounds. The proposed scenic integrity levels in each alternative determine the amount of alteration of the landscape that is allowable.

Lands managed by counties, states, or other federal agencies also have potential to affect the scenic viewing experience of visitors. Management activities on other lands that do not blend into the landscape can negatively affect the experience of forest users who are viewing scenery.

TOPIC 4

Roadless area management and recommended wilderness

Introduction

Abstract

There are approximately 640,000 acres of inventoried roadless areas on the White River National Forest. Of them, 37 key areas totaling 298,000 acres have been evaluated as capable and available for recommended wilderness. Ten areas, each containing less than 500 acres, were also evaluated as capable and available for recommended wilderness. These unroaded and undeveloped areas provide the forest with opportunities to manage for potential wilderness areas, non-motorized and limited motorized recreation, and other commodity and amenity uses.

Summary

Areas that are undeveloped or roadless in nature can serve a variety of purposes depending on what is regarded as most appropriate for the site. They can be managed as research natural areas or special interest areas, used for resource production or to provide non-motorized recreation, or, if suitable, recommended as wilderness.

A current inventory and analysis of roadless areas on the White River National Forest was done during the forest plan revision process and is detailed in Appendix C of the final environmental impact statement (FEIS). The current inventory was also utilized in the National Roadless Area Conservation Rule of January 2001 (USDA 2000a).

Each inventoried roadless area was evaluated for potential wilderness recommendation, focusing on three primary criteria: capability, availability, and need. These are measures of the area's wilderness characteristics, its value relative to other uses, and its value as an additional wilderness resource at its location. Additions to the National Wilderness Preservation System are made only by Congress. During the forest planning process, national forests are required to inventory their roadless areas, evaluate the wilderness values of these areas, and recommend to Congress those areas that meet the criteria for wilderness designation.

***Note:** all acreages were computed using the forest's Geographic Information System. Although this system produces more accurate measurements than did earlier methods, acreage figures given here have been rounded. As a result, some columns in tables will not add up to the exact total shown.*

Key indicators

- Management areas, by alternative, assigned to the *entire* roadless inventory not recommended for wilderness
- Management areas, by alternative, assigned to roadless inventory rated as capable and available for wilderness but not recommended for wilderness
- Number of acres of recommended for wilderness, assigned to the roadless inventory rated as capable and available for wilderness

Legal and administrative framework

- The **Code of Federal Regulations** at (36 CFR 219.17(a)) states that: “. . . roadless areas within the National Forest System shall be evaluated and considered for recommendation as potential wilderness during the forest planning process.”
- The **Forest Service Handbook** (1909.12.7.1) directs national forests to: “. . . identify and inventory all roadless, undeveloped areas that satisfy the definition of wilderness found in section 2 (c) of the 1964 Wilderness Act.” FSH 1909.12.7 also details the means by which the capability, availability, and need for potential wilderness areas are assessed.
- The **Wilderness Act** gives the statutory definition of wilderness (Section 2(c)): “A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammelled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act an area of undeveloped federal land retaining its primeval character and influence, without permanent improvements of human habitation, which is protected and managed so as to preserve its natural conditions and which:
 - (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man’s work substantially unnoticeable;
 - (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation;
 - (3) has at least 5,000 acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and
 - (4) may also contain ecological, geological, or other features of scientific, educational, or historical value.”
- Forest Service Manual Interim Directives 2400-2001-3 and 7710-2001-2 implementing the Chief of the Forest Service’s 1230/1920 letter of June 7, 2001 regarding Interim Protection of Roadless Areas.
- Forest Service Manual Interim Directives 1920-2001-1 and 7710-2001-3.

Affected environment

INTRODUCTION

Roadless inventory

The 1984 Forest Plan did not contain a roadless area inventory. When the plan was prepared, the second *roadless area review and evaluation* (RARE II) had been completed. At the time, it was thought that this inventory would sufficiently address roadless area concerns. However, RARE II was found to be of limited accuracy and utility. Management of the unroaded areas was guided by the management area prescription assigned in the plan. The assigned prescriptions ranged in emphasis from semi-primitive non-motorized recreation to resource production. For the plan revision process, a new and more complete inventory was both needed and required to address ongoing roadless area management issues.

Each undeveloped area on the forest was identified during the inventory and marked for further study according to the following measures:

- It contains 5,000 acres or more, or
- It contains fewer than 5,000 acres but
 - (a) is manageable in its natural condition, or
 - (b) is a self-contained ecosystem such as an island, or
 - (c) is adjacent to an existing wilderness, and
- It does not contain facilities for purposes of travel by vehicles greater than 50 inches in width.

In response to public comments received after the draft forest plan was released, the study area was expanded to include all unroaded areas adjacent to wilderness, regardless of size.

Areas were excluded from the inventory if they contained reservoirs, utility corridors, electronic sites, developed recreation sites, or current mining activity. However, some improvements were deemed acceptable. If motorized trails, fences, outfitter camps, or historical mining and timber activities were present, the area still was regarded as a *physically undeveloped area*. A range of management areas is assigned the roadless inventory based on the management emphasis and resource values. The current roadless inventory is displayed in the map packet.

Recommended wilderness The roadless inventory of the forest was evaluated in terms of three aspects: *capability, availability, and need*. During the evaluation, all roadless areas were evaluated for capability. Only those found to be capable of wilderness recommendation were evaluated for availability. Only those found to be available were evaluated to determine the need to recommend them for wilderness designation. Appendix C outlines the evaluation process. The management area 1.2 is assigned to recommended wilderness.

Capability The **capability** of potential wilderness is the degree to which it contains the basic characteristics that qualify it for wilderness designation. Factors examined include environment and special features, challenge, outdoor recreation opportunities, and manageability.

Availability An area's **availability** is determined by comparing wilderness values in that location to the value of and need for other resource uses and production from the same land area.

Need The **need** for designation of new wilderness is based on comparing the value of a potential area to existing wilderness in nearby locations as well as to the National Wilderness Preservation System as a whole. This analysis considers demand for additional wilderness recreation opportunities on the forest. It also looks at the need to give certain vegetation types the protection that wilderness designation would afford.

The analysis resulted our identification of 37 key areas on the White River National Forest as capable of and available for wilderness recommendation (**Table 114**).

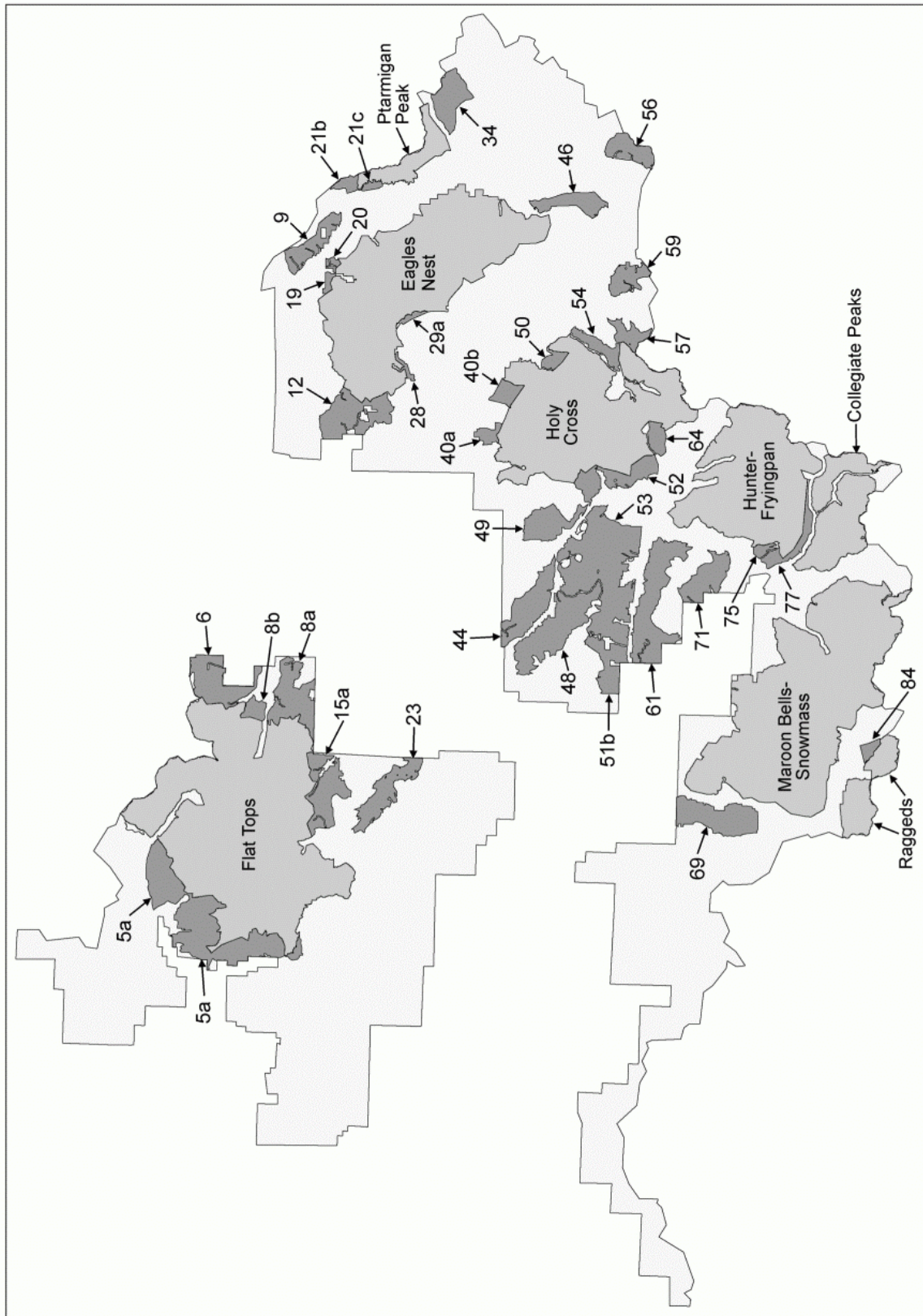
Collectively, these areas include about 298,000 acres. **Figure 48** shows the location of recommended and existing wilderness areas on the forest.

Table 114
Roadless inventory found capable of and available for wilderness recommendation

Map #	Name	Acres	Adjacent Wilderness
4	Ripple Creek Pass/Trappers Lake	600	Flat Tops
5a	Big Ridge to South Fork "A"	35,300	Flat Tops
6	Dome Peak	12,000	Flat Tops
8a	Red Dirt "A"	12,500	Flat Tops
8b	Derby	2,400	Flat Tops
9	Williams Fork	6,700	none
12	Lower Piney	13,400	Eagles Nest
15a	Sweetwater "A"	11,900	Flat Tops
19	Black Lake West	900	Eagles Nest
20	Black Lake East	700	Eagles Nest
21b	Ute Pass	1,800	Ptarmigan
21c	Acorn Creek	900	Ptarmigan
23	Deep Creek	9,900	none
28	Freedman Creek	1,000	Eagles Nest
29a	Spraddle Creek "A"	900	Eagles Nest
34	Tenderfoot Mountain	8,400	none
40a	Meadow Mountain "A"	2,100	Holy Cross
40b	Meadow Mountain "B"	3,100	Holy Cross
44	Hardscrabble	11,700	none
46	Tenmile	6,400	none
48	Gypsum Creek	18,000	none
49	Adam Mountain	8,200	none
50	Tigiwon	2,000	Holy Cross
51b	Basalt Mountain "B"	7,600	none
52	Woods Lake	9,600	Holy Cross
53a	Red Table	39,100	none
54	Homestake	4,100	Holy Cross
56	Hoosier Ridge	6,100	none
57	No Name	3,800	Holy Cross
59	Chicago Ridge	5,100	none
61	Sloan Peak	19,900	none
64	Mormon Creek	3,000	Holy Cross
69	Assignment Ridge	13,300	none
71	North Woody	8,500	none
75	Hunter	1,200	Hunter-Fryingpan
77	North Independent "A"	4,500	Hunter-Fryingpan
84	Treasure Mountain	1,500	Raggeds
*	Girart Creek	200	Holy Cross
*	Squaw Creek	500	Holy Cross
*	East Lake Creek	300	Holy Cross
*	Moniger Park	500	Eagles Nest
*	Eaglesmere Trail	200	Eagles Nest
*	Surprise Lake Trail	400	Eagles Nest
*	Conundrum Creek	500	Maroon Bells-Snowmass
*	North Schofield	500	Maroon Bells-Snowmass
*	Wagonwheel Creek	300	Flat Tops
*	Hack Lake	500	Flat Tops

**Denotes areas less than 500 acres in size that were too small to be displayed in Figure 48.*

Figure 48
Roadless areas capable and available for recommended wilderness



Environmental consequences

GENERAL EFFECTS

Roadless inventory management The policy concerning inventoried roadless areas on National Forest System lands is currently being developed. In the interim, the Chief of the Forest Service and the Secretary of Agriculture have committed to protecting and sustaining roadless values (Bosworth 2001). Specifically, the following principles were utilized to address the protection and management of roadless values.

1. Informed decision-making, using reliable information and accurate mapping, and drawing on local expertise and experience through the local forest planning process (FEIS Volume 3, Appendix C—*Roadless Inventory*);
2. Working together, by collaborating with States, tribes, local governments, organizations, and individuals through a fair and open process that is responsive to local input and information (FEIS Volume 3, Appendix C, *Interim Roadless Direction*);
3. Protecting forests from the negative effects of severe wildfire and insect and disease outbreaks (FEIS Volume 1, Chapter 3, Topic 7—*Fire Management—Environmental Consequences*);
4. Protecting communities, homes, and property from the risk of severe wildfire or other risks existing on adjacent federal lands (FEIS Volume 1, Chapter 3, Topic 7—*Fire Management—Environmental Consequences*); and
5. Protecting access to property by ensuring that states, tribes, and citizens owning property within inventoried roadless areas have access to that property as required by existing laws (The forest is required to comply with all existing laws regarding access, including Alaska National Interest Lands Conservation Act).

Management of inventoried roadless areas will comply with all interim and final national direction. The forest plan directs roadless area management activities in a forest-wide guideline to emphasize the maintenance of roadless characteristics and habitat improvement of threatened, endangered, proposed, or sensitive species; or maintenance or restoration of ecosystem composition and structure, such as reducing the risk of uncharacteristic wildfire effects.

Roadless areas capable and available for wilderness The roadless inventory found capable and available for recommended wilderness approximately 298,000 acres. Areas assigned the 1.2 recommended wilderness management area can be identified, by alternative, on the management area maps in the map packet. Roadless areas that are recommended for wilderness can be split into two categories: those that border existing wilderness (adjacent areas) and those that stand alone and do not border existing wilderness (independent areas). **Table 115** totals the number of roadless areas recommended for wilderness and the total acreage, for both of these categories. **Table 116** lists the areas recommended for wilderness designation by alternative. The ten areas less than 500 acres in size that were found capable and available for wilderness were not recommended for wilderness in any alternative. However, they have been included in the updated roadless inventory.

Table 115
Acres of management area 1.2 by alternative

	ALTERNATIVE						
	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
Acres of management area 1.2	0	94,000	47,000	107,000	0	200,000	82,000
Number of adjacent areas	0	9	3	0	0	22	13
Number of independent areas	0	1	2	6	0	4	3
Percent of capable and available roadless areas recommended for wilderness	0	32	16	35	0	69	28

Alternative I recommends both the largest number of roadless areas for wilderness designation and the largest number of acres. Alternative E recommends the next highest acreage, but in fewer areas; there are fewer, larger roadless areas recommended in Alternative E than in Alternative C. Alternative C recommends 10 areas, but with less acreage than E or I and more acres than D. Alternative K is most similar to Alternative C but with less acreage allocated. Of the alternatives that recommend wilderness, Alternative D has the fewest areas and the smallest number of acres. Alternatives B and F make no recommendations.

Table 116
Recommended wilderness by alternative

Alternative C			
<i>No.</i>	<i>Name</i>	<i>No.</i>	<i>Name</i>
5a	Big Ridge to South Fork	28	Freeman Creek
8a	Red Dirt	29a	Spraddle Creek
19	Black Lake West	53b	Red Table
21b	Ute Pass	77	North Independence "A"
21c	Acorn Creek	84	Treasure Mountain
Alternative D			
<i>No.</i>	<i>Name</i>	<i>No.</i>	<i>Name</i>
6	Dome Peak	71	North Woody
15a	Sweetwater	84	Treasure Mountain
69	Assignment Ridge		
Alternative E			
<i>No.</i>	<i>Name</i>	<i>No.</i>	<i>Name</i>
44	Hardscrabble	51b	Basalt Mountain
48	Gypsum Creek	53b	Red Table
49	Adam Mountain	61	Sloan Peak
Alternative I			
<i>No.</i>	<i>Name</i>	<i>No.</i>	<i>Name</i>
4	Ripple Creek	40b	Meadow Mountain
5a	Big Ridge to South Fork	48	Gypsum Creek
6	Dome Peak	50	Tigiwon
8a	Red Dirt	51b	Basalt Mountain
12	Lower Piney	52	Woods Lake
15a	Sweetwater	53b	Red Table
19	Black Lake West	54	Homestake
20	Black Lake East	57	No Name
21b	Ute Pass	61	Sloan Peak
21c	Acorn Creek	64	Mormon Creek
28	Freeman Creek	75	Hunter
29a	Spraddle Creek	77	North Independence "A"
40a	Meadow Mountain	84	Treasure Mountain
Alternative K			
<i>No.</i>	<i>Name</i>	<i>No.</i>	<i>Name</i>
4	Ripple Creek Pass	6	Dome Peak
8a	Red Dirt	15a	Sweetwater
21b	Ute Pass	21c	Acorn Creek
28	Freeman Creek	29a	Spraddle Creek
48	Gypsum Creek	52	Woods Lake
53b	Red Table	75	Hunter
69	Assignment	84	Treasure Mountain
77	North Independence "A"	64	Mormon Creek
Roadless areas not recommended in any alternative			
<i>No.</i>	<i>Name</i>	<i>No.</i>	<i>Name</i>
8b	Derby	46	Tenmile
9	Williams Fork	56	Hoosier Ridge
23	Deep Creek	59	Chicago Ridge
34	Tenderfoot Mountain		

DIRECT AND INDIRECT EFFECTS

Roadless inventory As stated previously, a forest-wide guideline for roadless area management will provide direction to emphasize maintenance of roadless characteristics in all alternatives. During the management area allocation process, the roadless inventory was considered, and a range of management areas have been assigned to the roadless inventory, which is summarized below. Management activities that change the unroaded character of these areas would require further environmental analysis on a site-specific basis. Current authority to approve this type of activity falls under the Chief of the Forest Service's responsibility. **Table 117** outlines management areas are grouped into three classifications: *Group 1*: MA categories 1 and 2, *Group 2*: MA categories 3 and 4, and *Group 3*: MA categories 5, 7, and 8. This grouping enables conclusions to be drawn about the types of management that will occur on these lands.

Roadless areas allocated to MA categories 1 and 2 are the most likely to retain their undeveloped character. These categories are basically non-motorized with backcountry emphases. This includes roadless areas that will be managed as research natural areas and some special interest areas. Alternative I (70 percent) retains the highest percentage of Group 1, followed by Alternatives C (40 percent) and K (32 percent).

Management area categories 3 and 4 emphasize various types of recreation. With an emphasis on human uses, the roadless areas that are assigned to management areas in these categories are likely to retain some undeveloped characteristics but also to include some motorized opportunities. Development in these management areas, however, does not include intensive land management activities such as commercial timber harvest or ski areas. Alternatives B (42 percent) and E (51 percent) assign the most number of acres to Group 2, with the fewest in Alternative D. Alternative K is similar to I in its allocation at 11 percent.

Management area categories 5, 7, and 8 will have the most intensive development and the potential to result in the most significant impact on the undeveloped character of the roadless areas. Roadless areas that have these management areas assigned to them may have timber harvest, road construction, motorized uses, utility corridors, and wildlife habitat developments. Alternative F assigns the highest percentage of acres to Group 3 (84 percent) followed by Alternative K (57 percent) and Alternative B (53 percent).

Table 117
Summary of inventoried roadless acres in management area groups by alternative

<i>Alternative</i>	Group 1		Group 2		Group 3	
	MA categories 1 and 2		MA categories 3 and 4		MA categories 5, 7, 8	
	<i>Acres</i>	<i>Percent</i>	<i>Acres</i>	<i>Percent</i>	<i>Acres</i>	<i>Percent</i>
<i>B</i>	34,094	5	264,683	42	340,812	53
<i>C</i>	258,208	40	131,807	21	249,562	39
<i>D</i>	163,507	25	49,824	8	426,250	67
<i>E</i>	200,289	31	323,455	51	115,836	18
<i>F</i>	50,983	8	54,115	8	534,485	84
<i>I</i>	445,765	70	77,626	12	116,189	18
<i>K</i>	204,451	32	67,568	11	367,564	57

Roadless areas capable and available for wilderness Capable and available roadless areas were assigned either the 1.2 management area (recommended wilderness) or another management area. If the area was not recommended for wilderness designation, it must be allocated to one of the other available management areas. Roadless areas are assigned a wide range of management areas in each alternative. **Table 118** identifies the number of acres recommended as wilderness in each alternative (MA 1.2) and summarizes the part of the roadless inventory rated as capable and available, similar to **Table 117**.

Table 118
Summary of inventoried roadless capable and available for wilderness recommendation by alternative

<i>Alternative</i>	Group 1		Group 2		Group 3	
	MA categories 1 and 2		MA categories 3 and 4		MA categories 5, 7, 8	
	<i>Acres</i>	<i>Percent</i>	<i>Acres</i>	<i>Percent</i>	<i>Acres</i>	<i>Percent</i>
<i>B</i>	21,900	7	126,600	42	149,400	50
<i>C</i>	199,500	67	44,200	15	54,400	18
<i>D</i>	124,300	42	15,000	5	158,900	53
<i>E</i>	137,000	46	131,800	44	29,200	10
<i>F</i>	33,500	11	25,700	9	238,800	80
<i>I</i>	258,100	87	25,500	8	14,200	5
<i>K</i>	153,782	51	12,118	4	135,686	45

Alternative I manages the highest percentage in MA categories 1 and 2 (Group 1). Alternative C has the next highest percentage, followed by Alternatives K, D, F, and B.

Alternatives E and B allocate the largest percentage to categories 3 and 4 (Group 2), with 44 percent and 42 percent, respectively.

Alternative F has 80 percent of the roadless areas managed within the Group 3 management areas. Alternatives B, D, and K manage about half of the roadless areas this way; C, E, and I have the lowest percentage of the roadless areas assigned to management areas 5, 7, and 8.

Effect on roadless areas from leasable mineral development

Management areas recommended for wilderness (MA 1.2) would be withdrawn from mineral entry and not available for oil and gas leasing. Alternative I would remove the highest number of acres, followed by Alternatives E, C, K, and D respectively. Alternatives B and F do not recommend any areas for wilderness and would not withdraw any acreage.

Effects on roadless area from biodiversity management

Alternative I provides the most undisturbed area with permanent protection through wilderness designation where biodiversity and natural processes will dominate. Alternatives E, C, K, and D follow. Alternative B and F have no areas protected through additional wilderness recommendations. The Need Assessment (Appendix C) addresses the ability of certain species to compete with increasing public use and development projects that affect their habitat.

Appendix C also addresses an area's ability to provide for the preservation of identifiable landform types and ecosystems. Alternative I provides the most number of acres of under-represented low elevation cover types (38,857), followed by Alternatives E (22,028), C (18,622), D (17,502), and K (12,970). No additional wilderness is recommended in Alternatives B and F.

Effects on roadless areas from wildlife management

Wildlife management practices in roadless areas will comply in all alternatives with the forest-wide guideline to emphasize the maintenance of roadless characteristics and habitat improvement of threatened, endangered, proposed, or sensitive species; or maintenance/restoration of ecosystem composition and structure.

In Alternatives C, I, and K, the bighorn sheep management area (5.42) overlaps a recommended wilderness management area (1.2). If direction between the two management areas is in conflict, the more restrictive direction applies. Recreation use may be limited to protect bighorn sheep populations, and vegetation habitat improvement projects may be limited to emphasize the maintenance of roadless characteristics.

Effects on roadless areas from domestic livestock grazing

Grazing of domestic livestock is allowed in all recommended wilderness and all other management areas except research natural areas (RNAs). The only RNA that overlaps a recommended wilderness occurs in Alternative D, where the Assignment Creek RNA overlaps the Assignment Ridge roadless area. There is no grazing currently occurring

within the area covered by the Assignment Creek RNA. If this RNA is designated, no grazing would be allowed in the future, regardless of its wilderness status.

Effects on roadless areas from travel management

A site-specific travel management plan will be completed following the revised forest plan decision based on the standards and guidelines outlined in the plan. Roadless areas recommended for wilderness (MA 1.2) will permit foot and horse travel and will prohibit motorized and mechanized travel. Roadless areas not recommended for wilderness may have a variety of travel opportunities depending on the management area assigned. These may range from year round nonmotorized and nonmechanized to allowing motorized trail use in summer and motorized area use in winter.

Effects on roadless areas from recreation management

Areas that are recommended for wilderness will be managed similarly to those lands currently designated as wilderness. Opportunities for primitive and non-motorized recreation will be found in roadless areas recommended for wilderness designation. These areas provide the best opportunities for solitude, the absence of motorized or mechanized vehicles, and lack of human developments. Alternative I would provide the most additional opportunities for these types of experiences, followed by Alternatives E, C, and K. Alternative D would provide the fewest additional opportunities, while Alternatives B and F provide no additional lands that would be managed like wilderness. In all alternatives that recommend wilderness, there would be a decrease of the primitive and semi-primitive recreation opportunities outside of wilderness.

Roadless areas that are assigned other management areas will be managed for the recreation opportunities appropriate to the assigned management areas. The settings are generally semi-primitive non-motorized in character. Development would tend to shift the settings toward the semi-primitive motorized experience. Alternatives F and D have the highest allocation to Category 3 management areas and would have the most opportunities for additional motorized activities.

Effects on roadless areas from special interest areas

Roadless areas occur in places with other special values. In addition to being a roadless area, the Deep Creek area was found to have special river values. One section of the river was found to have wild river values and another section has scenic river values. This area was also found to have value as a potential as an RNA. Both special interest area designations would be complementary to maintaining the roadless characteristics of the area.

Effects on roadless areas from timber management

Roadless areas that are allocated to the 1.2 management area (recommended wilderness) are not available for timber harvest. These effects are described in detail in the timber management section, Chapter 3, Topic 6, Direct and Indirect Effects. Alternative I removes the most acreage (133,000 acres), followed by Alternatives C, E, K, and D (22,000 acres). Alternatives B and F do not recommend any areas for wilderness,

therefore, no acres of tentatively suitable timber lands (TSTL) are removed under those alternatives.

Roadless areas that are allocated to management areas other than recommended wilderness may be available for vegetation treatments, including timber harvest, according to the standards and guidelines found in the forest plan.

CUMULATIVE EFFECTS

The cumulative effects analysis for roadless areas and recommended wilderness considers land within the White River National Forest boundary and the private and Bureau of Land Management (BLM)-administered lands between the major divides throughout the life of the 2002 Forest Plan. It also includes a review of designated wilderness on public lands in Colorado. Two national forests that are adjacent to the White River National Forest have completed forest plan revisions. The final revised forest plan for the Routt National Forest did not include any recommended wilderness. The final revised forest plan for the Arapaho-Roosevelt National Forest contained recommended wilderness totaling 8,810 acres. None of the recommended areas are adjacent to the White River National Forest. In addition, the Rio Grande National Forest has completed a forest plan revision that does not include any recommendations for additions to the wilderness system.

Wilderness has been officially designated on federal lands other than National Forest System lands. In the immediate vicinity of the White River National Forest are public lands administered by the Bureau of Land Management, none of which has been designated as wilderness nearby. In 2000, the Black Ridge Wilderness was designated in western Colorado and is the first area to be managed by the BLM in Colorado as designated wilderness. U.S. Representative DeGette has proposed legislation that would designate additional wilderness on the White River National Forest and surrounding BLM lands. U.S. Representative McInnis recommended eight areas on the White River as wilderness in his comments on the draft forest plan (McInnis 2000) and sponsored in 2001, legislation for designating Deep Creek as wilderness.

Population growth in Colorado and urban development adjacent to National Forest System lands result in increasing demands ranging from commodity production and to all types of recreation opportunities. Roadless areas have traditionally provided for the semi-primitive nonmotorized opportunities. Pioneered roads and trails on public lands reflect the increased demand for motorized and mechanized opportunities, but they result in a decrease in opportunities for primitive and semi-primitive nonmotorized recreation and may adversely impact soil, water, and wildlife resources.

Private land development adjacent to public lands in the region, including the White River National Forest, has strongly influenced the movement pattern of many wide-ranging wildlife species. This development negatively affects the availability and quality of wildlife habitat and increases the importance of similar undeveloped habitats within roadless areas. It is anticipated that development will further fragment unroaded private lands, decreasing the opportunities for primitive recreation experiences and the quality of wildlife habitat.

Alternative I would provide the most opportunities to manage inventoried roadless areas as recommended wilderness and for primitive recreation opportunities, followed by Alternatives E, C, and K. Alternative D would provide the fewest additional opportunities, while Alternatives B and F provide no additional lands that would be recommended to Congress for wilderness designation.

TOPIC 5

SPECIAL AREAS

- Part 1 — Heritage resources*
- Part 2 — Research natural areas*
- Part 3 — Wilderness*
- Part 4 — Wild and Scenic Rivers*
- Part 5 — Caves*
- Part 6 — National trails*
- Part 7 — Scenic byways*
- Part 8 — Special interest areas*

Topic 5, Part 1

Heritage resources

Introduction

Abstract

The White River National Forest contains a rich fabric of historic and prehistoric resources known as heritage resources. Only 7 percent of the forest has been intensively inventoried to locate these resources. However, each time a ground-disturbing activity is planned, the law requires that an inventory be conducted to mitigate any impacts to heritage resources. In addition to these actions, at least 125 sites are monitored annually for any adverse effects or vandalism. Because of the protections afforded under various laws, adverse effects to heritage resources are minimal.

Summary

Heritage resources are protected on all federal land through numerous federal laws enacted to protect them. Any federally funded or permitted activity must adhere to these protective measures so as not to inadvertently damage or destroy nonrenewable heritage resources. Some of this protection has been in place since the beginning of the 20th Century and continues today with even more stringent protection in place.

Key indicators

- Number of acres surveyed

Legal and administrative framework

- The **Antiquities Act** (1906) protects historic or prehistoric remains or any object of antiquity on federal lands and applies to both cultural and paleontological resources.

- The **National Historic Preservation Act (NHPA)** (1966), as amended, protects historic and archaeological values during the planning and implementation of federal projects. The law requires the location and identification of cultural resources during the planning phase of a project, a determination of “significance” (based on scientific archaeological value) for potentially affected resources, and provisions for mitigation of any significant sites which may be affected.
- The **Archaeological Resources Protection Act** (1979) imposes civil penalties for the unauthorized excavation, removal, damage, alteration, or defacement of archaeological resources.
- The **Native American Graves Protection and Repatriation Act** (1990) protects American Indian burials and sacred items.
- The **Federal Land Policy and Management Act** (1976) requires that “the public lands be managed in a manner that will protect the quality of scientific, scenic, historical, ecological resources . . . [and] preserve and protect certain public lands in their natural condition.”
- **Uniform Rules and Regulations (16 U.S.C.G. 432-433)** coincide with the Antiquities Act of 1906. They give the Secretary of Agriculture “jurisdiction over ruins, archaeological sites, historic and prehistoric monuments and structures, objects of antiquity, historic landmarks, and other objects of historic or scientific interests” on National Forest System lands.
- **36 CFR 261.9** prohibits “excavating, damaging, or removing any vertebrate fossil or removing any paleontological resource for commercial purposes without a special use permit.”

Affected environment

INTRODUCTION

The total extent of the heritage resource base of the White River National Forest has not been determined. Only 7 percent of the forest has been intensively inventoried for cultural resources. As of September 31, 2000, inventories totaling 162,149 acres have documented the existence of some 1,671 sites (individual cultural properties) in compliance with Section 106 of the NHPA. Most of the inventories completed prior to the 1980s are not considered adequate to grant projects clearance to proceed. This is due to inadequate research design, inventory standards, survey intensity, and methodology.

American Indian resources (prehistoric and historic)

Of the 1,671 sites recorded on the forest, 1,037 have been officially field-evaluated from 1975 through September 30, 2000. Of these sites, 703 are considered ineligible for inclusion on the National Historic Register. Of the remaining 334 sites, 88 prehistoric (or American Indian) sites have been field evaluated as eligible for inclusion and listing in the National Register. Another 60 prehistoric sites are listed as needing data. Most of these 148 prehistoric sites are open lithic scatters, open campsites, or small lithic processing and/or procurement sites. Open lithic scatters have a visible surface component of flaked stone material and stone tools. Open campsites are lithic scatters that have features exposed on the surface, such as hearths, circles, or alignments, usually composed of stone. Lithic procurement and/or processing sites typically are quarries

where material is obtained, or small areas of exposed rock, often single cores lying on the surface, where material is both obtained and processed in place.

Our policy is to classify all traditional cultural properties (or sacred sites, as they are often called) as eligible for the National Register. Consequently, all such sites identified by American Indian traditional practitioners from the Ute tribe and other American Indian groups as deemed appropriate are avoided and protected from impact. These sites are not counted in any of the figures listed above.

Evidence of the earliest human activity on the forest is in the form of mostly isolated occurrences from the Paleo-Indian Period, approximately 8,000 to 11,000 years ago.

**Historic
European-
American
resources**

Of the 1,037 heritage sites on the forest officially field-evaluated from 1975 through September 30, 1998, 69 historic sites are considered to be eligible for inclusion and listing in the National Register. One hundred seventeen sites were recorded as needing data. The remaining 703 prehistoric and historic sites are considered ineligible for National Register listing.

It generally is recognized that the European historic period for the Utes started sometime in the early 1600s when they became one of the first American Indian tribes to acquire horses from the Spanish. Historic sites may date from the first European contact in the area, which occurred in 1776 when the priest-explorers Dominguez and Escalante possibly traveled through the southwestern edge of the forest. Most Ute historic sites on the forest are camps, wickiup villages, rock shelters, rock art panels, lithic procurement sites or quarries, special use areas, cairns, trails, and ceremonial sites.

Historic European sites generally date from the settlement period when trappers, explorers, miners, and homesteaders entered the forest. The first recorded historic contact dates to 1825 when Antoine Robidoux began trapping on the White River. A record of early settlers and explorers can be found in cairns, camps, "forts," wooden and rock structures, fields, water use features, adits and other mine sites, towns, trails, railroads, roads, highways, bridges, and other European settlement features.

**Paleontological
resources**

The extent of paleontological resources on the forest is largely unknown at this time. A complete inventory of all potential fossil-bearing deposits and formations awaits a classification of potential locations based on previously mapped geological formations.

RESOURCE PROTECTION MEASURES

A draft protection plan developed for the forest in 1998 seeks to protect sites by recording site condition during scheduled monitoring trips to selected sites. At this time, we monitor more than 125 sites each year with the goal of adding 25 sites to this figure annually.

Environmental consequences

GENERAL EFFECTS

In all alternatives, the cultural resource program will provide support to all of the resource projects, as required by Section 106 of the NHPA. In addition, the program will include inventory, analysis, stabilization, and public interpretation under all alternatives.

Despite inventories, the potential exists for undiscovered sites to be exposed and/or damaged by surface disturbance or other events. These sites may or may not be noticed in time to allow mitigation. This damage represents an unavoidable adverse effect which would be present in all alternatives.

All alternatives will have some irreversible commitments of heritage resources. Examples are inadvertently damaged or destroyed sites, vandalized or looted sites, and sites that have not been inventoried and recorded and are undergoing loss from natural processes. Every alternative seeks to minimize this loss through inventory and evaluation, monitoring, and improved project implementation to insure that this loss is kept to an absolute minimum.

There is a direct relationship between the number of acres disturbed through project implementation and the number of acres surveyed for heritage sites. This relationship also exists for the number of heritage sites located and evaluated. Eligible sites will be avoided, or mitigation of effects will occur.

DIRECT AND INDIRECT EFFECTS

Direct effects can result both from natural events and human activities that can damage heritage resources or alter their settings. Examples include surface disturbance, soil compaction, erosion, heating and freezing, wildfire, prescribed burning, livestock trampling, off-highway vehicle use, alteration of a heritage resource setting (including introduction of atmospheric or audible intrusions), and potential loss of protection for undiscovered heritage resources if land is transferred from federal to non-federal ownership.

Indirect effects can result from improved access that brings more visitors, resulting in increased vandalism, removal of materials, inadvertent damage or fires, or scenic and auditory changes from adjacent or nearby activities, among others.

Effects on heritage resources from domestic livestock grazing

Effects of range-related activities have the potential to alter or destroy heritage resources. These activities include fence construction, spring developments, wells, stock tanks, pumps, pipelines, water storage and cattle guards, and non-structural projects such as noxious weed treatments, forage improvement, and livestock grazing.

Livestock grazing, especially where animals congregate or use pathways and stock trails, creates impacts to any heritage resources at those sites. Exposure from grazing also may encourage people to remove or vandalize sites due to increased visibility. These effects are direct, indirect, and cumulative. The stratigraphic soil layers that are very important in

establishing cultural chronologies can be churned and distorted by livestock digging, movements, and congregation. These same effects may be caused by wild herbivores and small mammals. Wild animals may increase in numbers and congregate due to range improvements such as wells and grazing. These sites are often located near springs, drainages, and forest edges.

Under each alternative, a cultural inventory would be necessary to prevent further damage, mitigate unforeseen damage, and prevent future impacts to sites.

Effects on heritage resources from fire management

Wildfires and prescribed burning have the potential to directly affect heritage sites by burning historic structures and damaging or destroying artifacts and features of archeological sites such as wickiups, tepee poles, tree platforms, brush game drives, snares, and other vegetal construction or tools. Activities carried out in emergency situations to control a wildfire such as the construction of firelanes can also directly damage heritage resources. Indirect effects of fire include erosion losses resulting from burned vegetation cover, deterioration and weathering after the matrix of artifacts and features are initially damaged by extreme temperatures, or changes in the landscape adjacent to heritage sites.

Inventories and evaluation will be completed on between 3,200 and 5,700 acres per year in response to prescribed burn plans or other fuel treatments, with Alternative C having the greatest acreage affected, followed in declining acreages affected by Alternatives D, K, B, E, F, and I. Effects to heritage sites that are discovered during these project inventories would be mitigated.

Effects tend to be greater in wildfire situations because of extreme temperatures, an inability to control the effects, and because it is almost impossible to plan inventories in advance. Some inventories may be conducted on firelines. Fire effects can be determined and appropriate mitigation carried out if a complete inventory of the burned area is conducted shortly after the fire has been controlled, but this is not always possible. Therefore, potentially significant effects from wildfire could remain undetermined under all alternatives of the forest plan. The number of heritage resources affected by wildfire on an annual basis cannot be predicted.

Effects on heritage resources from landownership adjustments

The National Historic Preservation Act defines effects to heritage resources as including transfer from federal ownership. Potential effects include loss of federal protection for heritage resources on lands transferred to other ownership, which could result in damage or destruction of heritage sites. However, prior to landownership transfer, inventories are conducted and mitigation applied, if needed. As a result of these inventories, there is a potential to locate eligible sites. That potential is the same under all alternatives.

Heritage resources on lands acquired from other ownerships are accorded protection under federal law. Potential effects on heritage resources would depend on activities subsequently planned for the land.

Effects on heritage resources from recreation management

Direct effects may occur from management activities such as construction or reconstruction of developed sites such as campgrounds. Recreational users, whether motorized, mechanized, or non-motorized, may trample of heritage resources. For planned recreation developments, most of the potential direct effects can be eliminated or mitigated. However, indirect effects such as increased vandalism, trampling, loss of integrity, and increased erosion cannot be completely mitigated, because inventories are not usually conducted outside the limits of the developed sites.

Off-highway vehicles (OHVs) driving over heritage sites can cause extensive direct damage. Indirectly, the use of OHVs can damage or destroy vegetation, inorganic surface crusts, and natural ground litter. Compaction of soils, alteration of soil stratigraphy, and reduced water-infiltration rates result from off-road and off-trail motorized recreation. Increased looting and vandalism may also take place. These effects could occur under any alternative, but are somewhat less likely under those alternatives that prohibit OHV use in larger areas of the forest. Alternative I, for example, would greatly reduce the potential for these negative effects, since access would be reduced. The number of sites potentially affected is not quantifiable.

Effects on heritage resources from timber management

Timber harvesting activities can affect heritage resources through surface disturbance caused by machinery and vehicles, by felling trees on certain types of sites, by skidding logs or trees, by theft or vandalism caused by workers, or by erosion caused by vegetation removal or damage. In addition, fuels and oils used by heavy equipment can be spilled or dumped on heritage sites. Construction or reconstruction of permanent or temporary roads associated with timber sales has the potential to affect heritage resources through damage or destruction of areas directly affected. As noted above, eligible sites will be avoided, or mitigation of effects will occur.

In all alternatives, surface disturbance associated with pre-haul maintenance on existing roads would occur. Effects to sites would be mitigated.

CUMULATIVE EFFECTS

Cumulative effects over time can include loss of sites or parts thereof prior to development of better research techniques, loss of interpretive values, and incremental loss of the heritage resource base.

Forest management projects may cause surface disturbance, bring additional people in contact with heritage resources, or affect the fabric of historic structures. Differences in cumulative effects to heritage resources under different alternatives as a result of sanctioned management activities should be low because of the protection and mitigation measures that will be implemented.

Cumulative effects also could occur to heritage resources as a result of non-sanctioned activities, such as vandalism or illegal excavation. Efforts to control and monitor these activities are similar in all alternatives, and will result in an extremely low level of cumulative adverse effects to heritage resources.

Alternatives that result in more acres of planned and budgeted management activities could reduce adverse cumulative effects. This is because more inventory and evaluation would be required under these alternatives. The additional inventory and evaluation would lead to more heritage resources being located and a reduction of adverse cumulative effects caused by natural processes after heritage resources are brought under appropriate management.

Cumulatively, heritage resources on federal land may assume greater importance because such resources on lands of other ownership are not provided the same degree of protection. Projects in and around the White River National Forest funded by the federal government are subject to federal requirements for protection of heritage resources. However, construction on and development of private land may destroy heritage sites without providing an opportunity for recovery of data or other mitigation.

It is believed that cumulative effects to heritage resources on state and private lands are much greater than for federally administered areas. This is because (1) there is a higher likelihood that important heritage resources occur on these lands (due to historic settlement patterns and environmental patterns); (2) little or no inventory or evaluation is being conducted, and (3) implementation of protection or mitigation measures is extremely rare.

We anticipate that a growing emphasis on American Indian input to management of the White River National Forest will provide positive effects by broadening our understanding and awareness of heritage resources in the planning area. American Indians' oral histories and lore may be used to complement scientific information, providing a more in-depth and rich interpretation of the broader cultural landscape.

Topic 5, Part 2

Research natural areas

Introduction

Abstract

Research natural areas (RNAs) are permanently established to maintain areas of natural ecosystems and areas of special ecological significance. The White River National Forest currently has one RNA, Hoosier Ridge, which it shares with the Pike National Forest. For this forest plan revision, 15 potential RNAs have been identified for possible inclusion in the system. These vary in size from the 1,419-acre Taylor-Willard site to the 24,447-acre Lower Battlement site (both of which are shared with the Grand Mesa-Uncompahgre-Gunnison national forests). These areas range in elevation from 5,540 feet (Lower Battlement) to 13,670 feet (East Lake Creek-West Cross Creek). All proposed RNAs have been field reviewed, and ecological evaluations are on file in the Supervisor's Office describing a variety of ecological values for each area.

Summary

Many Forest Service protective designations attempt to maintain natural ecosystem components and processes. In addition to research natural areas, the Forest Service designates botanical, ecological, geological, zoological, and scenic special areas and manages wilderness areas and wild, scenic, and recreational rivers that have been designated by Congress. Although these designations differ in their degree of 'naturalness,' isolation, and management emphasis, they all contribute in important ways to the protection of biological diversity.

RNAs serve three important functions:

- **Reference areas** – RNAs serve as benchmarks for monitoring and evaluating the sustainability and impacts of land management practices on lands with similar ecosystems. To determine the impact of management on an area, it is useful to have, as a control, a similar area maintained in natural condition for comparison. RNAs contribute to ecosystem management by providing these controls.
- **Biological diversity** – RNAs provide protection for biological diversity. A representative RNA system provides some degree of assurance that a wide array of plant and animal species will be afforded a high degree of protection in the future. This protection may be most important for soil microorganisms, fungi, insects, and other forms of biological diversity on which ecosystems often depend the most but about which we know the least. RNAs also can be selected to help protect specific populations of threatened, endangered, and/or sensitive species.
- **Research** – RNAs provide sites for research into how ecosystems function, particularly in areas in which ecological and evolutionary processes are functioning in a relatively natural state. They serve as sites for monitoring long-term change in ecosystems such as global climate change and shifting patterns in the landscape that result from such disturbances as fire, floods, and insect epidemics. Research projects in an identified RNA can greatly increase our understanding of particular ecosystems and improve the quality of ecosystem

management. RNAs also serve an important educational function by providing excellent examples of ecosystems in a relatively natural condition, with functioning ecological processes.

Key indicators

- Acres of potential RNAs
- Location of individual RNAs (potential RNAs are mapped on the management area map for each alternative)
- Plant associations within potential RNAs that currently are not included in the national RNA system

Legal and administrative framework

- **36 CFR 219.25** states that forest planning shall provide for the establishment of RNAs. To be identified are examples of important forest, shrubland, grassland, alpine, aquatic, and geologic types that have special or unique characteristics of scientific interest and importance and that are needed to complete the national RNA network.
- **Forest Service Manual FSM 4063** provides specific direction concerning RNA management.

Affected environment

INTRODUCTION

Currently, the White River National Forest has one established research natural area, Hoosier Ridge, located immediately east of Hoosier Pass. Management of this 695-acre area is shared with the Pike-San Isabel National Forest, with 328 acres of this RNA on the White River National Forest. Primary values associated with this area are a federally listed threatened plant species, several Forest Service Region 2 sensitive plant species, and an excellent representation of alpine ecosystems.

As required, the forest has analyzed a range of additional areas for potential inclusion in the RNA program. A total of 15 areas, totalling 128,500 acres, have been assessed (11,300 acres of the total extend onto the Grand Mesa-Uncompahgre-Gunnison national forests). These areas feature a diversity of representative cover types and plant associations found on the forest. A brief description of each proposed RNA is provided in FEIS Volume 3, Appendix G—*Research Natural Areas*.

Environmental consequences

GENERAL EFFECTS

The Forest Service Manual (FSM 4063) is quite specific regarding activities that are allowed within RNAs. Domestic livestock grazing, motorized vehicle use, new road and trail construction, timber management, ski areas, ground-disturbing mineral development, and other intensive management activities generally are restricted or prohibited. All alternatives would prohibit these activities in established RNAs. During the initial potential RNA screening process, future management options for each area were considered. This initial screening process removed from further consideration areas where significant conflicts with existing management were identified. Because nearly two-thirds of the White River National Forest occurs in designated wilderness or within management areas with limited active management activities, the forest was not significantly limited in identifying adequate areas to assess for potential RNA designation.

Most of the changes that occur to established RNAs will result from natural disturbance events such as fire, insects and disease, windthrow, or avalanche. Most forest stands not undergoing natural disturbance events are expected to move through natural succession into late-successional and old-growth stands in all alternatives.

The more acres of land that are designated as RNAs, the more the goals of the national and regional RNA program—to provide reference areas, protect elements of biodiversity, and use them for research—will be met. **Table 120** displays the potential RNAs recommended for establishment under each of the alternatives. This table also indicates the number of acres for each potential RNA. If no figure is shown under a potential RNA, that potential RNA is not recommended for establishment in that alternative. Alternative B adds no new RNAs and therefore no new acres, while Alternative I adds the most new acres, 128,500 (11,300 of this total is located on the adjacent Grand Mesa-Uncompahgre-Gunnison national forests).

An additional indicator of meeting the RNA goals is the number of new plant associations represented in the Region 2 RNA program. **Table 121** displays the number of major and minor representations of plant associations that are contained within the RNAs proposed under each alternative.

The area of concern for RNAs includes the two ecological sections within which the White River National Forest is located. Currently, 16 designated RNAs covering approximately 83,100 acres are located within the Northern Parks and Ranges Section, which includes the eastern half of the forest. There are no designated RNAs in the North Central Highlands and Rocky Mountain Section at this time. Potential RNAs in this revised plan include many plant associations that are unique to these two sections, supporting the RNA national and regional ecological goal of biodiversity protection. Based on the initial potential RNA analyses, Alternative E would add 75 new plant associations to the regional program (**Table 121**); Alternative K would include 91 new plant associations; Alternative F would include 99 new plant associations; Alternative C includes 109 new plant associations; Alternative D includes 115 new plant associations; and Alternative I would add the most with 136 new additions. Alternative B recommends

no new RNAs, and only one land type association (LTA) is represented by the existing Hoosier Ridge RNA. All other alternatives represent the LTAs commonly found on the White River National Forest, which also increases the ecological representation within the sections.

DIRECT AND INDIRECT EFFECTS

Effects on research natural areas from fire management

Several potential RNAs contain extensive areas that have been identified for future management with prescribed fire to meet landscape and wildlife habitat goals. General areas within these potential RNAs will be identified during the establishment process, and prescribed fire will continue to be used as a management tool. Areas identified for the use of prescribed fire remain constant within the respective potential RNAs for all alternatives.

Table 120
Acres of potential research natural areas by alternative

RNA	ALTERNATIVE						
	B	C	D	E	F	I	K
<i>Established</i>							
Hoosier Ridge	300	300	300	300	300	300	300
<i>Potential</i>							
Assignment Creek	0	4,000	4,000	0	4,000	4,000	4,000
Lower Battlement Mesa	0	*13,600	*13,600	*13,600	*13,600	*13,600	*13,600
Main Elk Creek	0	2,800	2,800	0	0	2,800	2,800
Deep Creek	0	4,600	4,600	0	4,600	4,600	
Black Creek	0	10,800	10,800	10,800	10,800	10,800	
Gift and Kline Creeks	0	11,100	11,100	11,100	11,100	11,100	11,100
Oyster Lakes	0	14,100	14,100	14,100	14,100	14,100	
Warren Peak	0	8,700	8,700	0	8,700	8,700	
Porcupine Gulch	0	5,900	5,900	0	0	5,900	
Difficult Creek	0	0	11,400	0	0	11,400	
Marten Creek	0	0	6,000	0	0	6,000	
Taylor-Willard	0	0	*700	0	0	*700	
East Lake Creek/West Cross Creek	0	0	0	0	0	10,800	10,800
W Mountain	0	0	0	0	0	9,900	
No Name Ridge	0	0	0	0	0	2,800	
Total potential acreage**		75,600	93,200	49,600	65,900	117,200	42,000

*Does not include acreage on the adjacent Grand Mesa-Uncompahgre-Gunnison national forests.

**Does not include the 300 acres on the established Hoosier Ridge RNA.

Table 121
Number of new plant associations potentially included in the Region 2 research natural area portfolio by alternative

RNA	ALTERNATIVE						
	B	C	D	E	F	I	K
Major representation*	0	50	51	28	46	59	27
Minor representation*	0	59	64	47	53	77	64
Total new plant associations	0	109	115	75	99	136	91

**Major representation indicates that the plant association is well represented within the RNA; minor representation indicates that the plant association is usually only found in the RNA in small acreage or is much better represented in other areas.*

Effects on research natural areas from recreation management

During the initial screening process, levels and types of recreation use were reviewed for each potential RNA to ensure that current and expected future uses were compatible with the goals of RNA management. RNA direction allows low levels of non-motorized recreation use. Projected recreation use under all alternatives is still within the allowable levels, and no major impacts on RNAs established in this process are anticipated.

Effects on research natural areas from wilderness management

Several potential RNAs are located in designated wilderness. The objectives of wilderness are generally compatible with RNA objectives. The Wilderness Act defines wilderness as “an area of undeveloped federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man’s work substantially unnoticeable.” When conflicts exist between management area direction, the more restrictive standards and guidelines apply. Research related to RNAs in wilderness can be more difficult if it appears to conflict with the restrictions imposed in the Act: “. . . except as necessary to meet minimum requirements for the administration of the area for the purposes of this Act . . . there shall be no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no form of mechanical transport, and no structure or installation within any such area.” Restrictions on human use may be necessary to protect the values for which the RNA was established. Alternative I has the most RNA acres in designated wilderness, followed by Alternatives D, C, and F.

CUMULATIVE EFFECTS

The RNA program is a national program intended to provide representative sample ecosystems found within each ecological section containing National Forest System Lands. The spatial scale for the cumulative impacts assessment for the RNA program on the White River National Forest involves the 2 ecological sections in which the forest is located, the North-Central Highlands and Rocky Mountains and the Northern Parks and Ranges. Each new potential RNA would add different ecological plant associations into the Region 2 portion of this national program (see **Table 121**, above). Prior to the initiation of the forest plan revision effort, only one RNA, Hoosier Ridge, was designated on the forest.

Through the revision effort a wide range of potential RNAs were considered for inclusion into the regional RNA program. Alternative B included no new RNAs, Alternative E included 4 new RNAs, Alternative D has 5, F has 7, C has 9, and Alternative D has 12. Total acreage of new RNAs included in each alternative varies from zero in Alternative B, to 128,500 in Alternative I (including acreage on the Grand Mesa National Forest). As other National Forest in Region 2 enter into forest plan revisions, they will include an assessment of potential new RNAs as a portion of the revision process.

The RNA program is restricted to National Forest System lands. Therefore, private lands and BLM lands within the 2 sections were not considered in this assessment. The BLM does has a similar system of land delineation known as Areas of Critical Environmental Concern, but those lands are not included in this assessment.

Forest Service manual direction (FSM 4063) prohibits activities that would jeopardize the objectives for which the RNAs were established. Therefore, impacts from Forest Service management are considered to be minimal for all alternatives. Natural disturbance processes will be the primary factor in any changes that occur within RNAs. None of the proposed RNAs are adjacent to private land developments that might significantly affect resources within the RNA.

Topic 5, Part 3

Wilderness

Introduction

Abstract

The White River National Forest manages three wilderness areas entirely and shares management of five wilderness areas with adjoining national forests. Current management emphasis allows natural processes to be maintained or improved within wilderness. Management of existing designated wilderness areas varies by alternative in terms of the number of acres allocated to each of the following management areas: pristine (1.11), primitive (1.12), or semi-primitive (1.13). Wilderness areas can be essential to retaining biological diversity on the forest and to providing non-motorized recreation opportunities.

Summary

Congressionally designated wilderness is one type of special area on the forest. The Wilderness Act of 1964 emphasizes the protection of pristine areas and recognizes multiple values and public benefits found in these areas. Wilderness provides outstanding opportunities for solitude and for primitive and unconfined recreational experiences. Since the Wilderness Act became law, millions of people have visited designated wilderness for solitude, recreation, spiritual enhancement, and natural appreciation. Wilderness is also important for maintenance of species diversity, protection of threatened and endangered species, protection of watersheds, scientific research, and various social values.

Key indicators

- Acres designated under each of the wilderness management area prescriptions: 1.11, 1.12, and 1.13

Legal and administrative framework

- The **Wilderness Act** (1964) established a National Wilderness Preservation System to be administered in such a manner as to leave these areas unimpaired for future use and enjoyment as wilderness.
- The **Alaska National Interest Lands Conservation Act** (1980) directs the Secretary of Agriculture to provide adequate access to non-federal land within the boundaries of the National Forest System including Congressionally designated areas.
- **Congressional Grazing Guidelines** (Sec. 108, P.L. 96-560, H.R. Report 96-617 dated 11/14/79) clarify the Congressional intent that livestock grazing will be permitted to continue in national forest wilderness areas, when such grazing was established prior to classification of an area as wilderness. This policy is reiterated in FSM 2323.22.

Affected environment

INTRODUCTION

The White River National Forest manages eight wilderness areas. Approximately one-third of the forest totaling 754,519 acres is designated wilderness, the largest proportion

of any national forest in Colorado. This represents 24 percent of the state's designated wilderness on National Forest System lands. Since the 1984 Forest Plan was prepared, 8,330 acres have been added to Hunter-Fryingpan Wilderness, and the 12,594-acre Ptarmigan Wilderness was established. **Figure 49** displays the location of existing wilderness on the White River National Forest. Basic establishment and acreage data are summarized in **Table 122**.

Figure 49
Map of Existing Wilderness on the White River National Forest

Table 122
Existing wilderness acres on the White River National Forest

<i>Name</i>	<i>Establishing Law</i>	<i>WRNF Acres</i>	<i>Other Acreage*</i>	<i>Total Acres</i>
Collegiate Peaks	P.L. 96-560 12-22-80	35,482	189	35,671
Eagles Nest	P.L. 94-352 07-12-76	133,311	185	133,496
Flat Tops	P.L. 94-146 12-12-75	196,344	192	196,536
Holy Cross	P.L. 96-560 12-22-80	113,366	475	113,841
Hunter-Fryingpan	P.L. 95-237 02-24-78	82,026	40	82,066
	P.L. 103-77 08-13-93			
Ptarmigan Peak	P.L. 103-77 08-13-93	12,594	0	12,594
Raggeds	P.L. 96-560 12-22-80	16,793	39	16,832
Maroon Bells	P.L. 88-577 09-03-64	161,984		
/Snowmass	P.L. 96-560 12-22-80		1,499	163,483
Total acres		751,900	2,619	754,519

*Note: *The "other acreage" category includes lands under private or other type of ownership. It does not include National Forest System acreage on adjoining national forests.*

Source: USDA Land Areas of the National Forest System, 2000

Collegiate Peaks Collegiate Peaks Wilderness encompasses a total of 168,000 acres and overlaps three national forests: the White River, Gunnison, and Pike-San Isabel. The Pike-San Isabel National Forest is lead agency for management. Within this area are more peaks above 14,000 feet (a total of eight) than any other wilderness in Colorado or the lower 48 states. This portion of the Sawatch Range follows the Continental Divide for more than 40 miles, offering magnificent views of craggy peaks and deep U-shaped valleys. The northwest section of this wilderness lies on the White River National Forest. Its boundary is bisected by a deep indentation or “cherry stem” along the Lincoln Creek drainage. Despite its large acreage, much of this area is easily accessible from roads around its perimeter.

Eagles Nest Eagles Nest Wilderness is located along the crest of the Gore Range in north-central Colorado directly north of Vail Pass and totals 133,500 acres. The Interstate 70 corridor linking the towns of Vail, Dillon, and Silverthorne runs along the southern boundary of the area. First designated in 1932 as the Gore Range-Eagles Nest Primitive Area, the area’s final boundaries were determined after much controversy when Vail Pass was chosen as the route for Interstate 70. An earlier plan for the highway would have bisected the primitive area. A chain of sharp peaks, rugged escarpments, and steep-sided valleys characterizes the Gore Range, forming a rock backbone of pristine wilderness.

Flat Tops The Flat Tops Wilderness totals 235,400 acres and is the second largest wilderness in Colorado. Most of the area is located on the White River National Forest, although its northeastern perimeter is on the Routt National Forest. The White River National Forest is the lead managing agency. The wilderness is the centerpiece of the White River Plateau. The Flat Tops feature, a broad, lava-capped dome, provides hikers with hundreds of miles of trails that cross a broad expanse of nearly level terrain above timberline.

The area’s best-known attraction, just inside its northern boundary, is Trappers Lake, which is known as “the cradle of wilderness.” In 1919, the magnificent scenery of the lake sparked the beginning of the modern wilderness preservation movement when Arthur Carhart, a Forest Service landscape architect, proposed that the area be kept in its natural state through designation as a primitive area. Flat Tops Wilderness also is known for its very large and wide-ranging elk herd and native Colorado River cutthroat trout population.

Holy Cross The Holy Cross Wilderness totals 123,400 acres and is predominately on the White River National Forest, with 9,600 acres on the San Isabel National Forest. The White River National Forest is the lead managing agency. Holy Cross is named for its most prominent peak, Mount of the Holy Cross. This 14,003-foot mountain was made famous in the 19th century by William Henry Jackson’s photographs of the snow-filled couloir that forms a Latin cross near its summit.

In 1929, 1,400 acres of what was then the Holy Cross National Forest (which later merged with the White River National Forest) were turned over to the National Park Service, placing Mount of the Holy Cross under its jurisdiction as a national monument. This status was rescinded in 1950 and the land returned to Forest Service management. In the 1920s and 1930s, the mountain was visited by thousands of

religious pilgrims each year and still attracts many people to the forest to view the cross.

Holy Cross Wilderness contains the northernmost extension of the Sawatch Range, typified by glacial valleys and towering peaks. The mining boom of the early 1880s played a significant role in the human history of lands near and within this wilderness. Just outside its boundary, the ghost town of Holy Cross City and remnants of Gold Park reveal this heritage. Another relic of the mining era is the 475 acres of private inholdings within the wilderness that originated as patented mining claims.

Hunter-Fryingpan

The Hunter-Fryingpan Wilderness was named for the headwaters of the Fryingpan River and Hunter Creek, which are tributaries of the Roaring Fork River. In recognition of the outstanding fishery, the Colorado Division of Wildlife has identified these waters as Gold Medal streams. The Hunter-Fryingpan Wilderness is immediately adjacent to Mount Massive Wilderness and totals 82,100 acres. Rugged and unnamed peaks of the Williams Mountains and the valleys of the Fryingpan River and Hunter Creek dominate the area.

Maroon Bells-Snowmass

The Maroon Bells-Snowmass Wilderness is the only wilderness area on the White River National Forest that was designated by the 1964 Wilderness Act. Currently encompassing 183,800 acres, it is the fourth largest wilderness area in Colorado. Most of the area is located on the White River National Forest, although 20,400 acres are shared with the Gunnison National Forest. The White River National Forest is the lead managing agency. The most-photographed scene in Colorado is probably the Maroon Bells, easily recognized by their jagged contours and rugged escarpment. Within this portion of the Elk Range are six “fourteeners,” including Castle Peak (14,265 feet), the highest point in this wilderness. Crater Lake and Conundrum Hot Springs are destinations that present unique management challenges because of their popularity and accessibility. The Maroon Bells-Snowmass Wilderness contains 1,500 acres of inholdings, making it second in Colorado only to Weminuche Wilderness for the largest acreage of private property within designated wilderness.

Ptarmigan Peak

The southern slope of the Williams Fork Mountains is the site of the smallest wilderness area on the White River National Forest. Designated in 1993, Ptarmigan Peak is quite different from the typical “rock and ice” wilderness for which Colorado is known. With elevations ranging from 8,800 to 12,800 feet, the area offers forested slopes with more gentle alpine tundra running along the spine of the Williams Fork range.

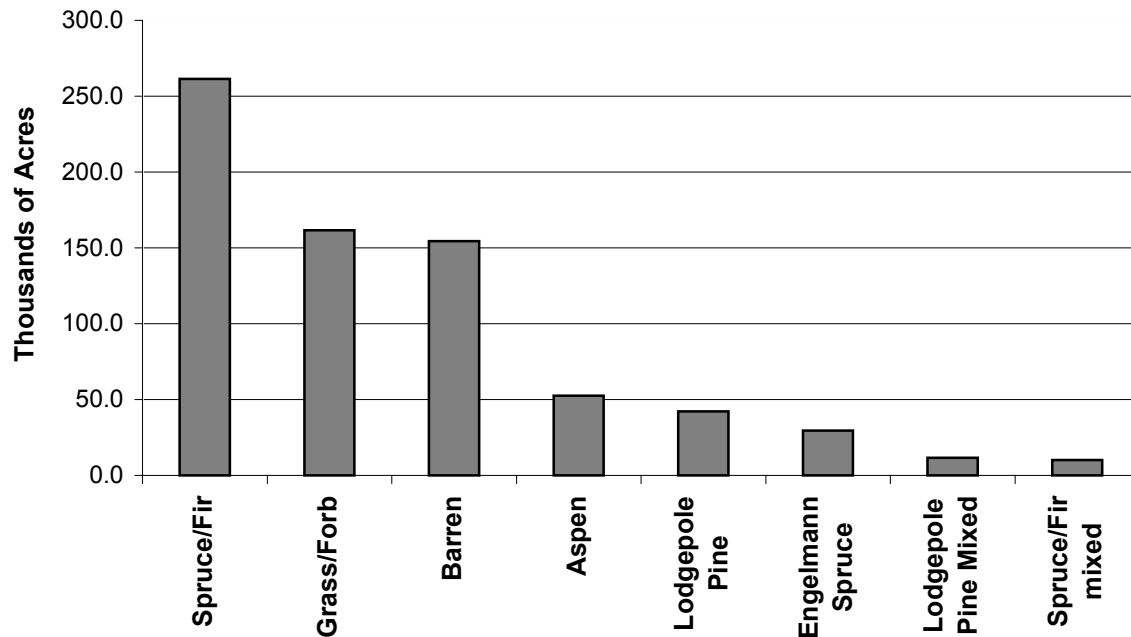
Raggeds

The Raggeds Wilderness is composed of 65,400 acres, of which 48,600 are on the Gunnison National Forest and the remainder on the White River National Forest. The Grand Mesa-Uncompahgre and Gunnison national forests are the lead managing agencies. Aptly named for the Ragged Mountains, this wilderness features a line of jagged knife-sharp peaks. The landscape is diverse with deep canyons and sweeping glacial valleys. The northern boundary of the area was modified extensively to avoid potentially mineralized areas and existing motorized recreation areas.

BIOLOGICAL DIVERSITY OF WILDERNESS ON THE WHITE RIVER NATIONAL FOREST

Air quality	The Flat Tops, Eagles Nest, and Maroon Bells-Snowmass Wildernesses are rated as Class I areas. Current monitoring strategies for these are as follows: • Flat Tops: lake chemistry analysis • Eagles Nest: visibility and lake chemistry analysis • Maroon Bells-Snowmass: ambient air quality, visibility and lake chemistry analysis. All other wildernesses on the White River are rated as Class II airsheds. Air quality monitoring in the Eagles Nest and Maroon Bells-Snowmass wilderness areas indicates no adverse regional impacts to air quality and exceptional visibility ratings.
Vegetation	More than 99 percent of the wilderness acreage on the White River National Forest is above 7,600 feet of elevation, and encompasses much of the forest's alpine tundra and subalpine areas. About 162,000 acres are in the grass/forb plant community; 272,000 acres are spruce-fir; 54,000 acres are lodgepole pine; and 56,000 acres are aspen (Figure 50). Wilderness areas on the forest contain 48 percent of the late successional spruce-fir, and 42 percent of the old growth spruce-fir.
Domestic livestock grazing	Livestock grazing is an authorized use of national forest wilderness. Under current forest plan guidelines, the forest's wilderness areas contain 27 active sheep and cattle allotments and 30 vacant allotments.
Wildlife and fisheries	Eagles Nest Wilderness is home to a native band of bighorn sheep. Additionally, transplanted herds have been established in Flat Tops, Holy Cross and Maroon Bells-Snowmass. Mountain goats are found in Eagles Nest, Collegiate Peaks, and Maroon Bell-Snowmass.

Figure 50
Vegetation cover types, in thousands of acres, in wilderness on the White River National Forest



In 1982, the Colorado Legislature listed mountain goats as a species native to the state. Winter range is critical for both bighorn sheep and mountain goats. Increased levels of winter recreation and private land development have the potential to affect their survival.

Resident moose populations have developed in Eagles Nest, Holy Cross, and Flat Tops Wildernesses as a result of migrations from the transplanted North Park herd. The Colorado Division of Wildlife (CDOW) does not allow hunting of these animals at this time. In 1995, the Eagles Nest Wilderness was added to the state's district animal unit plan to allow hunting if the moose population exceeds the population objective level set by CDOW.

Many of the high mountain lakes within the White River National Forest's wilderness areas have been stocked with fish by the CDOW. Stocking has been done since the early settlement era. The Colorado River cutthroat trout is the forest's only native game fish species. This species is a Region 2 sensitive species and is considered a *species of special concern* by CDOW. Stocking of Colorado River cutthroat trout by fixed-wing aircraft in wilderness was suspended in 1994 as a result of outbreaks of whirling disease in the state fish hatcheries.

A number of fish species that are not indigenous to the forest's wilderness areas, such as rainbow and brook trout, were introduced many years ago and are considered naturalized.

CDOW is reducing the stocking of non-native game fish species and is emphasizing stocking with native cutthroat strains in wilderness.

Fire	Within the forest's wilderness areas the primary management action for fires during the past decade has been suppression. This has led to vegetation conditions that diverge from those resulting from natural processes. The <i>Flat Tops Fire Management Area Guidebook for Prescribed Natural Fire Planning and Implementation</i> was completed in 1995. In 1997, the Bridge Creek Fire in Flat Tops Wilderness became the first fire in Region 2 to be managed as a wildland fire managed for natural resource benefit. The <i>Eagles Nest and Ptarmigan Peak Guide for Managing Wildland Fires</i> was finalized in the spring of 2001 and is currently being implemented.
Insects and disease	Snags remaining after the spruce beetle epidemic of the 1940s are abundant in Flat Tops Wilderness. That outbreak produced the largest recorded single mass killing of trees in North America. The current outbreak in lodgepole pine of mountain pine beetles, which has been increasing since 1996, is evident along the southern periphery of Eagles Nest Wilderness and the northern periphery of the Holy Cross Wilderness as well as in the Hunter-Fryingpan Wilderness. Mountain pine beetle is native to the forests of western North America. Because the outbreak is considered natural, no management actions within wilderness are underway or planned.
Noxious Weeds	An inventory identifying the location of undesired species occurring within the forest's wilderness areas has not been fully completed. Noxious weeds that have been found in wilderness include common tansey, common teasel, houndstongue, plumeless thistle, yellow toadflax, chamomile, and Canada thistle. A special order is in place throughout Colorado requiring all hay used on National Forest System lands to be "certified weed-free." Additionally, a special order prohibits hay and unprocessed feed within Flat Tops Wilderness.

RECREATION IN WILDERNESS ON THE WHITE RIVER NATIONAL FOREST

The 1984 forest plan allocates the following wilderness management areas: pristine (11 percent), primitive (53.5 percent), semi-primitive (35 percent), and transition (0.5 percent). Specific direction is further detailed in the *wilderness implementation schedule* (WIS) for each area. In the 2001 Forest Plan, designated campsites are a tool for managing recreation use but are not mentioned specifically by location or management prescription. Conundrum Hot Springs, Crater Lake, Geneva Lake, and Thomas Lakes in Maroon Bells-Snowmass Wilderness require camping at designated campsites. In all wilderness areas, regulations prohibit camping within 100 feet of lakes, streams, and trails. In addition, some high-use areas have additional regulations prohibiting campfires, dogs, and stock tethering.

Heavy use transition areas (8D)	Areas within the 8D management prescription have experienced consistently high use near popular trailhead portals. These high use levels often require special regulations to comply with forest plan standards and to protect wilderness values. It is very likely that these and even additional regulations will be required to meet standards and guidelines regardless of the alternative selected.

A brief description of these areas and special management regulations currently in place are as follows:

- **Eagles Nest Wilderness**—*Cataract Lake* is a major portal into the northwest portion of the area. Camping is prohibited around the lake. Cataract Guard Station, a Forest Service administrative site, is located outside of the wilderness near the northern shore of the lake.

Piney Lake is a major portal from Vail into the southern portion of the area. No special restrictions are in place. However, a portion of the lake and shore is on private property and the owners do not permit camping in the area.

- **Holy Cross Wilderness** – *Halfmoon Pass* is the main route for ascending Mount of the Holy Cross. Campfires are prohibited within this drainage. In route to the summit, visitors are requested not to camp in the East Cross Creek drainage due to the shortage of sites sufficiently away from lakes, streams, and trails.

- **Flat Tops Wilderness** – *Trappers Lake* is the major entrance point into the Flat Tops Wilderness for day use (primarily fishing) at the lake and for overnight visitation into the bulk of the wilderness. This area is easily accessed by a high-standard gravel road and is located within one-half mile from a Forest Service campground and the Trappers Lake Lodge. The lake is entirely within wilderness. Camping and campfires are prohibited within one-fourth mile of the lake. CDOW has two cabins at the lake under special use permit that are used for spawn-taking operations and for storing equipment.

The *Lake of the Woods* portal is two miles below Trappers Lake and is popular because of its close proximity to Trappers Lake. There are no camping restrictions in this area.

- The area near Himes Peak Campground is heavily wooded, difficult to access, and receives limited use. It does not meet the current forest plan description of an 8D area.

Maroon Bells-Snowmass Wilderness – Maroon Lake is almost entirely outside of the Wilderness but is a major destination and portal into the area. The classic view of the Maroon Bells is reported to be the most photographed scene in Colorado. From this trailhead, three peaks exceeding 14,000 feet can be climbed. Restrictions on camping, campfires, dogs, and livestock are in place in the vicinity of the lake.

Recreation Use

Recreation use trends and capacity on the White River National Forest, including Wilderness, are discussed in the recreation management section. Cole (1996) reviewed use trends in wilderness across the nation and found that “with the benefit of an additional 10 years of data, it now appears that the decline (in use) was limited to a brief period and to a subset of wildernesses. The prominent trend has been one of increasing use.”

Types of recreation use may vary by wilderness area or terrain. In most areas on the White River National Forest, day hiking constitutes a major portion of total wilderness use. Other activities include but are not limited to backpacking, horseback riding, llama trekking, fishing, and hunting. Flat Tops Wilderness receives the majority of the forest’s wilderness horse use.

Commercial services may be permitted within wilderness areas to the extent necessary to support activities essential to realizing the recreational or other values of the area (Wilderness Act of 1964). Services provided on the White River National Forest include a variety of activities that meet the intent of the Wilderness Act. Use associated with commercial outfitting and guiding services is estimated to comprise less than 10 percent of the total wilderness use on the forest.

All of the wilderness areas on the forest except Maroon Bells-Snowmass have a group size limitation of 25 people and stock. Sometimes referred to as the “heartbeat” rule, this regulation allows any combination of people and stock totaling 25. The Maroon Bells-Snowmass group size limitations specify no more than 10 people and 15 stock for a total of 25 people and stock.

Public safety

Visitors are expected to be knowledgeable about and prepared to deal with conditions typically found in wilderness. The norm is to expect more difficult travel conditions, few or no facilities, and a high reliance upon primitive survival skills and modes of travel. However, the high density of standing dead trees in Flat Tops Wilderness, which because of their age are prone to windfall, was deemed a unique hazard that warranted special notice to visitors. Bridges are sometimes provided for public safety where streams cannot be safely forded during normal flows. The Forest Service on a case-by-case basis may authorize motorized equipment where there is a legitimate emergency involving human health and safety. Every year and at an increasing rate, the use of helicopters is authorized to rescue injured or lost people. In 1990, there were nine approvals for use of motorized equipment on search and rescue missions. Between 1992 and 1994 there were 11, 17, and 16 approvals, respectively, for use of motorized equipment on search and rescue missions. The forest has initiated memoranda of understanding with county sheriffs, who are responsible for all search and rescue activities, so that obtaining approvals for use of motorized equipment does not impede rescue efforts in life-threatening situations.

SPECIAL INTEREST AREAS IN WILDERNESS ON THE WHITE RIVER NATIONAL FOREST

A given land area on the White River National Forest may be allocated to multiple management prescriptions if they are compatible with one another. Special interest areas are managed with an emphasis on protecting or enhancing areas of unusual characteristics. Examples of special areas that may occur in wilderness are research natural areas (RNAs), wild, scenic, or recreation rivers, heritage resources, and caves. Under the 1984 Forest Plan, there currently are no research natural areas or wild, scenic, or recreational rivers designated in wilderness on the forest. In the past decade, significant cave resources have been found within various wilderness areas. Currently, there are no permanent structures authorized within wilderness for cave protection.

Notch Mountain Shelter, a stone shelter constructed by the Civilian Conservation Corps in the early 1930s in view of Mount of the Holy Cross, is being evaluated for historical significance and listing in the National Historic Register. Management at this time consists of maintaining the existing structure without improving the facility.

FUTURE TRENDS

There continues to be public and congressional interest in adding land to the National Wilderness Preservation System. If lands are added to the system, they will help satisfy both a need for preserving natural ecological conditions and for public recreation in primitive and pristine environments. For further information about recommended wilderness and roadless area management in the 2001 Forest Plan and acreage by alternative, see Topic 4, Roadless Areas.

Regardless of the acreage of designated wilderness, new technologies will continue to be developed that may alter the primitive wilderness experience. For example, cellular phones and GPS units are eroding the sense of challenge, adventure, and solitude. Given the reliance on these devices and the urbanization of the population, it is likely that the primitive skills of wilderness visitors will diminish in the future. These changes may lead to an increase in the number of rescues needed to save lives.

Environmental consequences

GENERAL EFFECTS

**Major
differences
between
alternatives**

The main difference among alternatives is the location and extent of acreage assigned to each wilderness management area prescription. In general, the pristine class (1.11) will decrease the amount of human influences on the natural environment. The other classes, primitive (1.12) and semi-primitive (1.13), allow for more intensive human use, with semi-primitive allowing the highest level within the limits described. There are also differences between secondary management area allocations such as research natural areas, wild, scenic, or recreational rivers, or bighorn sheep.

Figure 51 illustrates the allocation, by alternative, of the three wilderness management areas (MAs). Alternative K has the most number of acres allocated pristine (1.11). Alternatives E and F have the least number of acres of MA 1.11. Primitive (1.12) allocations range from 61.6 percent in Alternative K to 88.5 percent in Alternative B. Alternative E has the most of the semi-primitive (1.13) management area. Alternatives B, C, D, I, and K have less than 1 percent of the total wilderness acreage in MA 1.13.

Figure 51
Allocation of Management Areas 1.11, 1.12, and 1.13 by alternative

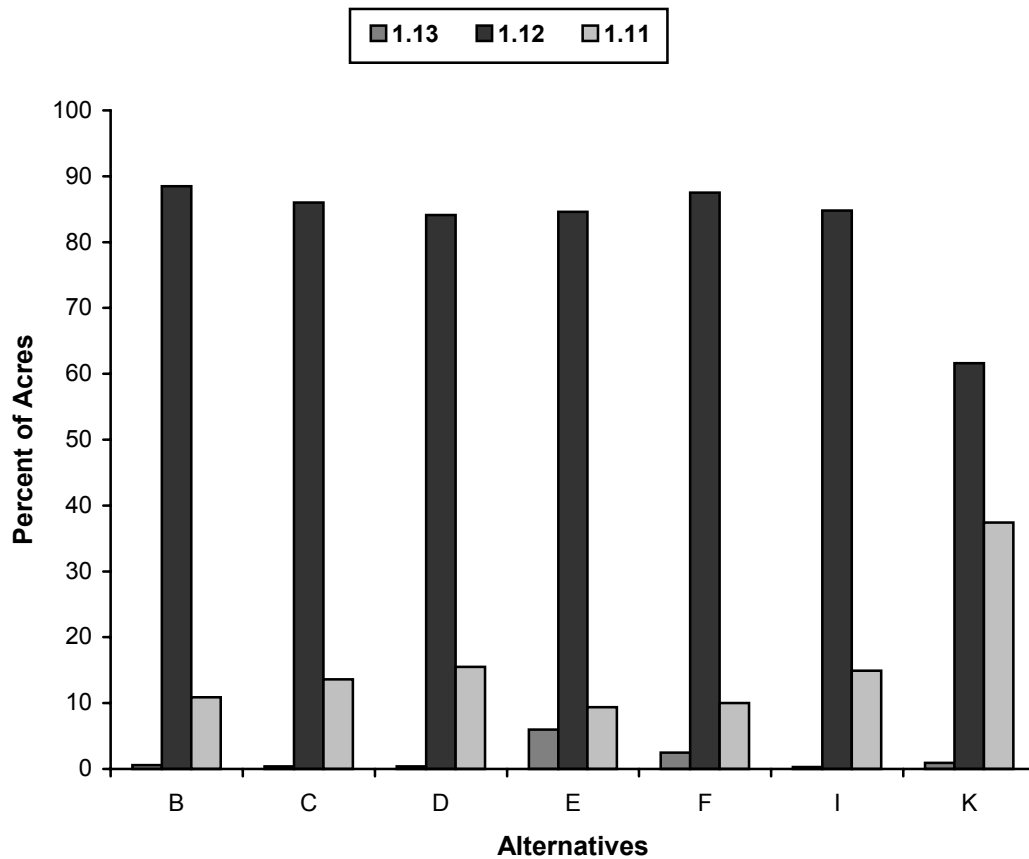


Figure 51 illustrates the allocation, by alternative, of the three wilderness management areas (MAs). Alternative K has the most number of acres allocated pristine (1.11). Alternatives E and F have the least number of acres of MA 1.11. Primitive (1.12) allocations range from 61.6% in Alternative K to 88.5% in alternative B. alternative E has the most of the semi-primitive (1.13) management area. Alternatives B, C, D, I, and K have less than 1 percent of the total wilderness acreage in MA 1.13.

The proposed increases in 1.11 fall primarily in West Cross and the East Fork of Homestake Creeks in Holy Cross Wilderness, throughout ridge tops in the Maroon Bells-Snowmass Wilderness, and in the middle of the Flat Tops Wilderness. These areas meet the criteria of primitive by being remote, without National Forest System trails, and with high opportunities for solitude.

Proposed increases in 1.13 (semi-primitive) occur primarily along heavily used trail corridors and destinations including Mount of the Holy Cross in Holy Cross Wilderness; Marvine and Trappers Lakes, in Flat Tops Wilderness, Snowmass Lake and Conundrum Creek in Maroon Bells-Snowmass Wilderness; Independence Lake in Hunter-Frying Pan Wilderness; Booth Falls, Wheeler Lakes, Ryan Gulch, Boulder Lake, and Cataract Lake in Eagles Nest Wilderness; and Ptarmigan Trail in Ptarmigan Peak Wilderness. The shift

in management to this category would require camping to be either restricted to designated sites or prohibited. It would also allow for a higher level of recreation capacity for these areas.

Effects on wilderness from wild and scenic rivers

Alternatives C through K propose the same number of acres (15,200) of eligible wild river designation (management area 1.5) in wilderness. These rivers include Cross Creek (in Holy Cross Wilderness); the South Fork of the White River (in Flat Tops Wilderness), and the Crystal River (in Maroon Bells-Snowmass Wilderness). This designation does not supersede private water rights.

Alternatives B through K have the same number of acres (2,100) of eligible scenic river designation (management area 3.4) and of eligible recreation river designation (50 acres in management area 4.4) in wilderness. The only eligible scenic and recreation river in wilderness is the Crystal River in Maroon Bell-Snowmass Wilderness. This designation does not supersede private water rights.

If designated by Congress, both wild and scenic river status offers additional protection to wilderness water flows by restricting some development projects.

Effects on wilderness from research natural areas

In general, the research natural area designation is complementary to wilderness management. In Alternatives C, D, E, F, I, and K in which there is dual management of RNAs within wilderness. Existing trails would continue to be maintained to reduce erosion and protect natural resources. Additional restrictions on human use may be necessary to protect the values for which the RNA was established. All of the action alternatives (C through K) have between 3 percent and 11 percent of their total acreage also designated as a research natural area. Alternative I has the most acres proposed and Alternative B has no acres of RNAs within wilderness.

Table 123
Research natural areas within wilderness on the White River National Forest

RNA Name	ALTERNATIVE						
	B	C	D	E	F	I	K
Black Creek (Eagles Nest)		X	X	X	X	X	
Difficult Creek (Collegiate Peaks)			X			X	
East Lake and West Cross Creeks (Holy Cross)						X	X
Gift and Kline Creeks (Maroon Bells- Snowmass)		X	X	X	X	X	X
Marten Creek (Hunter-Fryingpan)			X			X	
Oyster Lake (Flat Tops)		X	X	X	X	X	
W Mountain (Flat Tops)						X	
Warren Peak (Hunter-Fryingpan)		X	X		X	X	

Effects on wilderness from bighorn sheep management

The 5.42 management area for bighorn sheep overlaps designated wilderness in Alternatives C through K. Alternatives C, D, E, and I have approximately 14 percent of the total wilderness acres on the White River National Forest in 5.42. Alternative F has 4.7 percent and Alternative K has 19.5 percent of the total wilderness acres in 5.42. Recreation, especially during the winter, could be restricted in these areas if human activity is determined to disturb bighorn sheep. Areas potentially affected include Avalanche and East Maroon Creeks in Maroon Bells-Snowmass Wilderness, South Fork Canyon in Flat Tops Wilderness, and the Booth and Pitkin drainages in Eagles Nest Wilderness.

Effects on wilderness from heritage and cave resources

Under any alternative, heritage resources will be surveyed and their status determined. If there are found to be significant, these structures will be managed to be compatible with the desired condition of the management area.

Cave management will consider the protection of the cave's ecosystem and protection of wilderness values in all alternatives.

Effects on wilderness from vegetation management

We manage wilderness in accordance with the policies set forth in the *Wilderness Management Philosophy* (1989). Management activities in wilderness are limited. In fact, the forces of nature (fire, insects, and disease, among many other phenomena) should be allowed to play their historic role in wilderness ecosystems without intervention, as long as they do not threaten resources and properties outside the wilderness boundary. Present conditions reflect 100 years of fire control. It is possible that the most serious adverse impact to wilderness has been the suppression of fire. To help improve ecosystem health and meet the intent of the Wilderness Act, the Forest will consider increasing its use of prescribed fire within designated wilderness in all alternatives.

In any alternative within designated wilderness, vegetation management inside wilderness is restricted to wildfires managed for natural resource benefit. This action will help to return wilderness vegetation conditions to natural conditions.

Logging and related road building activities near the wilderness boundary have the potential to affect wilderness use levels by creating potential motorized entry points. Improved access may result in increased recreation use. In the short term, increased noise levels change the user's perception of being in a remote area. Alternatives C and F would provide more opportunity for vegetation management adjacent to wilderness.

Effects on wilderness from wildlife and fisheries management

In all alternatives, activities for fish and wildlife management in wilderness will be conducted according to the policies and guidelines set in the *Memorandum of Understanding of the International Association of Fish and Wildlife Agencies* (Appendix C of the 2001 Forest Plan). This includes guidelines pertaining to threatened and endangered species, chemical treatment, and fish stocking. All activities will be conducted in accordance with the Wilderness Act's purpose of protection of natural processes.

Effects on wilderness from recreation management

Alternative K has the most opportunity for pristine (Management Area 1.11) wilderness experiences. It may provide the most opportunity to reduce crowding and protect pristine conditions within wilderness. There will also be fewer miles of system trails. Alternatives E and F have the greatest increase in the semi-primitive (1.13) management area. This increase would allow campsites and trails to be modified to allow an increased number of people to recreate. There also will be restrictions in overnight camping in these areas.

In wilderness areas, the White River National Forest contains eight peaks exceeding 14,000 feet. Alternative E establishes a 1.13 corridor for Mount of the Holy Cross to address management issues related to camping in this corridor. These peaks are such popular destinations that management actions will be required to meet the wilderness management area standards and guidelines.

Effects on wilderness from domestic livestock grazing

Grazing would continue in wilderness in accordance with Congressional guidelines. Because the Wilderness Act of 1964 permits grazing within wilderness, vacant allotments are recommended for closure by alternative based on range capability, not on wilderness considerations. There are 294,337 acres of vacant allotments within wilderness. Table 3-114 displays the acres of closed vacant allotments in wilderness by alternative.

Table 124
Vacant allotments closed in wilderness

	ALTERNATIVE						
	B	C	D	E	F	I	K
Number of Acres	0	218,404	195,831	245,652	142,810	248,815	191,677

CUMULATIVE EFFECTS

The cumulative effects analysis for wilderness considers designated wilderness within the White River National Forest boundary over the life of the plan. Past management actions emphasized education of wilderness visitors and minimal regulations to protect wilderness resources. With increasing use, current management actions require designated campsites and day use areas in high use corridors. Population growth along the Front Range of Colorado and urban development adjacent to designated wilderness has a direct relationship with use and increased resource concerns within wilderness. As wilderness use increases, additional management strategies will need to be implemented to continue to protect the wilderness resource. The designation of additional wilderness areas will provide additional opportunities for primitive unconfined recreation experiences and broaden the ecological diversity within the system.

Wilderness management in accordance with the standards and guidelines of the 2002 Forest Plan will maintain or improve wilderness conditions on the forest. As a result, these components of the National Wilderness Preservation System can continue to contribute to the purposes for which wilderness is designated. It is anticipated that additional regulations will be required to protect the wilderness resource and manage the increased use and associated impacts throughout the wilderness.

Topic 5, Part 4

Wild, scenic, and recreational rivers

Introduction

Abstract

Wild and scenic rivers are managed to protect their free-flowing characteristics and their particular *outstandingly remarkable values*. These values were identified in an eligibility study, the first phase of a two-phase study process, of all rivers on the national forest. That review identified five rivers as eligible for addition to the wild and scenic river system. The second phase of wild and scenic river study addresses their suitability for inclusion. This phase will be initiated at a later date when certain criteria are met.

Summary

Free-flowing rivers designated by Congress as wild and scenic rivers offer outstanding ecological, heritage, or recreational features that are protected for future generations. During forest planning, the Forest Service evaluates rivers within National Forest System lands and determines which are eligible for inclusion in the National Wild and Scenic Rivers System.

To be included in the system, a river must meet the tests of eligibility and suitability. To be eligible, a river must be free-flowing and possess river values that are deemed to be outstanding and remarkable. To be suitable, the benefits of designation should outweigh the disadvantages. This assessment involves consideration of the land ownership in the area; the land uses that would be affected; public, state, and local government interest in the river's designation; estimated costs; and any other issues raised.

Key indicators

- Locations of eligible rivers
- Miles of eligible rivers



Legal and administrative framework

- The **Wild and Scenic Rivers Act** (1968) establishes objectives, goals, and procedures for designation of wild, scenic, and recreational rivers, making it national policy to “preserve selected rivers or sections thereof in their free-flowing condition, to protect water quality of such rivers and to fulfill other vital national conservation measures.” According to the Act, these rivers “shall be preserved in free-flowing condition” and “they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations.”
- The **Forest Service Handbook** (1909.12) directs the Forest Service to evaluate rivers for inclusion in the National Wild and Scenic River System during the forest planning process.

Affected environment

INTRODUCTION

The 1984 Forest Plan found two rivers on the White River National Forest to be eligible: the Crystal River (including North and South forks) from the forest boundary to the sources of both forks; and the South Fork of the White River to its source. Standards and guidelines were developed to protect their resource values. In 1995, the Forest Service and the Bureau of Land Management (BLM) jointly determined Deep Creek to be eligible as well. All three rivers currently are being managed to protect their values for potential designation.

For the 2001 Forest Plan, all rivers on the forest (580 rivers with a total length of about 3,000 miles) were evaluated for eligibility. Initial review identified 77 rivers totaling 755 miles that were screened for free-flowing character and outstandingly remarkable values. The resource values evaluated in this process were fisheries, wildlife, geology, scenery, history and culture, and recreational potential. Rivers found to be free-flowing with at least one outstandingly remarkable value were deemed eligible.

Each stream found eligible then was reviewed for potential classification as wild, scenic, or recreational based on the following criteria:

- **Wild** — Rivers or sections of rivers that are free of impoundments, with watersheds or shorelines essentially primitive; they generally are inaccessible except by trail, with undisturbed landscapes.
- **Scenic** — Rivers or sections of rivers that are free of impoundments, with watersheds or shorelines still largely primitive and undeveloped; they can be accessible in places by inconspicuous, well-screened local roads.
- **Recreational** — Rivers or sections of river that are readily accessible by road or railroads and have some degree of development along their shoreline where minor structures are allowed, providing that the waterway generally remains natural in appearance.

Additional details regarding this classification can be found in Appendix B of the 2002 Forest Plan.

Table 125 displays the results of the inventory and evaluation of streams on the forest for eligibility. See Appendix F for more detailed descriptions, and the management area maps for river locations.

The 1992 Colorado State Comprehensive Outdoor Recreation Plan (SCORP) identified that in Region 11 (Garfield, Mesa, Moffat, and Rio Blanco counties) wild and scenic river designation was one of 17 issues that residents placed in the highest importance category. In contrast, Region 12 (Eagle, Grand, Jackson, Pitkin, Routt, and Summit counties) identified this issue as one of 16 issues placed in the medium importance category.

Table 125
Streams found eligible for inclusion in the National Wild and Scenic River System 1

<i>Name</i>	<i>Length (miles)</i>	<i>Outstandingly remarkable values</i>	<i>Potential Classification</i>
South Fork of the White River	25	Recreation, scenery, geologic	Wild and scenic
Crystal River	39	Scenery, historic, recreational	Wild, scenic and recreational
Deep Creek ²	13	Geologic, scenic, recreational, and ecologic condition	Wild, scenic and recreational
Colorado River (Segment 1)	4	Geologic, scenic driving	Recreational
Colorado River (Segment 2)	5	Geologic, scenic driving	Recreational
Cross Creek from the headwaters to the wilderness boundary	23	Fisheries	Wild

¹Detailed descriptions of the stream segments can be found in Appendix F.

²Includes portions on public lands administered by Bureau of Land Management.

FUTURE TRENDS

Detailed suitability evaluations of eligible rivers have not been done during this revision of the forest plan.

Each stream found eligible for inclusion in the Wild and Scenic Rivers System will be managed to maintain its eligibility until a detailed suitability study is completed.

Individual suitability studies will be considered when:

- Strong local interest or support is demonstrated for wild and scenic designation, and
- Congress expresses interest in a specific river for wild and scenic designation, or
- A proposed project would alter the free-flowing character of a stream (such as impoundment) or would affect the resources that made the stream eligible.

Environmental consequences

GENERAL EFFECTS

Alternative B provides protection for the Crystal River and the South Fork of the White River only, a total of 64 miles. All 103 miles of eligible rivers are protected in Alternatives C, D, E, F, I and K.

DIRECT AND INDIRECT EFFECTS

Effects on wild and scenic rivers from minerals management

Mineral or energy exploration and subsequent development could have an effect on the character of river segments. Scenery could be degraded by excavation and spoils. Environmental accidents, including hazardous waste spills, are more likely to occur at these sites. Eligible rivers will be withdrawn from mineral entry and made **administratively unavailable** for new oil and gas leases. New claims or leases are prohibited within a quarter mile of the river. Existing valid mining claims and existing oil and gas leases are allowed with restrictions that protect the river resources.

Effects on wild and scenic rivers from domestic livestock grazing

Livestock use would not affect a river's eligibility for nomination, but range improvements must be compatible with a river's potential classification and designation. The period of occupancy and number of livestock allowed within the river corridor may be affected in order to protect riparian areas and wetlands.

Effects on wild and scenic rivers from vegetation management

Vegetation management could alter scenery in an area either positively or negatively. Although all river corridors are removed from the ASQ, trees could be cut in the eligible scenic or recreational river corridors. Trees will be cut only if they do not alter the recreation characteristics of the land and physical resources, or if they do not affect the eligibility, classification, or potential suitability of the area. For wild and scenic classifications, vegetation alteration outside the areas will be performed in a manner that does not reduce the scenic quality of the river corridor.

Both natural and prescribed fires may be used as a tool to maintain ecological conditions within many of the river corridors. These burns could affect scenery in the short term, but should contribute to meeting long-term scenic objectives and desired future conditions of the management area.

Effects on wild and scenic rivers from travel management

Road construction and reconstruction can adversely affect scenic and water qualities. The Crystal River is paralleled by Colorado State Highway 133, and the Colorado River segments adjoin Interstate 70. Construction and reconstruction work on these and other adjacent roads will be performed in ways that do not affect the eligibility, classification, or potential suitability of the areas.

Effects on wild and scenic rivers from recreation management

Predicted levels of recreation use are not expected to affect any of the rivers found eligible. Recreation developments and facilities will not be allowed if they affect the eligibility, classification, or potential suitability of the areas.

Effects on wild and scenic rivers from scenery management

Positive effects on potential wild and scenic river management areas are expected from scenery resource management. These river segments will be managed to protect natural appearing landscapes.

CUMULATIVE EFFECTS

Currently, Colorado has one designated wild and scenic river, the Poudre River west of Fort Collins. The eventual designation of any of the five rivers found eligible in this plan would add diversity and improved representation of outstanding rivers in the state.

Designation of the five eligible rivers on the forest could lead to an increase in river-related recreation. The rivers are a component of the forest's dispersed recreation opportunities; designation would likely make them more attractive as recreation destinations. Regionally, it would not significantly increase the amount of recreation use. Non-designation would not affect the amount of river-related or dispersed recreation uses on the forest but would represent a lost opportunity to have representative streams in Colorado as part of the National Wild and Scenic River System.

Topic 5, Part 5

Caves

Introduction

Abstract The boundaries of the White River National Forest include a significant concentration of caves, which are essentially non-renewable resources. In 1994, the Forest Service established a procedure to recognize and protect the most valuable cave resources. The forest plan revision will integrate protections for these valuable resources. Alternatives C, D, F, I, and K recognize 42 significant caves. Alternative E recognizes three significant caves. Alternative B does not recognize any significant caves.

Summary Cave resources can be quite fragile and rare. They include any material or substance occurring naturally in caves, including but not limited to biotic, cultural, mineralogic, paleontologic, geologic, or hydrologic resources.

The White River National Forest has a significant number of caves and a significant proportion of all caves in Colorado, perhaps as much as one third of the state's known caves.

Key indicators

- Number of significant cave nominations

Legal and administrative framework

- The **Federal Cave Resources Protection Act (FCRPA)** (1988) at 16 USC 4301-4309 requires the Secretary of Agriculture to consider significant caves in the preparation of any land management plan. It also requires that the locations of significant caves be kept confidential unless it is determined that disclosure will not create a risk of harm, theft, or destruction to cave resources. Finally, the act defines actions that are prohibited in significant caves and establishes penalties for violating the prohibitions.
- **36 CFR 290 – Cave Resources Management** regulations implement the requirements of FCRPA on National Forest System lands. They provide the basis for identifying and managing significant caves.

Affected environment

INTRODUCTION

Many of Colorado's karst areas and caves are located within the White River National Forest, including at least 242 of the approximately 700 currently known Colorado caves. Each year, additional caves are discovered. Caves have been located on five of the forest's seven ranger districts. Their abundance stems from the region's geology. Up to one-fourth of the forest consists of geological formations known as karst, which is a type of landform that develops when soluble rocks such as limestone, dolomite, gypsum, anhydrite, and halite are dissolved over time. Karst processes often form caves.

A few examples of the known outstanding caves on the White River National Forest are listed below:

- **Groaning Cave**, discovered in 1968, is Colorado's longest cave, having nearly 9 miles of mapped passage. It is gated and visitation is managed by the Colorado Cave Survey. It receives between 200 and 400 visitors per summer.
- **Hourglass Cave**, was the location of a Native American skeleton determined to be 8,000 years old. The high altitude cave, which is currently gated, provides excellent conditions for preserving the bones and other organic materials. Significant scientific studies and reports have already resulted from this discovery.
- **Ron-Tom Cave**, discovered in 1986, satisfies multiple criteria for significance as defined under the FCRPA, including biota, geologic, mineralogic, paleontologic, hydrologic, recreational, educational, and scientific values. For example, the cave contains exceptional fried-egg stalagmites, pictures of which were used in the second edition of *Cave Minerals of the World*, published in 1997. In the same text, the author reports on three known occurrences of lotus rimstone, circular to convoluted rimstone that resembles water lilies; one of these three sites is Ron-Tom Cave. The forest is currently analyzing the impacts of installing a gate on this cave with a preferred alternative of installing the gate.

Only five caves have any current management strategies in place, either formally or informally. In partnership with the Timberline Grotto and the Colorado Cave Survey, some protection measures have been implemented. One cave is gated to protect a site in which the 8,000-year-old remains of a Native American were found. A gate is also maintained at Groaning Cave. A ladder and signs are maintained at Spring Cave and Fulford Cave. Information on Spring, Fulford, and Hubbard Caves is provided to the public upon request.

Cave resource inventories are incomplete. Very few surveys have been initiated. The location of all caves on the forest, the extent of their passageways, the animal species that occur in them, their association with aquifers, or the extent of resource damage, if any are not well known.

Significant caves

The Federal Cave Resources Protection Act of 1988 directed the Secretary of Agriculture to prepare a list of *significant caves* which meet the criteria in 36 CFR 290.3(c) and have been designated in accordance with 36 CFR 290.3(e). As of December 1998, no significant caves on the forest had been nominated.

Regulations at 36 CFR 290.3(c) list six criteria that justify a classification of a cave as significant. The areas of consideration are biota, cultural, geologic/ mineralogic/ paleontologic, hydrologic, recreational, and educational, or scientific. We have already used these criteria to support the installation of cave gates for resource protection. In addition, the forest will nominate Groaning, Hourglass, and Ron-Tom caves as significant under all alternatives except for the no action alternative (Alternative B). The process defined in 36 CFR 290.3 requires that the forest carry out evaluations in consultation with individuals and organizations interested in the management and use of caves.

Nominations for significant cave designation are then submitted to the authorized officer, currently in the Washington office of the Forest Service, who either accepts or rejects the nomination.

Section (d) of 36 CFR 290.3 also states that “all caves located within special management areas, such as special geologic areas, research natural areas, or National Monuments, that are designated wholly or in part due to the cave resources found therein are determined to be significant.” Based on this criteria, the Deep Creek Research Natural Area, which contains about 40 caves (*Mineral Potential Assessment Report; Deep Creek Caves Withdrawal*, 08/09/88) establishes significance for these caves. Groaning Cave is one of these 40 caves. This research natural area is proposed in Alternatives C, D, F, and I.

FUTURE TRENDS

Public and agency awareness of cave resources on the forest is growing as new caves continue to be discovered. The forest will initiate inventories to better understand the scope and condition of this resource. As new information becomes available, additional caves that meet the significance criteria will be nominated.

RESOURCE PROTECTION MEASURES

We have added a set of standards and guidelines for mitigation and protection of cave resources in the 2001 Forest Plan. Therefore, the effects of other forest management activities on cave resources are expected to be very low. Differences in the effects of the alternatives on cave resources are negligible because of the forest-wide standards and guidelines. Cave resources associated with National Forest System lands are accorded protection under any alternative, as they are on other federal lands.

Environmental consequences

GENERAL EFFECTS

Cave resources are considered non-renewable because of the unique conditions under which they formed, the time it takes for them to develop, and the sensitivity of cave micro-climates to disturbance.

Caves can be damaged by vandalism and theft of formations, by nearby blasting, by the use of heavy equipment (which breaks through into passages or caverns), by hazardous material spills, or by deposition of gravel and soil carried by flowing water. Activities that draw down water from aquifers may also affect caves, because such drawdowns may reduce the underground flow of water, which affects cave formation. Flowing water may occur naturally during storm events or as a result of human alteration of surface flows.

Indirect effects can result from anything that alters the cave's micro-climate: the presence of humans and their litter; plant seeds and spores; the installation of electric lights, which raises the cave temperature and allows plant material to grow; the creation or enlargement of surface entrances, which alters air flow and temperature; and events on the surface (such as wildfire, removal of vegetation, or paving), which alter the infiltration of moisture or introduces pollutants to the cave level.

Protection of cave resources and maintenance of natural conditions are considered beneficial effects. Developing a cave so that people can easily visit it may compromise natural conditions and expose formations to physical damage. However, development

may provide beneficial effects if visitors gain an appreciation of cave resources and the need to protect them.

Because of groundwater and streamflow regimes, activities occurring on overlying or adjacent formations, as well as those occurring on the limestone formations, may negatively effect cave resources.

DIRECT AND INDIRECT EFFECTS

Effects on cave resources from vegetation management

Timber harvest in or above limestone formations has the potential to damage cave resources. Heavy equipment used in logging operations could break through into cave passages, creating new openings to the surface, and thereby altering the cave’s micro-climate. Soil compaction by heavy equipment and removal of trees can influence the amount of water that infiltrates into the soil, and perhaps into any caves below. The effects of road construction and reconstruction associated with timber harvest are described below. Timber harvest may occur in or above the limestone formations in all alternatives. **Table 126** shows the timber harvest acreage by alternative. The greatest potential for adverse effects occurs under Alternatives F, B, which provide for the most acres of timber harvest in the next decade. Alternatives K and D provide an intermediate level of timber harvest, while Alternatives, C, I, and E create the least potential for adverse effects due to the fewest annual acres of timber harvest. The magnitude of direct effects is not quantifiable, because the location or extent of some caves is unknown. However, forest-wide standards and guidelines are designed to minimize or eliminate damage to cave resources from timber harvest activities.

Table 126
Harvest acres (in thousands) by alternative per decade

Budget Level	ALTERNATIVE						
	B	C	D	E	F	I	K
Experienced	12	4	9	5	19	5	10
Full	17	7	14	7	27	7	16

Changes in the rate of water infiltration could indirectly affect cave micro-climates and the rate at which speleothems develop. Such changes would be small, immeasurable, and probably less drastic, and indistinguishable from changes caused by natural variations in precipitation.

Effects on cave resources from road construction and reconstruction projects

Road construction and reconstruction in or above limestone formations has the potential to damage cave resources by altering water infiltration or surface-water drainage patterns. Heavy equipment operation may also cut into or fall through the surface into cave passages. Forest development road construction and reconstruction generally are due to

timber harvest activities, and may occur in or above the limestone formations in all alternatives.

As with timber harvest, the magnitude of direct effects is not quantifiable because the location or extent of some caves is unknown. Indirect effects of forest development road construction and reconstruction would be similar to those described for timber harvest.

Table 127
Road miles constructed for timber access by alternative per decade

Budget Level	ALTERNATIVE						
	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
Experienced	44	16	33	16	73	19	42
Full	62	24	50	25	104	24	62

Effects on cave resources from other infrastructure construction and reconstruction projects

Other construction and reconstruction projects (fencing, instream habitat structures, utility lines, or buildings) would have negligible effects on cave resources in all alternatives.

Effects on cave resources from fire management

Neither wildfire nor prescribed burning would directly affect cave resources. However, removal of vegetation and changes in soil characteristics as a result of burning can influence rates of water infiltration, and could indirectly affect cave micro-climates and the rate at which speleothems develop. Such changes would be small, immeasurable, of less magnitude, and probably indistinguishable from changes caused by variations in precipitation. Also, as long as fire occurrence is within the historic range of variability, environmental conditions should not depart from natural conditions.

Effects on cave resources from minerals exploration and extraction

Gravel pits are not allowed near or above known caves in any of the alternatives, and so there are no effects to known cave resources from this activity.

There is a possibility that caves exist in limestone layers beneath existing oil and gas leases or those to be issued in the future. Drilling could penetrate these caves, and drilling fluid could contaminate them if adequate precautions are not taken.

Mining of locatable minerals has the potential to damage cave resources by blasting, use of heavy equipment, changes in surface-drainage patterns, or infiltration of leachate, chemicals, or petroleum products. The potential is considered low in all alternatives. The possibility exists that mineral leachate or chemicals from mining could contaminate surface or groundwater and subsequently pass into the karst formations, but this situation has not been documented thus far. As additional protection from mining of locatable minerals, areas where significant cave resources exist can be withdrawn from mineral entry if that action does not further jeopardize cave resources by identifying the cave location.

Effects on cave resources from recreation management

New recreation sites such as campgrounds will not be placed near known cave entrances or over caverns where there is a possibility that traffic or heavy equipment might break through. Caves may be developed for interpretive purposes if cave resources can be adequately protected. The effects of these activities will be minimal in all alternatives.

There is growing interest in the sport of recreational caving, a use that has the potential to result in cave damage from vandalism, overuse, littering, and human excrement. Where damaging use is occurring at significant caves, protective gates or other mitigation will be considered to eliminate these effects. Effects are likely to be similar in all alternatives.

Off-highway vehicle use is not likely to affect cave resources, except where use is concentrated to the point that vegetation is removed, soils are compacted, or surface-drainage patterns altered through erosion. This is not widespread.

Dispersed recreation, both motorized and non-motorized, can lead to the discovery and use of cave entrances and thus may increase potential damage to cave resources. These effects vary slightly by alternative according to dispersed recreation capacity, but are be minimal in any alternative.

Effects on cave resources from special area management

Designation of recommended wilderness areas, botanical areas, research natural areas, or wild and scenic rivers will provide additional protection for cave resources because surface-disturbing activities such as road construction and timber harvest are be prohibited or restricted.

CUMULATIVE EFFECTS

Probably 90 percent of known caves in the vicinity of the White River National Forest lie beneath federal lands. The remainder lie beneath state or privately owned lands, where there are few controls to limit potentially negative effects. Even if cave resources on or beneath private and state lands are damaged, those on federal lands will continue to represent a substantial regional resource.

Topic 5, Part 6

National trails

Introduction

Abstract	The White River National Forest manages a segment of the Continental Divide National Scenic Trail and three national recreation trails. Other trails of national or regional significance either cross the forest or have been proposed to do so. All of these trails play a role in providing trail-related recreation in systems that reach beyond the forest boundaries. It is important to recognize and protect the values of these trails when planning the management of the White River National Forest.
Summary	The National Trails System Act (NTSA) recognizes the importance of a national system of trails and establishes procedures for their official designation. National scenic trails are designated only by an act of Congress. National recreation trails are designated by land management agencies. The act has fostered a system of almost 40,000 miles of national scenic and historic trails as well as more than 800 national recreation trails totaling more than 10,000 miles in combined length. The White River National Forest has a national scenic trail and three national recreation trails.
Key indicators	There are no key indicators identified that vary across the alternatives.
Legal and administrative framework	The National Trails System Act (1968) established procedures for the official designation of national scenic trails. The NTSA, as amended, established the Continental Divide National Scenic Trail and described a process for locating, constructing, and maintaining it. The NTSA authorizes the Secretary of Agriculture to establish and designate national recreation trails. This authority has been delegated to the Chief of the Forest Service.

Affected environment

INTRODUCTION

The Continental Divide National Scenic Trail (CDNST), which extends for about 3,100 miles from Canada to Mexico, crosses the White River National Forest from Tennessee Pass to Loveland Pass (a distance of about 67 miles). Much of its route is coincident with two other trails: the Colorado Trail and the American Discovery Trail (ADT) planning corridor.

The American Discovery Trail currently is a concept that proponents hope to persuade Congress to fund for study and designation as a national trail. When it is completed, the ADT will traverse the U.S. from east to west; early route identification indicates that 63 miles of the trail probably will cross the forest.

The Colorado Trail, which was initiated in 1974, links Durango to Denver. It traverses the forest for 49 miles of its 500-mile total length. After the Colorado Trail was established, its route across the forest was found to be the best location for those portions of the CDNST and the ADT as well.

Also in a conceptual stage is the Great Divide Mountain Bike Route, which would coincide with much of the CDNST but would parallel it outside of wilderness areas and national parks, thereby providing cyclists with a complete north-to-south trail route free of prohibitions on bicycle use.

Because the Colorado Trail is the product of strong statewide partnerships and is recognized as regionally significant, any protective standards or guidelines assigned to the CDNST or ADT also will protect this trail.

The forest has about 61 miles of national recreation trail: the Wheeler-Tenmile Trail (23 miles), the Tenmile-Vail Pass Trail (30 miles), and the Two Elk Trail (eight miles). The Wheeler-Tenmile Trail partially coincides with the CDNST, the ADT, and the Colorado Trail.

Figure 3-35 shows the location of the CDNST, Two Elk, Wheeler-Tenmile and Tenmile-Vail Pass trails on the forest.

Figure 52
National scenic trails and national recreation trails on the White River National Forest

FUTURE TRENDS

The American Discovery Trail has not been officially proclaimed by Congress. Congress has funded studies for this trail and the study corridor crosses the forest. It is possible that Congress would add this trail to the national trail system. The present study route uses existing trails and roads and would probably not add any new miles of trail to the total system. Subsequent studies and plans would shape protective measures for this trail and they would be amended to the forest plan at that time, as appropriate. Otherwise, no additional national trails are anticipated.

Recreation use of the national trails on the forest is expected to increase but not at a significantly different rate from that of other forest development trails.

Environmental consequences

DIRECT AND INDIRECT EFFECTS

Effects on national trails from timber management

Effects to trails from timber management will be minimal. Project or area analyses will be completed for timber sales and mitigation measures identified, if appropriate, to decrease potential negative effects. Potential positive effects might occur if timber harvest activities provide greater access to trails or areas in which trails exist. Additional benefits can occur if scenic vistas are created through careful timber management.

Effects on national trails from recreation management

Effects on national trails from recreation use is not expected to be different from effects on other trails on the forest and are not expected to be significantly different among alternatives. Recreation use affects trails through compaction and damage to drainage structures, leading to increased erosion. Increased recreation use will bring a need for more frequent maintenance.

Effects on national trails from domestic livestock grazing

Both recreational livestock and domestic livestock use have the same erosion effects on trails that general recreation use has. In addition, large amounts of livestock use can make a trail undesirable for hikers because of manure residues. Domestic livestock use is very limited on the national trails on the forest but recreational livestock use is expected to increase. These impacts do not vary between alternatives.

Effects on national trails from travel management

Conflicts can develop when motorized and non-motorized uses both occur on the same route. The issues raised usually are hiker safety, noise, exhaust fumes, and damage to the travelway. The Final Environmental Impact Statement for the Continental Divide National Scenic Trail in Colorado and Wyoming (1993) estimated that for that portion of the trail analyzed on the White River National Forest, the potential for conflict was low.

CUMULATIVE EFFECTS

No cumulative effects are anticipated. The CDNST will continue to be used as a segment of the cross-country route given Congressional designation. The ADT eventually may join this category of trails and become a valuable resource for long-distance hikers.

These trails will continue to be part of a larger national system. Management actions on the forest will not affect national values or uses of these trails.

Topic 5, Part 7

Scenic byways

Introduction

Abstract

Parts of three scenic and historic byways cross the White River National Forest. These byways promote scenic and historic cultural values along their routes. National Forest System lands along the byways can be allocated with an emphasis on the same values as the byways. Alternative B does not allocate any lands as scenic byways. The alternatives that provide recognition of the established scenic byways on the forest include C, E, and K. Alternatives D, F and I recognize some of the established scenic byways, but not all of them. With the exception of Alternative B, all the other alternatives emphasize the scenic byway concept by allocating additional lands in this prescription that are not currently established scenic byways. This additional allocation maintains the scenic quality and recreational experience of other areas on the forest.

Summary

In 1988, the Forest Service established a National Forest Scenic Byways program to better serve the needs of people visiting the national forests for the purpose of enjoying scenic drives. This program works in tandem with a State of Colorado program that designates Colorado Scenic and Historic Byways.

Colorado scenic byways are nominated by local partnership groups and designated by the Colorado Scenic and Historic Byways Commission for their exceptional scenic, historic, cultural, recreational, and natural resources. National forest scenic byways are designated by the Chief of the Forest Service for similar purposes, though only with state concurrence.

In the Colorado system of outstanding touring routes are 21 byways with a combined length of 2,034 miles. The system affords the traveler meaningful interpretation and identification of key points of interest and services while providing for the protection of significant resources.

Key indicators

Legal and administrative framework

- Acres of byway corridors allocated to the 4.23 management area prescription.
- A **Memorandum of Understanding** (April 1989) between the Federal Highway Administration and the Forest Service provides guidance on the applicability of 49 U.S.C 303 and 23 U.S.C. 138 to highways included in the National Forest Scenic Byways System.
- The **Transportation Equity Act for the 21st Century** (P.L. 105-178) recognizes the National Scenic Byways (NSB) Program and provides for discretionary grants for scenic byway projects.

Affected environment

INTRODUCTION

When the 1984 Forest Plan was prepared, there were no scenic byways on the White River National Forest and no management prescriptions for this designation. **Table 128** describes the three scenic byways that have since been established on the forest. About 3 percent (61 miles) of the total state system is located within the forest boundary. A management plan has been prepared for the Top of the Rockies Byway. As opportunities arise, plans will be prepared for the other byways that designate management constraints for their associated resources.

Table 128
Scenic byways on the White River National Forest

<i>Name</i>	<i>National Forest byway</i>	<i>Colorado byway</i>	<i>White River mileage</i>	<i>Colorado mileage</i>
West Elk Loop Scenic and Historic Byway	yes	yes	19	204
Flat Tops Trail Scenic and Historic Byway	yes	yes	14	82
Top of the Rockies Scenic and Historic Byway	no	yes	31	76

West Elk Loop The 204-mile West Elk Loop has been described as “the closest you can come to a wilderness experience in a passenger car.” This statement is based on the fact that the complete route circumnavigates West Elk Wilderness and passes near three other wilderness areas: Maroon Bells-Snowmass, Raggeds, and Fossil Ridge.

The White River National Forest hosts 19 miles of the byway, which begins in Carbondale against the backdrop of Mount Sopris, towering some 6,500 feet above the surrounding terrain. To the south is the picturesque canyon of the Crystal River. The route continues to the south through Redstone and leaves the Forest after a steep switchback climb to McClure Pass.

Flat Tops This byway near the northern boundary of Flat Tops Wilderness connects the communities of Meeker and Yampa, passing through both the White River National Forest and Routt National Forest. About 40 miles of the 82-mile drive are unpaved, but are graded for summer use by passenger cars. Elevations range from 6,200 feet to more than 10,000 feet. The route also serves as the gateway to the forest’s popular Trapper’s Lake area. Points of interest near the route include the Ute Trail, the Lost Creek Ranger Station, built between 1907 and 1936, and the scenic overlook at Ripple Creek Pass.

Top of the Rockies About 76 miles of all-season, state-maintained roads make up this route. It includes the segment of U.S. Highway 24 that links Minturn to Leadville and Twin Lakes via Tennessee Pass. Also featured is all of Colorado Highway 91 as it climbs to Fremont Pass from Leadville, then descends past the Climax Mine site to its intersection with Interstate 70 at Copper Mountain Ski Area. The byway’s name reflects its high-elevation setting. The roadway seldom drops below 9,000 feet as it twice crosses the Continental Divide in view of four of Colorado’s five highest peaks.

FUTURE TRENDS

No additions to the Colorado Scenic and Historic Byway system are anticipated. The current focus is on enhancing the existing system. Through cooperative partnership projects and funding from many sources, improvements such as interpretive signing, scenic pullouts, restrooms, and other facilities are being added.

Environmental consequences

GENERAL EFFECTS

Table 129 shows the acres allocated to management area 4.23, by alternative for each of the scenic byways on the forest. Some alternatives include additional acres in this management area that are not directly related to scenic byway route management but will contribute to the scenic integrity of other roadway corridors. These acres are not displayed in this table.

Table 129
Acres of management area 4.23 related to scenic byways, by alternative

Name	ALTERNATIVE						
	B	C	D	E	F	I	K
West Elk Loop	0	700	1,200	700	500	400	740
Flat Tops Trail	0	5,200	3,400	4,600	0	0	2,400
Top of the Rockies	0	3,200	0	1,700	0	2,100	3,000
Total	0	9,100	4,600	7,000	500	2,500	6,140

Although the acres of 4.23 associated with the West Elk Loop byway are limited in number, this byway receives the most recognition and protection of its scenic values in all alternatives because of the presence of the Crystal River corridor, which has been found eligible for recreational river designation. In every alternative but B, some acres adjacent to this corridor are in the 4.23 management area.

The Flat Tops Trail has at least some 4.23 allocation in Alternatives C, D, E, and K. There are no 4.23 acres allocated to this route in Alternatives B, F, and I.

The Top of the Rockies byway has at least some 4.23 allocation in Alternatives C, E, I, and K. There are no 4.23 acres allocated to this route in Alternatives B, D, and F.

In some alternatives additional acreage has been allocated to the 4.23 management prescription in order to help maintain the overall scenic quality of roadway corridors that are not officially designated as scenic byways.

The following is an overview of the additional areas and the acreage for each.

- Alternative C allocates an additional 6,800 acres for the Independence Pass corridor and the Vail Pass corridor.
- Alternative D allocates an additional 8,900 acres for the Independence Pass corridor and Tenmile Creek corridor.
- Alternative E allocates an additional 1,700 acres for the Red Sandstone Road corridor.
- Alternative F allocates an additional 12,300 acres for the Maroon Creek corridor and Independence Pass.
- Alternative I allocates an additional 24,700 acres to this prescription for Vail Pass corridor, Maroon Creek corridor, Castle Creek corridor, Interstate 70 Corridor from Eisenhower tunnel over to East Vail, Mayflower Creek, and Loveland Pass Corridor
- Alternative K also allocates approximately 750 acres of the Tenmile Creek Canyon.

DIRECT AND INDIRECT EFFECTS

Effects on scenic byways from scenery management

The direct and indirect effects of management actions on scenic byways are similar to their effects on scenic resources in general. These effects are discussed in detail in the scenery management section, Topic 3, Part 4.

The direct and indirect effects of management actions on heritage resources is discussed in detail in the heritage resources section, Topic 5, Part 1.

CUMULATIVE EFFECTS

It is important that the sections of these byways that are influenced by management activities on the White River National Forest maintain the character and values for which the byways were established. When managed in this way, these sections will continue to contribute to the driving experience for the entire length of the byway. Thus, these byways will remain a part of the entire system of Colorado Scenic and Historic Byways and be able to satisfy the purposes of the system.

If byway management continues to implement information, interpretation, and marketing efforts, local economies on and off the forest will most likely benefit from increased tourism, and travelers will benefit from enhanced experiences.

Cumulatively, development of lands along a byway that are not part of the National Forest System can alter the settings and the ambiance of the driving experience. The Forest Service has no authority over these lands.

Topic 5, Part 8

Special interest areas

Introduction

Abstract

The White River National Forest contains a number of special and unique resources. Planning procedures and regulations allow for these resources to be recognized and protected. This has been done to varying degrees in the forest management alternatives prepared for this plan revision. Some of the special interest areas have been proposed in these alternatives to emphasize recreation use and interpretation of the environment. Other special interest areas have been proposed to minimize recreation and other uses in order to protect their special values.

Summary

National forest managers designate special interest areas (SIAs) to protect or enhance areas of the forest that contain unusual or significant characteristics. The research natural area management category 2.2 also recognizes unique botanical and biological resources (see Topic 1, Part 3, Section 2). However, research natural areas often require a higher degree of pristine character to qualify for designation because they serve as ecological baseline reference areas. Special interest areas can be designated to recognize a broader range of values than research natural areas, including botanical, geological, historical, paleontological, scenic, or zoological resources. They may be allocated to protect and manage threatened, endangered, or sensitive species and other elements of biological diversity, or for their emotional significance, historic importance, scenic values, or public popularity. There are two different special interest area management categories: 2.1, minimal use and interpretation; and 3.1, emphasis on use and interpretation. The size of individual special interest areas varies depending on the site-specific resource values and management emphasis.

Key indicators

- Acres of special interest areas by emphasis
- Values protected or interpreted

Legal and administrative framework

- The **Forest and Rangeland Renewable Resources Planning Act (1974)**, as amended, directs the Secretary of Agriculture to set out the process for the development and revision of land and resource management plans, and the prescribed guidelines and standards.
- **36 CFR 219, Subpart A** provides the Secretary of Agriculture's direction regarding how land and resource management planning is to be conducted on National Forest System lands. Specifically, 36 CFR 219.11(c) specifies that a forest plan will contain multiple-use prescriptions and associated standards and guidelines for each prescription.

Affected environment

The 1984 Forest Plan did not establish any special interest areas. The forest plan revision team identified nineteen potential special interest areas on the White River National Forest. A description of these areas and their special values can be found in Appendix H. Six special interest areas emphasize recreational use and interpretation of the environment. Fourteen special interest areas minimize recreation and other uses in order to protect their special values. See the 2001 Forest Plan, Chapter 3 for a comparison of activities allowed or restricted in category 2.1 and 3.1 areas. **Tables 130 and 131** list the areas and the acres proposed for each alternative.

Table 130
Special interest areas proposed for minimal recreation use and interpretation (MA 2.1)

Name	ALTERNATIVE						
	B	C	D	E	F	I	K
Coal Basin	0	0	0	0	0	7,920	
Continental Divide Land Bridge	0	1,020	1,030	2,570	970	980	4,430
Dead Horse Creek	0	1,280	1,300	0	0	1,270	990
Jakeman East						3,170	
Leeman						1,130	
Main Elk Creek	0	0	6,300	0	1,640	0	4,680
Mitchell Creek	0	3,930	4,550	0	0	0	4,790
Porcupine	0	0	0	1,570	0	0	1,570
Quaker Mesa	0	0	4,730	0	0	0	
Quandary Peak	0	2,050	8,690	1,890	0	2,050	4,080
Serry Lake	0	0	3,640	0	0	0	2,520
Taylor Pass	0	860	500	0	0	0	860
Upper Gypsum Creek	0	0	0	0	0	680	
Warren Lakes	0	0	0	0	0	0	340
Total 2.1 acres	0	9,140	30,740	6,030	2,600	17,200	24,260

Table 131
Special interest areas proposed to emphasize recreation use and interpretation (MA 3.1)

Name	ALTERNATIVE						
	B	C	D	E	F	I	K
Castle Creek and Ashcroft	0	0	0	3,370	0	0	100
Camp Hale	0	1,460	0	0	0	1,460	1,210
Coal Basin	0	0	0	3,010	0	0	1,020
Colorado Midland Railroad	0	350	0	350	0	0	1,190
Holy Cross City	0	0	0	0	0	320	170
Independence Pass	0	0	0	8,750	0	0	180
Total 3.1 acres	0	14,910	0	15,480	0	1,780	3,870
Total MA 2.1 and 3.1 acres	0	24,050	30,740	21,510	2,600	18,980	28,130

Table 132
Total acreage of special interest areas proposed (MA 2.1 and 3.1)

	ALTERNATIVE						
	B	C	D	E	F	I	K
Total MA 2.1 and 3.1 acres	0	24,050	30,740	21,510	2,600	18,980	28,130

FUTURE TRENDS

There will be an increasing interest in focusing on the more localized special values on the forest. It is likely that requests will be made to amend the forest plan to include additional special interest areas. Each such request will be addressed within the contexts of the values identified and the particular management situation at the time of the proposal.

Environmental consequences

GENERAL EFFECTS

Alternative D identifies the most acreage for protecting special biological or zoological resources, followed by Alternatives K and I. Considerably less acreage is identified for these purposes in Alternatives C, E, and F. Alternative B does not identify any lands for this management prescription.

Alternative E identifies the most acreage for emphasizing recreation use and interpretation (management area 3.1). Alternative K allocates 25 percent of the acreage of Alternative E, but focuses on the most important cultural landscapes. Alternatives C and I designate about 12 percent as management category 3.1 as compared to Alternative E. Alternatives B, D, and F would not manage lands for this purpose.

DIRECT AND INDIRECT EFFECTS

As noted above, the forest plan will place constraints on activities within SIAs to protect them from direct effects of other management activities. However, some of the proposed SIAs are situated downstream or downwind of areas where management activities are controlled by other standards and guidelines, or where other factors are present on nearby lands that are not within the forest boundaries. For the most part, upstream activities are controlled by forest-wide standards and guidelines. It is assumed that these effects will be mitigated and there will be no difference between alternatives.

CUMULATIVE EFFECTS

Upwind activities and their resulting effects may occur far from the forest. Because a significant share of the SIAs are established with the objective of maintaining natural conditions, degraded air quality could represent a serious threat, although these impacts will not vary among alternatives. However, special interest areas can be viewed as secondary beneficiaries of the three wilderness areas on the forest rated as class I under the Clean Air Act. Thus, there is some degree of protection from adverse off-forest air-quality effects.

Colorado and its counties and local communities are becoming more active in acquiring and setting aside areas to protect open space for biological values or for recreation. These areas often serve the same general purposes as special interest areas and so a cumulative effect to similar resource values may thus occur regionally. Also, public awareness of these unique values may enhance public support for additional designation of special interest areas and the protection of these resources.

TOPIC 6

TIMBER MANAGEMENT

Introduction

Abstract Historically and in recent years, timber resources have provided valuable products from National Forest System lands. Timber management has also been used as an effective tool to meet a variety of natural resource objectives and achieve desired conditions for management area prescriptions. Since 1900, however, only about 4 percent of the White River National Forest has been directly affected by harvesting. From 1940 to 1999, timber volume harvested averaged 15.2 million board feet (MMBF) per year. From fiscal years 1984 through 1999, White River National Forest commercial harvest levels averaged 22.4 MMBF per year.

Summary About 37 percent of the White River National Forest's land base is 'tentatively suitable' for timber management. Most of the forest's timberlands are in mature to late-successional forest structural classes. Timber harvesting as part of the suitable timberlands that contribute to the allowable sale quantity (ASQ) is allowed only in management areas 5.12, 5.13, 5.4, and 5.43. In addition, management area 5.5 allows for harvesting of aspen and lodgepole pine as part of the suitable timberlands that contribute to the ASQ.

Assuming first-decade averages for experienced budget levels, **Table 133** shows that the alternatives will result in the following harvest (average per year) from suitable timber lands:

Table 133
Harvests from suitable timber lands at the experienced budget level

	ALTERNATIVE						
	B	C	D	E	F	I	K
Harvest in million cubic feet	3.3	1.3	2.5	1.2	5.2	1.4	2.8
Harvest in million board feet	14.4	5.5	10.8	5.4	22.3	6.4	12.4
Suitable timber land acres	362,000	291,000	444,000	119,000	599,000	91,000	425,000

Effects vary among alternatives for changes in structural class (acres), levels of reforestation, and thinning.

The availability of other forest products is expected to be the highest in Alternative F and lowest in Alternative E. The cumulative effects of past, current, and planned harvesting (through the 10-year plan) will be about 2.8 percent of the forest under any alternative.

Key indicators

- Timber demand level
- Suitable acres by management area prescription
- ASQ and volume offered

Legal and administrative framework

- The **National Forest Management Act (1976)** requires identification of areas suitable and available for timber harvest and determination of the allowable sale quantity (ASQ) from those lands.
- **36 CFR 219** requires the supply-and-demand situation for resource commodities to be analyzed.

Affected environment

Introduction

Historically, specific areas of the White River National Forest were used for the harvesting of wood products. Logging for railroad ties, mine props, fence poles, and construction materials on the forest dates to the 1880s. During the initial phase of European settlement in the late 19th Century, settlers drew upon lower-elevation forests for fuel and building materials. Apparently, very little live timber was used by these early settlers because of the weight of green trees, the hauling distances, and the added expense for milling. Most settlers preferred to build log homes from dead spruce and fir trees, of which there was an abundant supply. Reports from that era indicate that between 25 percent to 40 percent of the spruce, fir, and other large trees on the forest were dead.

Fragmented records from between 1910 and 1939 indicate that an average of about 6.0 MMBF was removed annually from the forest during that period. Harvest volumes ranged from 1.6 to 10.5 MMBF with a marked decrease associated with the Great Depression of the 1930s. Accurate records of timber harvesting levels are available from 1940 to 1999. During this period, 15.2 MMBF were cut and removed annually. Harvest volumes ranged from 5.6 MMBF to 46.2 MMBF with a peak from 1947 to 1954. Many national forests across the West saw the same increase in harvesting after World War II to meet the demands of a rapidly growing economy. The White River National Forest experienced another period of increased harvesting volume in the mid-to-late 1980s as a result of salvage operations following a mountain pine beetle epidemic. This period also saw increased public demand for dead spruce logs for home construction, drawing on a supply of trees that were killed by a spruce beetle epidemic in the late 1940s.

Figure 53 illustrates the changes in harvest volumes from 1910 to 1999. The volume harvested from 1984 to 1997 is shown in **Figure 54**. The average annual harvested volume in this period was 23.1 MMBF. **Table 55** displays the acres of harvest activity by silvicultural system that has occurred over the last 10-year period from 1984 to 1997.

Figure 53
Historical timber sales volume, 1910–95

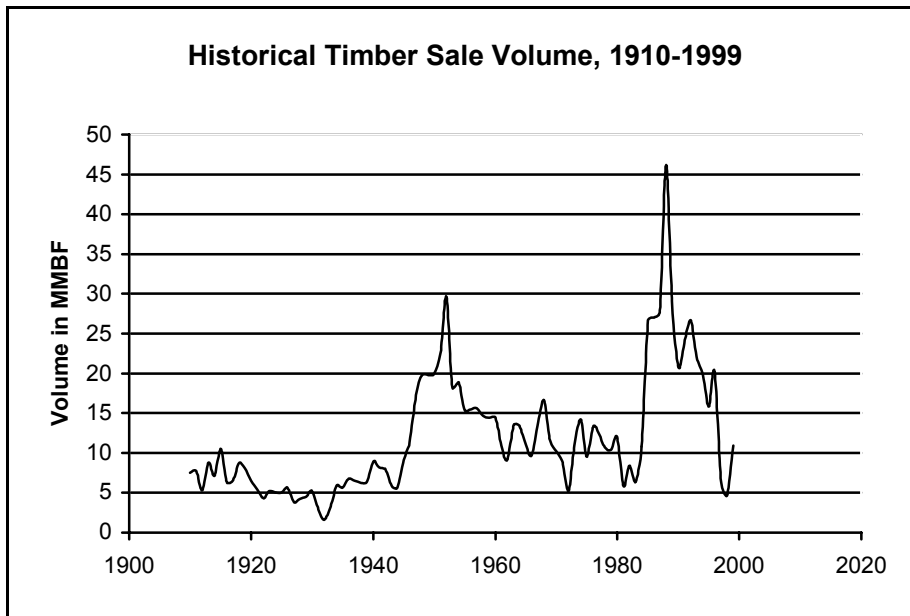


Figure 54
Historical timber harvest volume, 1984-97



Table 134
Acres of harvest activity by silvicultural system

<i>Silvicultural System</i>	<i>Acres</i>	<i>Silvicultural System</i>	<i>Acres</i>
<i>Clearcut</i>	4,332	<i>Commercial thinning</i>	706
<i>Shelterwood</i>		<i>Selection</i>	
<i>Preparation cut</i>	4,541	<i>Individual</i>	330
<i>Seed cut</i>	799	<i>Group</i>	444
<i>Removal cut</i>	1,107	<i>Sanitation/salvage</i>	18,196
Total acres of harvest activity		30,455	

The acres treated by timber harvest from 1984 to 1997 account for 2.2 percent of forested lands and 1 percent of total forest acres. The 1984 Forest Plan identified 888,075 acres (39 percent) as tentatively suitable for timber production. From the tentatively suitable land base, 472,838 acres (21 percent) of the national forest were determined to be suitable and were scheduled for timber harvest.

Timber supply and demand

Market Assessment of the Timber Situation of the White River National Forest, a recent report by Douglas Rideout of Colorado State University, addresses the sawtimber economy of the Forest from fiscal years 1990 to 1995. It also reviews sawtimber supply and demand and predicts the future of the market. The following observations are drawn from this report.

First, the sawtimber market area for the forest is regional rather than consisting of a traditional timbershed. The forest's proximity to the Interstate 70 transportation corridor makes many of its products accessible to a wide range of purchasers and processing facilities. Wood fiber from the forest is processed as far away as Saratoga, Wyoming, by Louisiana-Pacific (LP). Most of the conifer sawtimber, aspen, and products other than logs are processed by Louisiana-Pacific at Olathe.

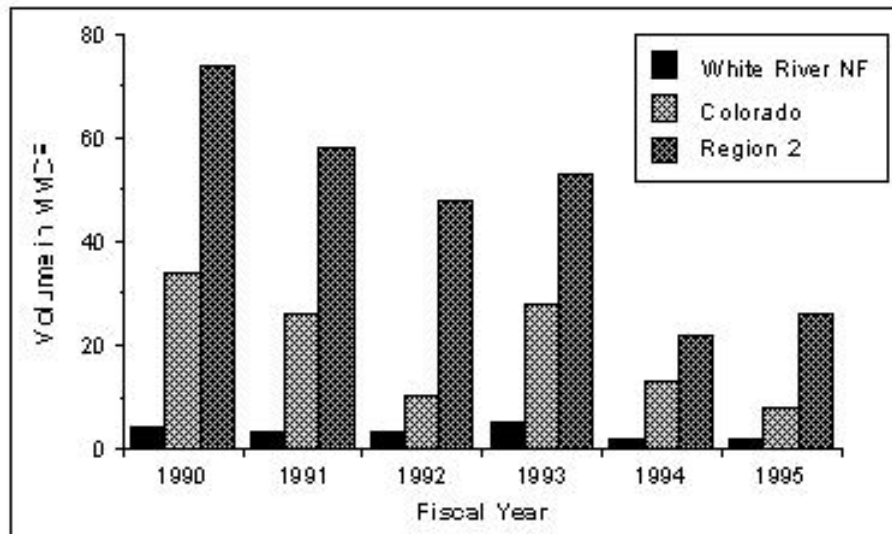
The forest has been a key supplier of dead spruce that primarily has been used for house logs. This resource has provided nearly half of the forest's timber revenue. A declining supply of dead spruce will have important implications for revenue production and current processors. As the accessibility and availability of dead spruce dwindles, the future for those dependent on this supply is uncertain. With only minor dead volumes in the future, revenue generated from salvage timber sales will change.

Although aspen has generated only 4 percent of the forest's revenues, it has accounted for 14 percent of the volume offered. Louisiana-Pacific continues to be a major aspen processor for waferwood, although other processors are showing increased interest in using aspen for other products. Aspen volumes are available on private lands, which currently supply half of the commercial volume. As demand for aspen continues to grow and public supply is limited, future prices for aspen could rise. If the forest continues to offer aspen sales, the future revenue share of aspen should go up.

Figure 55 provides a regional view of the White River National Forest timber sale program. Declining sale volumes have occurred throughout the Rocky Mountain Region, including the White River National Forest. Volumes from 1990 to 1995 have declined by about 65 percent. While the forest's volume varies annually, its share of the regional sale

volume has remained a consistent 5–7 percent. **Figure 55** also contrasts the forest volume with national forest volumes within Colorado. Forest sales that contribute to the total for Colorado national forests are more volatile, ranging from 13 percent in fiscal year 1990 to 20 percent in fiscal year 1995. Although the White River National Forest's volumes are minor relative to regional and state sale levels, local purchasers consider it to be important because of the unique market it has served.

Figure 55
Regional, state, and White River National Forest sale volumes



Uncut volume under contract is declining on the forest, as it is throughout the region. Rideout's interviews determined that purchasers who use the White River National Forest have one year or less of volume under contract.

Special forest product markets include firewood, transplants, and Christmas trees. The fuelwood market has stagnated as restrictions that protect air quality have increased and as substitute sources of energy have become more readily available. Fuelwood sales primarily have been dead spruce; this could likely change as spruce volume declines. Christmas tree sales are primarily for fir along with sales of spruce and pine.

**Below-cost
timber sale
program**

The financial efficiency of the White River National Forest timber sale program is a public concern both locally and nationally. According to the *timber sale program information and reporting* (TSPIRS), the economic account for the forest is generally above cost when all of the resource values, market and non-market, are considered for *present net value* (PNV) between fiscal years 1988 and 1997 (**Figure 56**). Timber revenues and expenses (which do not include payment to states) shows that the forest's timber sales generally were below cost between fiscal years 1988 and 1997 (**Figure 57**). The history of the timber sale program is not a predictor of future net benefits or net revenues.

Figure 56
Timber economic account, all resource PNV

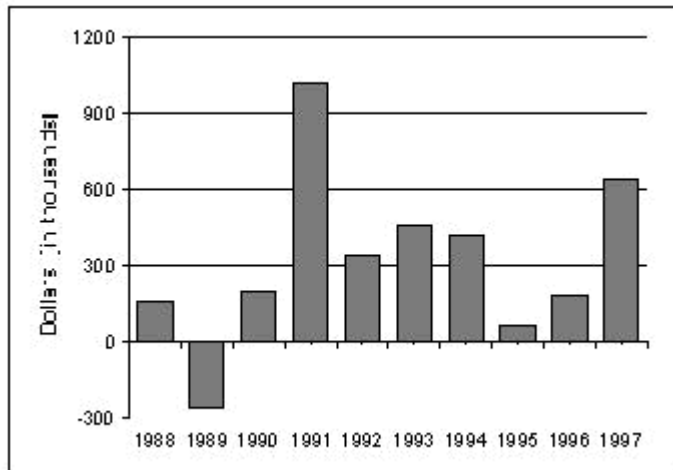
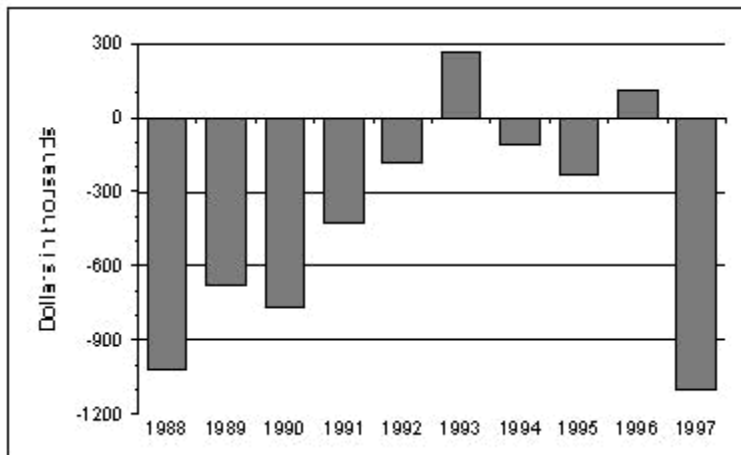


Figure 57
Timber sales revenues and expenses, 1988-97



Insects and diseases

Foremost among the insects and diseases on the White River National Forest are mountain pine beetle, lodgepole pine dwarf mistletoe, spruce beetle, and Armillaria root disease, as well as several decays, cankers and wood-boring insects of aspen. Most of the forest's resources, including timber, recreation, wildlife, range, and water yield are affected in a variety of ways by these insects and diseases. This section briefly outlines the current occurrence and estimated level of impact (if known) of these insects and diseases.

Current outbreaks of mountain pine beetle have been noted in lodgepole pine in the Vail Valley and Piney Analysis Areas (on the Holy Cross Ranger District); in ponderosa pine on Derby Mesa (near the Flat Tops on the Eagle Ranger District; and in ponderosa pine and lodgepole pine near the Keystone Resort on the Dillon Ranger District. Although this

activity does not yet equate to a large-scale epidemic, mountain pine beetle-related mortality is increasing at a rapid rate and is likely to continue to do so over the next several years.

Although mountain pine beetle is currently in an endemic status over the rest of the forest, stand conditions are such that a major outbreak, such as that experienced in Summit, Eagle and Grand counties in the early 1980s, is likely to occur again in the near future. At the Piney/Red Sandstone Area on the Holy Cross Ranger District, a recent analysis concluded that 96 percent of the 15,000 acres of lodgepole pine cover type is at moderate-to-high risk for a substantial mountain pine beetle outbreak, and 25 percent is at high risk (Angwin 1996). A 1997 analysis of all RMRIS inventory data available for the Upper Fryingpan Drainage (Sopris Ranger District) revealed that 46 percent of the 10,501 acres of lodgepole pine cover type for which inventory data had been collected and risk levels had been calculated are at moderate-to-high risk, and 3 percent is at high risk.

Although lodgepole pine dwarf mistletoe and Douglas fir dwarf mistletoe are found on the White River National Forest, Douglas fir dwarf mistletoe is rather uncommon. In contrast, lodgepole pine dwarf mistletoe is found on lodgepole pine throughout the Forest and is of great management concern.

Many lodgepole pine stands around Dillon Reservoir (Dillon Ranger District) and in the Upper Fryingpan Watershed (Sopris Ranger District) have particularly high disease levels. Aerial surveys conducted in 1997 identified at least 6,125 acres that have high levels of the disease. Since 1989, lodgepole pine dwarf mistletoe has been identified as a concern at Aspen Highlands Ski Area (Aspen Ranger District); Chapman Campground, Nast Lake and Basalt Mountain (Sopris Ranger District); West Hat Creek (Eagle Ranger District); and near Keystone Resort, Sapphire Point, and at Heaton Bay and Prospector campgrounds (Dillon Ranger District). In addition, because there are only limited acres of lodgepole pine on the Blanco Ranger District, infestations of lodgepole pine dwarf mistletoe near Yellowjacket Ridge are of particular interest.

Considerable variation in the amount and intensity of dwarf mistletoe infestations exists in different areas of the forest. Surveys conducted in 1979 indicate that 36 percent (52,000 acres) of the lodgepole pine cover type on the White River National Forest is infested. A conservative estimate of the associated merchantable volume loss is more than 31,000 cubic feet per year (Johnson et al. 1980). Inventory data compiled in 1997 indicates that approximately 43 percent of the lodgepole pine cover type on the forest is infested with lodgepole pine dwarf mistletoe, while 10 percent is infested at moderate to high levels. At the Piney Analysis Area, approximately 17 percent of the acres are infested with dwarf mistletoe, and 13 percent have moderate-to-high infection levels. In contrast, in the Upper Fryingpan drainage, 1997 inventory data indicates that approximately 69 percent of surveyed acres are infested with dwarf mistletoe, and 24 percent have moderate-to-high dwarf mistletoe ratings.

The spruce beetle currently is in an endemic status on the forest and only minimal activity has been reported recently. Forest-wide inventories indicate that the spruce-fir cover type is at moderate-to-high risk to spruce beetle loss. Approximately 80 percent of the 15,000 acres of spruce-fir cover type in the Piney Analysis Area is at moderate-to-high risk to spruce beetle loss, with 4 percent at a high risk level (Angwin 1996). At the

Fryingpan Drainage, the figures are 78 percent moderate-to-high risk and 3 percent high risk. In contrast, most of the stands in the Flat Tops now are only minimally susceptible to spruce beetle outbreaks because the 1939–51 spruce beetle epidemic caused a shift in species mix in the area from mostly spruce to mostly fir. Other areas in which spruce beetle concerns have been noted include the Middle Clark Road, Bear Gulch and Bar HL areas of the Blanco Ranger District, and Dutch Creek Area and the In-Between and Coal Ridge sale areas on the Rifle Ranger District.

Armillaria root disease is the most common and widespread root disease on the White River National Forest. While found on most coniferous and hardwood species, the most significant impact of the fungus is on subalpine fir.

Investigations of root disease losses in Region 2 of the Forest Service are in their infancy (Johnson 1984); thus no data are available on volume loss. At the Piney Analysis Area (site of the only landscape-level root disease assessment on the Forest), 53 percent of the lodgepole pine acres had Armillaria root disease, but moderate-to-high root disease levels were identified on only 19 percent of the acres.

Aerial surveys conducted in the 1990s indicate that subalpine fir mortality caused by the Armillaria root disease/western balsam bark beetle complex (otherwise known as ‘subalpine fir decline’) is widespread throughout the forest. In the 1997 aerial survey of the Dillon Ranger District, approximately 12,000 trees over 2,964 acres were found to have been killed during the last two to four years. Most of this activity was concentrated throughout the Williams Fork Mountains and the Gore Range.

Although Armillaria root disease is widely distributed throughout the Forest, the Four-Mile/Divide Creek (Sopris Ranger District) and Kobey Park (Aspen Ranger District) areas have particularly high disease levels. At both locations, widespread small groups of subalpine fir mortality began to be noticed in the early 1990s. In both cases, western balsam bark beetle was identified in association with the root disease. It is believed that drought conditions experienced during the early to mid-1990s may have helped to trigger this sudden appearance of dead and dying fir. Other areas in which high disease levels have been reported include Basalt Mountain (Sopris Ranger District) and the Flat Tops (Eagle and Rifle Ranger Districts).

The major diseases affecting timber values in aspen are the stem decays and cankers. In a survey by Juzwik et al. (1978), white trunk rot was identified on 3.5 percent of aspen trees surveyed on the White River National Forest. Another survey conducted throughout Colorado (including the forest) found that white trunk rot was responsible for just under 60 percent of the decay volume in aspen (Davidson et al. 1959). Although this survey was conducted nearly 40 years ago, this figure probably is still accurate for the forest.

Environmental consequences

GENERAL EFFECTS

Effects common to all alternatives

Timber may be cut and removed to meet the allowable sale quantity (ASQ) with the intent to create or improve stands that will meet future timber product needs. This includes live green trees that meet the utilization standards on suitable lands, and dying timber which at the time of ASQ calculations was green volume.

The only management area prescriptions that are suitable for timber harvest to meet timber goals and contribute to ASQ are 5.12, 5.13, 5.4, 5.43, and 5.5. In management area 5.5, only aspen and lodgepole pine cover types contribute to the ASQ. Douglas fir and spruce-fir cover types in management area prescription 5.5 do not contribute to ASQ. Timber harvest may be allowed in other management area prescriptions, but only to meet resource objectives. Harvest in these areas would not contribute to ASQ but would contribute toward the total *timber sale program quantity* (TSPQ).

Timber may be cut and removed to meet vegetation management objectives, such as hazard tree removal, fuel reduction, wildlife habitat maintenance and improvement, improvement of scenic vistas, and ecosystem management. In addition, timber affected by natural mortality events (fires, windstorms, insect and disease infestations) may be harvested under salvage sales to serve objectives other than commercial product offerings. Commercial products may be a by-product of meeting these objectives. The volume of timber cut and removed to meet these objectives will vary among alternatives based on objectives and available funding. Table S-2 (in Chapter 2) displays allowable sale quantity and timber sale program quantity at the full budget level for decade 1, and chargeable and non-chargeable volume offered at the experienced budget level for the first and fifth decades.

Timber harvesting may be done to accomplish biodiversity goals. If analyses indicate that current vegetation differs greatly from historical norms, vegetation treatments, including timber cutting, may be used to try to emulate natural patterns of species composition and stand structure. Timber products derived from this cutting may be sold commercially. Biodiversity accomplishments are more pronounced in Alternatives F, K, D, B, and E than in Alternatives C and I.

As standards and guidelines are implemented on the ground, harvest volumes may be limited based on site-specific analysis. Examples are water quality guidelines or wildlife and heritage resource protection measures. Where possible, the effect of these standards and guidelines has been taken into account in the calculation of the ASQ. However, the ASQ is considered to be a ceiling, and certain conditions may arise in which standards and guidelines may limit what volume is actually available.

In each alternative, the effects on sawtimber production are directly related to the amount of acres classified as suitable for timber harvest; acres within management area prescriptions 5.12, 5.13, 5.4, 5.43; and the aspen and lodgepole pine component of 5.5. Under Alternative B, all of the management prescriptions that contribute to ASQ have a more intensive timber management emphasis, with rotation ages that are between 120 and 140 years, resulting in an increased level of timber production at a lower cost.

Under Alternatives C, D, E, F, I, and K, only the aspen and lodgepole pine component of management prescriptions that contribute to ASQ have a more intensive timber management emphasis. These species have rotation ages between 120 and 140 years, resulting in an increased level of timber production at a lower cost. Under Alternatives C, D, E, F, I, and K, the Douglas-fir and spruce-fir components of the management prescriptions that contribute to ASQ have a less intensive timber management emphasis. These species have rotation ages exceeding 250 years and incorporate a higher percentage of uneven-aged management, resulting in lower levels of timber production at higher costs.

**Tentatively
suitable timber
lands**

Timber suitability was analyzed for the revised plan. This analysis determined a tentatively suitable land base of about 845,000 acres, or 37 percent of the forest. **Table 135** displays tentatively suitable timber lands (TSTL) by species composition. A discussion of the process used to determine suitability can be found in Appendix B. Based on the amount of TSTL, **Tables 136** and **137** display the annual growth and standing net merchantable volume. In all cases, the annual growth and net merchantable volume exceed the ASQ.

The timber suitability map in the map packet illustrates the distribution of forested lands available for scheduled timber harvesting that contributes to the accomplishment of ASQ.

Table 135
Tentatively suitable timber lands by species composition

<i>Species</i>	<i>TSTL (acres)</i>	<i>% of Total</i>
Aspen	337,000	40
Douglas fir	29,000	3
Lodgepole pine	185,000	22
Spruce-fir	294,000	35
Total	845,000	100

Table 136
Annual growth for tentatively suitable lands

<i>Species</i>	<i>Million cubic feet*</i>	<i>Million board feet*</i>
Spruce-fir	10.02	51.95
Lodgepole pine	4.00	21.46
Douglas fir	0.35	2.38
Aspen	12.21	42.50
Total	26.58	118.29

**Estimated from strata average of Stage 2 data calculated with the FVS (forest vegetation simulation) program, as PAI Merchantable volumes from FVS average summary statistics by cycle tables, and based on the following minimum merchantability specifications: spruce-fir and Douglas fir = 8.0 inches DBH to a 6.0 inches top DIB; lodgepole pine = 7.0 inches DBH to a 6.0 inches DIB; and aspen = 5.0 inches DBH to 4.0 inches DIB. Values calculated are based on cycles immediately preceding, during, or immediately after the Forest 10-year planning period (2002-2011).*

Table 137
Standing net merchantable volume—tentatively suitable lands for timber harvest

<i>Species</i>	<i>Million cubic feet *</i>	<i>Million board feet *</i>
Spruce-fir	819	3,792
Lodgepole pine	565	2,056
Douglas fir	52	239
Aspen	1,050	3,788
Total	2,486	9,875

**Estimated from strata average of Stage 2 data calculated with the FVS program, as PAI Merchantable volumes from FVS average summary statistics by cycle tables, and based on the following minimum merchantability specifications: spruce-fir and Douglas fir = 8.0 inches DBH to a 6.0 inches top DIB; lodgepole pine = 7.0 inches DBH to a 6.0 inches DIB; and aspen = 5.0 inches DBH to 4.0 inches DIB.*

Suitable timber lands Table 138 displays the acres of suitable timber lands by management area prescription for each alternative rounded to the nearest thousand. Alternatives D and F have the largest acreage of suitable timber, with Alternative F having the largest portion in management area prescriptions 5.12 and 5.13 as well as the greatest number of acres suitable for timber production. Alternatives I and E have the lowest number of acres that are suitable for timber production. Of the 845,000 acres identified as tentatively suitable timber lands, Alternative F retains the most suitable timber lands at approximately 71 percent as compared to Alternatives I and E, which retain the least at 11 percent and 14 percent respectively.

Table 138
Acres of suitable timber lands by management area prescription

	<i>ALTERNATIVE</i>						
	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
% Tentatively Suitable Landbase	43	34	53	14	71	11	50
MAAs 5.12 & 5.13	287,000	95,000	61,000	27,000	472,000	51,000	83,000
MAAs 5.4 & 5.5	69,000	133,000	277,000	42,000	91,000	19,000	227,000
MAAs 5.43	6,000	63,000	106,000	50,000	36,000	21,000	115,000
Total Suitable Acres	362,000	291,000	444,000	119,000	599,000	91,000	425,000

A primary objective when harvesting timber on suitable lands will be to use silvicultural methods that favor and facilitate natural regeneration. If the silviculturist determines that a site does not have the potential for satisfactory natural regeneration within five years of final harvest, the site will not be harvested. It is expected that this approach will be successful 95 percent or more of the harvested sites. In order to assure adequate restocking of openings created as a result of final harvest, stocking surveys will be accomplished at the end of the first and third growing seasons following reforestation treatments. When harvesting occurs on unsuitable lands to meet goals other than

sustainable timber production, the determination for regeneration within five years may not be necessary in proceeding with the harvest activity.

DIRECT AND INDIRECT EFFECTS

The effects discussed below focus primarily on acres actually harvested and the resulting ASQ harvested from those acres. 'Acres harvested' includes those areas in which trees are scheduled to be felled, skidded, and decked at landings.

Acres harvested may not include all the acres in a stand where cutting has occurred, particularly in stands prescribed for group selection. Group selection areas on the White River National Forest often are too small to be delineated as separate sites or stands. A 100-acre stand may be prescribed for half-acre groups scattered throughout the stand, comprising approximately 20 percent of the stand's acreage; the effects of harvesting on that 100-acre stand would be said to occur on 20 acres. This approach for displaying and discussing effects is more accurate than viewing effects in terms of stands affected.

Assuming experienced budget levels, implementation of Alternative F would result in the most acres harvested and the greatest volume, followed by Alternatives B, K, and D. Timber harvest effects related to acres treated and volume produced are lowest under Alternatives E, followed by Alternatives C and I (see **Tables 139, 140, and 141** for a comparison, across the alternatives, of acres treated and ASQ for experienced budget levels).

Alternatives F and B would provide the highest level of stability for the existing timber industry. However, with supplies below the demand level, there will be changes to the timber industry within the timber zone.

Table 139
Acres harvested per year (decade 1 average, experienced budget level)

Cover types	ALTERNATIVE						
	B	C	D	E	F	I	K
Aspen	30	30	30	30	30	30	30
Douglas-fir	0	0	0	0	0	0	0
Lodgepole pine	900	320	680	320	1,400	380	770
Spruce-fir	270	100	200	100	420	110	230
Total	1,200	450	910	450	1,850	520	1,030

Table 140
Sawtimber harvest in thousand cubic feet per year (decade 1 average, experienced budget)

Cover types	ALTERNATIVE						
	B	C	D	E	F	I	K
Aspen	120	120	120	120	120	120	120
Douglas-fir	0	0	0	0	0	0	0
Lodgepole pine	2,780	1,030	2,080	930	4,430	1,100	2,330
Spruce-fir	400	150	300	150	650	180	350
Total	3,300	1,300	2,500	1,200	5,200	1,400	2,800

Table 141
Sawtimber harvest in thousand board feet per year (decade 1 average, experienced budget)

Cover types	ALTERNATIVE						
	B	C	D	E	F	I	K
Aspen	500	500	500	500	500	500	500
Douglas-fir	0	0	0	0	0	0	0
Lodgepole pine	12,300	4,400	9,100	4,300	19,200	5,200	10,500
Spruce-fir	1,600	600	1,200	600	2,600	700	1,400
Total	14,400	5,500	10,800	5,400	22,300	6,400	12,400

Effects common to silvicultural harvest methods (and described in Appendix I) will be expected for the acres shown in **Table 142**. In all alternatives, harvesting will be dominated by even-aged management system, whether coppice, clearcut, or shelterwood. Most of the coppice and clearcutting will be in aspen or lodgepole pine cover types. Coppice and clearcutting are preferred for regeneration of mature and overmature aspen and lodgepole pine stands because of several factors: (1) aspen and lodgepole pine are pioneer species, are shade intolerant, and reproduce best in most instances when overstory competition is removed or drastically reduced; (2) dwarf mistletoe, present in lodgepole pine stands in varying degrees, is best controlled by separating the old stand from the new; (3) windthrow and mountain pine beetle, while variable, are always a threat in lodgepole pine; and (4) the potential for future growth is limited because of the generally low vigor of mature and overmature stands and the suppressed condition on many smaller trees. Furthermore, the majority of natural aspen and lodgepole pine stands are even-aged, having developed after catastrophic fires or other disturbances.

Table 142
Acres per year harvested by silvicultural system (decade 1 average, experienced budget level)

Silvicultural system	ALTERNATIVE						
	B	C	D	E	F	I	K
Clearcut	680	245	510	245	1,050	285	580
Coppice	30	30	30	30	30	30	30
Shelterwood	480	170	360	170	750	200	410
Selection	10	5	10	5	20	5	10
Total	1,200	450	910	450	1,850	520	1,030

All of the alternatives treat approximately 1 percent of the harvested acres using uneven-aged management. Alternative F would treat the highest number of acres under uneven-aged management.

In harvested areas, objectives for controlling stand composition could serve to modify forest conditions and favor other species. Alternatives F, B, K, and D would affect the highest number of acres under even-aged methods. But with the limited number of acres proposed for harvesting, this species composition control would occur over a small portion of the forest. For all alternatives, less than 0.3 percent per year of the tentatively suitable timber lands for the national forest will be treated under even-aged management.

No alternative has a commercial timber program that is below cost in the first decade.

Tables 143 and 144 display the net return and present net value (PNV) by alternative.

The timber value is based on a four-year average return to the U.S. Treasury expressed in 1996 dollars, which is \$210.70/MBF for conifer and \$16.50/MBF for aspen. Alternative F has the highest net return and PNV, followed by Alternatives B, K, D, and I.

Alternatives C and E have the lowest net return and PNV.

Table 143

Net return from the timber program per year (decade 1, experienced budget level)

	ALTERNATIVE						
	B	C	D	E	F	I	K
Net Return	760,000	230,000	540,000	230,000	1,170,000	290,000	590,000

Table 144

PNV from the timber program for first 50 years (experienced budget level)

	ALTERNATIVE						
	B	C	D	E	F	I	K
PNV	15,800,000	6,300,000	13,300,000	5,400,000	25,100,000	6,000,000	14,400,000

About one out of every 20 acres harvested with a final harvest removal cut are predicted not to regenerate adequately within five years after harvest. These areas will require planting. **Table 145** displays the estimated acres that could require planting by alternative and funding level.

Table 145

Acres of reforestation per year (decade 1, experienced budget level)

	ALTERNATIVE						
	B	C	D	E	F	I	K
Acres	35	5	25	10	50	15	30

A limited amount of thinning is planned for most alternatives. **Table 146** displays the estimated acres to be thinned by alternative and funding level. Some thinning is accomplished every year through administration of small posts and poles sales. Most of this occurs in lodgepole pine stands. Also, thinning may be prescribed where insect or disease damage is apparent in understories.

Table 146

Acres of thinning per year (decade 1, experienced budget level)

	ALTERNATIVE						
	B	C	D	E	F	I	K
Acres	850	180	610	180	1,350	240	730

Availability of other forest products is expected to be highest in Alternative F as a result of more accessibility to greater volume of forest products. Fuelwood and posts/poles will be by-products of sawtimber sales. **Table 147** displays predicted personal-use fuelwood/post and pole volume for the alternatives. The three-year average (1995–97) volume is 2,80 MCF (1,400 MBF) (fuelwood = 95 percent; posts/poles = 5 percent). Because fuelwood and posts/poles will be byproducts of sawtimber sales, no further ground disturbance activity is anticipated. All alternatives reflect a drop in volume from current levels. Alternative F produces the highest amount of personal use firewood and post/pole material while Alternatives C and E produce the least.

The cutting of Christmas trees and the removal of transplants are still expected under all alternatives. The three-year average (1997-99) Christmas tree and transplant removal is about 4,000 trees (92 percent Christmas trees, 8 percent transplants). No ground-disturbance activities will occur with the removal of Christmas trees. The ground-disturbance activity associated with the removal of transplants is too minimal to consider in this analysis.

Table 147
Personal use fuelwood/post and pole volume (decade 1, experienced budget level)

Product (measure)	ALTERNATIVE						
	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
Personal use fuelwood (MCF)	160	40	110	40	240	50	130
Personal use fuelwood (MBF)	770	210	560	200	1,200	250	630
Posts/poles (MCF)	10	5	5	5	10	5	5
Posts/poles (MBF)	30	10	20	10	40	10	20

Areas managed for timber activities are expected, over the 10-year period of the plan, to revegetate and stabilize to some degree. Roads constructed for timber management use will have mitigations applied to reduce the potential for their erosion as well as for sedimentation into receiving stream channels. With successful mitigation measures applied, erosion and sedimentation from these roads are expected to decrease over time.

Effects on timber management from biodiversity management

Alternatives D, C, I, and K stress the need for management activities to mimic historical range of variability (HRV) conditions to meet biodiversity goals. In these alternatives, silvicultural treatments will be designed to incorporate HRV landscape pattern characteristics into treatment areas. This may involve even-aged treatments blocks larger than 40 acres, more irregular edges, or other modifications to current silvicultural prescriptions. ASQ is not expected to be affected by these changes, but the methods or acres may be modified. The themes for Alternatives B, E, and F do not stress the need to mimic HRV conditions in management activities; therefore, little impact to current silvicultural treatments is expected under these alternatives.

Effects on timber management from fire management

White River National Forest fire history data indicate that numerous small fires and infrequent large ones have occurred. Implementing Alternatives C or I, which emphasize allowing natural processes to occur, could result in fires damaging or killing trees on very limited acreages or across many acres depending largely on climatic conditions. Salvage and/or sanitation cutting might be deemed necessary after fires.

Effects on timber management from insects and diseases

Under Alternatives C and I, insect and/or disease infestations will be allowed to run their course. As with fires, disturbances from insects and disease generally have occurred frequently over small areas and infrequently over large areas.

Insect and disease activity has a direct connection to the variability of species and size class distribution across the landscape. Based on the amount of silvicultural treatments, Alternative F would be more resilient to the spread of insects and diseases, followed by Alternatives B, K, and D. Alternatives E and C would be more prone to the spread of insects and diseases, followed by Alternative I because of less-intensive vegetation management.

Depending on the severity of an infestation, effects on timber resources could vary widely. Infrequent large disturbance events such as the spruce beetle outbreak that occurred on the Flat Tops in the late 1940s and early 1950s can dramatically alter timber stand structure and composition, sometimes resulting in large areas of standing dead or dying trees. Based on spruce beetle risk ratings derived from timber stand inventories, 112,400 acres or 78 percent of the spruce cover type has a moderate or high risk rating. Under all alternatives, the potential exists for salvage/sanitation cuts to harvest dead and damaged timber, and to attempt to slow or impede infestations from spreading. The degree to which these harvests are undertaken will largely depend on the risk associated with infestation spread into healthy stands; public safety; the presence of high-value resources; and the resource emphasis of the infested or adjoining area. Based on the mountain pine beetle risk rating, 62,500 acres or 39 percent of the lodgepole pine cover type has a moderate or higher risk rating.

Salvage of dead trees is still expected under all alternatives from both the suitable and unsuitable land bases. The annual salvage volume between 1985 and 1999 was about 170 MCF (870 MBF) on about 150 acres. This volume estimate omits the Engelmann spruce killed by the 1940s spruce beetle epidemic. The salvage level is expected to remain at the current level in all alternatives for decade 1. Each succeeding decade will increase the possibility of a catastrophic insect infestation.

Effects on timber management from travel management

On an infrequent basis, the White River National Forest will grant right-of-way easements or temporary road use to private individuals for access to their inholdings within the forest's boundary. The forest's five-year average (1993–97) of right-of-way easements is seven per year. Two right-of-way timber sales per year are projected to occur during the planning period. This will result in about six acres of treatment and 9 MCF (45 MBF) of sawtimber harvested per year.

The closing of existing roads will allow old roadways to revert to natural vegetation including regeneration of tree species. Any growth of tree species on these closed roads will be slow and inconspicuous during the 10-year period of the plan.

Effects on timber management from recreation management

All alternatives involve some reconstruction of trailheads, reconstruction of campgrounds, and reconstruction/construction of trails. Some alternatives involve small expansions of existing campgrounds. Trees would be cut and cleared but only enough to allow safe construction and effective use of these facilities. The timber product volumes derived from these activities are minimal and have not been estimated.

Where recreation impacts are concentrated (such as in campgrounds, near trailheads, or near heavily used dispersed sites), existing trees will be damaged by cutting, scarring, and soil compaction as a result of the heavy recreation use. Treatments within developed sites also include the removal of hazard trees. In these circumstances, individual dead and/or dying trees may be harvested. These individual trees are so scattered and infrequent and their volume so minimal that the volume has not been estimated.

Effects on timber management from ski areas

Vegetation management treatments within Management Area 8.25 on lands outside of the suitable timber land base (ski slopes) is expected under all alternatives. Treatments include regeneration of trees in between designated ski runs, removal of hazard trees, and vegetation maintenance along ski runs and lifts. The six-year average (1994–99) of volume removed for forested vegetation maintenance within developed ski areas is about 60 MCF (300 MBF) per year. The volume is removed from about 36 acres per year. The removal of timber volume from ski slopes is expected to remain at the current level for all alternatives in this planning period.

Effects on timber management from inventoried roadless areas

Suitable timber lands (STL) includes portions of inventoried roadless areas within management areas 5.12, 5.13, 5.4, 5.43, and aspen and lodgepole pine areas in management area 5.5. The number of inventoried roadless areas that are allocated to management area prescriptions that generate ASQ varies by alternative, Alternative F having the highest number of acres and Alternatives E and I having the lowest. All alternatives retain the opportunity to use limited vegetation treatment within suitable timber lands to improve habitat for threatened, endangered, proposed, or sensitive species; or to maintain or restore ecosystem composition and structure, such as reducing the risk of uncharacteristic wildfire effects. The use of vegetation management within inventoried roadless areas will be re-evaluated as national direction and policy regarding the management of roadless areas is developed and finalized.

Effects on timber management from recommended wilderness

Alternatives C, D, E, I, and K include areas recommended for wilderness designation. These recommendations reduce the area on the forest in which timber harvesting can occur. Wilderness designations for these areas would effectively preclude the harvesting of any timber products. Alternatives B and F make no wilderness recommendations.

Table 148 displays the acres removed from the suitable timber lands (STL) by alternative because of lands recommended for wilderness; acres are rounded to the nearest thousand.

Table 148
Acres removed from TSTL because of lands recommended for wilderness designation

	ALTERNATIVE						
	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
Recommended wilderness	0	94,000	47,000	107,000	0	200,000	82,000
STL in recommended wilderness	0	58,000	22,000	59,000	0	133,000	48,000

Effects on timber management from designation of special areas

Timber harvesting is not permitted in areas recommended for wilderness or in research natural areas. No special interest areas are included in the suitable timber base. Natural processes will be allowed to occur in these areas; disturbance events (such as fire, insect outbreaks, and disease) would be anticipated. The least amount of land allocated to these areas is in Alternative B, followed by Alternatives F, E, K, and D. The most is allocated in Alternatives C and I.

Effects on timber management from increased funding levels

In the unlikely event that funding levels would increase substantially to fulfill budget needs for full implementation of the alternatives, **Tables 149, 150, and 151** display the changes in effects that will be expected. The relative ranking of effects (most to least, highest to lowest) among the alternatives, as previously discussed under experienced funding levels, will not change appreciably. Under all alternatives, full funding would result in about a 50 percent increase in acres treated and volume produced over the experienced budget level. **Table 16** in Chapter 2 of the FEIS discloses the budget levels associated with the desired condition and experienced budget levels.

Table 149
Acres harvested per year (decade 1 average, full budget level)

Cover types	ALTERNATIVE						
	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
Aspen	30	30	30	30	30	30	30
Douglas-fir	0	0	0	0	0	0	0
Lodgepole pine	1,280	500	1,030	510	2,060	480	1,170
Spruce-fir	390	150	310	150	620	150	350
Total	1,700	680	1,370	690	2,700	660	1,550

Table 150
Sawtimber harvest in thousand cubic feet per year (decade 1 average, full budget level)

Cover types	ALTERNATIVE						
	B	C	D	E	F	I	K
Aspen	120	120	120	120	120	120	120
Douglas-fir	0	0	0	0	0	0	0
Lodgepole pine	3,950	1,590	3,240	1,480	6,340	1,380	3,610
Spruce-fir	530	190	440	200	840	200	470
Total	4,600	1,900	3,800	1,800	7,300	1,700	4,200

Table 151
Sawtimber harvest in thousand board feet per year (decade 1 average, full budget level)

Cover types	ALTERNATIVE						
	B	C	D	E	F	I	K
Aspen	500	500	500	500	500	500	500
Douglas-fir	0	0	0	0	0	0	0
Lodgepole pine	17,200	6,800	13,800	6,700	27,600	6,400	16,000
Spruce-fir	2,300	900	1,900	900	3,700	900	2,100
Total	20,000	8,200	16,200	8,100	31,800	7,800	18,600

Spectrum timber modeling was also completed using an unconstrained budget. **Table 152** displays the green volume that could be harvested at the unconstrained budget level while meeting forest plan standards and guidelines.

A 'market share' comparison of ASQ at the unconstrained budget versus ASQ at the full implementation budget was conducted. Based on historical green offered and sold volume and existing mill capacity, a determination was made that the ASQ at the full implementation budget level was more reasonable than the unconstrained budget ASQ. Therefore, further ASQ analysis and alternative comparisons were based on the experienced budget and full implementation budget levels.

Table 152
Allowable sale quantity, unconstrained budget

	ALTERNATIVE						
	B	C	D	E	F	I	K
Harvest in million cubic feet	6.4	5.4	8.6	2.6	10.9	1.8	7.4
Harvest in million board feet	28.1	23.7	37.7	11.5	47.3	7.9	32.5
Suitable timber land acres	362,000	291,000	444,000	119,000	599,000	91,000	425,000

Most local purchasers generally do not process green volume. The average green volume offered for sale between 1987 and 1997 was 14.3 MMBF. The average green volume sold between 1987 and 1997 was 9.1 MMBF. Both experienced offered and sold volumes are substantially lower than ASQ at the unconstrained budget level in Alternatives B, D, C, F, and K. Mill capacity for green volume from the national forest is calculated at 30.0

MMBF. Alternative F exceeds the mill capacity by about 58 percent, while Alternatives D and K exceed mill capacity by about 26 percent and 8 percent respectively at the unconstrained budget level. Finally, local purchasers had developed a specialty market drawing upon supplies of dead Engelmann spruce killed during the spruce beetle epidemic in the 1940s. This group historically has used limited volumes of green timber and is not expected to use increasing volumes in the near future.

Full disclosure of the ASQ at the unconstrained budget level can be found in Appendix B.

Summary Tables 153 and 154 display summaries of timber sale program quantity (average per year) for all alternatives for the 10-year period of the plan.

Table 153
Timber sale program quantity (TSPQ) for first decade in MCF by budget level

Volume component *	Budget level	ALTERNATIVE						
		B	C	D	E	F	I	K
Chargeable volume offered ASQ	Experienced	3,300	1,300	2,500	1,200	5,200	1,400	2,800
	Full	4,600	1,900	3,800	1,800	7,300	1,700	4,200
Personal use fuelwood (PUF)	Experienced	160	40	110	40	240	50	130
	Full	230	60	170	60	360	90	190
Other products (OP)	Experienced	10	5	5	5	10	5	5
	Full	10	5	10	5	10	5	10
Other vegetation management (OVM)	Experienced	70	70	70	70	70	70	70
	Full	70	70	70	70	70	70	70
Salvage (sal)	Experienced	170	170	170	170	170	170	170
	Full	170	170	170	170	170	170	170
TSPQ total	Experienced	3,710	1,585	2,745	1,485	5,690	1,695	3,175
	Full	5,080	2,205	4,220	2,105	7,910	3,730	4,640

**The use of MBF for many of these products is only for comparison purposes. Many of these products are sold in either cubic or cord volumes. Many have small diameters that are not easily translated into board foot volume. OP are non-sawtimber from suitable lands — mostly post/poles.*

OVM = volume from unsuitable lands to meet other resource objectives.

SAL = dead and/dying timber from suitable or unsuitable lands.



Table 154
Timber sale program quantity (TSPQ) for first decade in MBF by budget level

Volume component *	Budget level	ALTERNATIVE						
		B	C	D	E	F	I	K
Chargeable volume offered ASQ	Experienced	14,400	5,500	10,800	5,400	22,300	6,400	12,400
	Full	20,000	8,200	16,200	8,100	31,800	7,800	18,600
Personal use fuelwood (PUF)	Experienced	770	210	560	200	1,200	250	640
	Full	1,160	310	850	390	1,800	380	970
Other products (OP)	Experienced	30	10	20	10	40	10	20
	Full	40	10	60	20	60	10	60
Other vegetation management (OVM)	Experienced	350	350	350	350	350	350	350
	Full	350	350	350	350	350	350	350
Salvage (sal)	Experienced	870	870	870	870	870	870	870
	Full	870	870	870	870	870	870	870
TSPQ total	Experienced	16,420	6,940	12,600	6,830	24,760	8,260	14,280
	Full	22,420	9,740	18,330	9,730	34,880	9,410	20,850

**OP = non-sawtimber from suitable lands, mostly post/poles.*

OVM = volume from unsuitable lands to meet other resource objectives.

SAL = dead and/or dying timber from suitable or unsuitable lands

CUMULATIVE EFFECTS

Effects on other lands within or adjacent to the White River National Forest

Private lands. About 200,000 acres of private land are scattered within the boundaries of the White River National Forest. It is not known how much of this land has been affected by harvesting, but the total acreage is small and cumulative impacts are minimal.

State lands. About 4,000 acres of state land is located within the boundaries of the White River National Forest. The scattered parcels range up to 640 acres in size and support little or no timber production. In addition, there are scattered parcels of state lands dispersed around the forest's perimeter. The cumulative effects from timber management on any of the state lands is minimal.

Federal lands. The Bureau of Land Management manages blocks of public land adjacent to the national forest. Little or no timber harvesting has occurred on these lands. The cumulative effects from timber management administered by the Bureau of Land Management is minimal.

Harvesting has occurred on all national forests bordering the White River National Forest. A considerable buffer lies between harvested acres on the Medicine Bow-Routt, Arapaho-Roosevelt, and Grand Mesa-Uncompahgre-Gunnison national forests and those of the White River National Forest.

Total acres harvested within the White River National Forest since the 1950s has amounted to about 41,000 acres, or 1.8 percent of the national forest. Most of these acres have been partially cut (that is, a portion of the overstory has been removed), generally

leaving half or more of the original overstory. Only clearcut and overstory-removal methods result in removing all of the overstory. (Overstory removal generally releases for growth a fully stocked understory). These methods have been used on less than 0.5 percent of the national forest.

All harvested areas have retained some amount of residual large trees, allowing younger trees to grow up underneath or adjacent to the overstory while maintaining a mature forest cover. As a result, a mature forest cover has been maintained on the bulk of the acres harvested. For the next decade, assuming funding remains consistent with recent levels, the most acres affected by harvesting (Alternative F) would be 18,500 acres, or 0.8 percent of the national forest. Most of this harvesting would occur in areas previously entered.

Assuming greatly increased funding for full implementation of any alternative, Alternative F would result in 27,000 acres affected, or 1.2 percent of the national forest, again including many areas previously entered. Assuming that the alternative representing the largest area and degree of harvest (again Alternative F) were implemented over the next 10-year period, added to harvesting that has occurred since the 1950s, the cumulative impacts of harvesting under full implementation throughout the White River National Forest will have occurred on about 3.0 percent of the national forest, while retaining an intact, mature forest on most of those acres. Forest growth and renewal have concurrently occurred during past and present harvest activities.

As the forests continue to age under all alternatives, forest insects and diseases will be increasingly evident in unmanaged areas. The lack of age class diversity in forest stands will result in higher levels of insect and disease caused mortality and growth loss.

Table 155 displays the timber program for each alternative under experienced budget in the context of suitable timber land (STL) acres, tentatively suitable timber land (TSTL) acres and total national forest acres. None of the alternatives harvest more than 2.2 percent of the tentatively suitable timber land acres for the first decade, and less than 1.0 percent of the national forest will be harvested for the same period. The forest's annual growth of 118 MMBF per year from tentatively suitable timber lands will continue to out pace timber harvest for all alternatives. Alternative F will harvest approximately 19 percent of the annual growth while Alternative E, which harvests the least timber, will harvest approximately 5 percent of the national forest annual growth under experienced budgets.

Table 155
Harvest acres first decade in thousands of acres (experienced budget)

	ALTERNATIVES						
	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>I</i>	<i>K</i>
Total Harvest Acres	12	4	9	5	19	5	10
Total Suitable Acres	362	291	444	119	599	91	425
% Suitable Acres Harvested	3.3%	1.3%	2.0%	4.2%	3.2%	5.4%	2.4%
Tentative Suitable Acres	845	845	845	845	845	845	845
% Tentative Suitable Acres	1.4%	0.5%	1.1%	0.6%	2.2%	0.6%	1.2%
Total Forest Acres	2,286	2,286	2,286	2,286	2,286	2,286	2,286
% Total Forest Acres Harvested	0.5%	0.2%	0.4%	0.2%	0.8%	0.2%	0.4%

Cumulative effects also can be expressed in the amount of time it would take to manage all the suitable acres at the experienced budget level. To accomplish the management strategies for Alternative B on suitable timber lands would require a minimum of 300 years. Accomplishing the management strategies on suitable timber lands would require the following minimum number of years: Alternative C, 730 years; Alternative D, 495 years; Alternative E, 240 years; Alternative F, 315 years; Alternative I, 180 years; Alternative K, 425 years.

The cumulative effects on the national forest's forested communities from implementing any of the alternatives will be minimal during the planning period with respect to the range of natural variability. Planned harvesting will mostly influence the lodgepole pine and spruce-fir cover types.

TOPIC 7

COMMUNITIES

Introduction

Abstract

The relationship between the White River National Forest and local lifestyles and economies is highly interdependent and complex. Skiing, wilderness areas, exceptional scenery, and headwaters vital to various municipal water sources all provide a stunning backdrop to mountain communities that are growing at alarming rates. This portion of the final environmental impact statement (FEIS) examines the history, present condition, and forecasts of counties and communities that both influence and are influenced by the White River National Forest.

Summary and Key Concepts

The White River National Forest is located in portions of nine Colorado counties, five of which have important social and economic ties to the White River National Forest: Eagle, Garfield, Pitkin, Rio Blanco, and Summit counties. The robust tourism-based economy and high cost of living in some of these counties has caused a direct spillover to three adjacent counties—Lake, Park, and Grand—which provide public services and affordable housing for service and retail workers who are employed in Summit or Eagle counties. Of these three counties, Lake is the most intimately tied with the White River National Forest area. While Fairplay and Alma in Park County and Kremmling in Grand County are communities with strong connections to activities in and around the national forest, influences from other parts of Colorado more strongly affect those two counties as a whole. For these reasons, the information and analyses presented here focus on Summit, Lake, Eagle, Pitkin, Garfield, and Rio Blanco counties. However, when information at the community level is presented, Fairplay, Alma, and Kremmling are also included.

The six-county area is by no means homogeneous in its makeup. Numerous comments on the draft environmental impact statement (DEIS) suggested a more detailed examination of social and economic effects. In response to these comments, much of the information here is separated into three sub-areas—Eagle-Summit-Lake, Garfield-Pitkin, and Rio Blanco. These combinations recognize both the differences and the commonalities among sub-areas of the forest.

This portion of the FEIS is separated into two sections and five subsections: the first section, **Communities of Place**, includes the subsections *Demographics*, *Economics*, and *Local Governments*; the second section, **Communities of Interest**, includes the subsections *Stakeholders* and *Financial and Economic Efficiency*. The analysis in each subsection is further subdivided into Affected Environment and Environmental Consequences discussions to mirror the organization in the rest of the FEIS. The last two subsections differ from the first three because they are not local impact analyses. Instead, they look at the social, financial, and economic consequences of alternatives from the perspectives first of stakeholder groups, and then taxpayers and society as a whole.

Key Indicators

- Jobs
- Labor income
- Households with a housing cost burden in Eagle-Summit-Lake counties
- Seasonal employees in Eagle-Summit-Lake counties
- Federal payments to states and counties
- Present net value

Legal Framework

- The **National Environmental Policy Act (NEPA)** requires that consequences to the human environment be analyzed and disclosed. The extent to which these environmental factors are analyzed and discussed is related to the nature of public comments received during the public involvement process, from scoping through preparation of the FEIS.
- The **National Forest Management Act** requires the examination of local community impacts as well as economic cost-efficiency considerations when preparing or revising a forest plan.
- **Executive Order 12898** requires that planning alternatives be assessed to determine whether they would disproportionately affect minority and low-income populations. The concept is called “environmental justice.”
- The **Secure Rural Schools and Community Self-determination Act of 2000** specifies how states and counties will be compensated for impacts associated with visitors to National Forest System lands.
- The **Payments in Lieu of Taxes Act of 1976** authorizes compensation to counties in lieu of property taxes that cannot be levied against federal lands within their jurisdiction.

Communities of Place

Demographics

Affected environment

HISTORY AND CULTURE

Knowing the history and culture of an area can often provide valuable context for understanding communities and how current or future events may shape their lives. No two communities in the planning area are alike, though many of them share a common history. What follows are brief historical and cultural profiles of the communities in the planning area. These profiles were provided by a local writer, Allen Best, who has lived on the West Slope of Colorado for over 20 years.

Summit County The American explorer John Charles Frémont passed through what is now Summit County in 1844. Ascending the Blue River from Middle Park, he reported seeing Arapahoe tribesmen and, near today's Silverthorne, trails made by bison in three directions. He followed the bison path south, crossing the Continental Divide at Hoosier Pass.

Prospectors used this same pass in 1859 when dispersing from South Park in search of gold. They found gold in abundance, most notably in and around Breckenridge but also in such distant camps as Montezuma, Kokomo, and Robinson. The most significant mining ended in 1942, when the last gold dredge ceased operation in the Upper Blue River.

Summit County continued to lose population and valuation until the 1960s, when Breckenridge Ski Area began operations in 1961, followed by Keystone in 1970, and Copper Mountain in 1973. Those three, along with Arapahoe Basin, founded in 1946, now host more skier visits than all of Utah.

Dominated by Interstate 70, Summit County now calls itself "Colorado's Playground," an apt description. In addition to the municipalities, noteworthy population centers are also found at Keystone, Summit Cove, and Wildernest. Heeney is found along the Green Mountain Reservoir. The county, when it was one of Colorado's original 17 counties, stretched westward to Utah and northward to Wyoming.

Silverthorne—Silverthorne was created in the late 1950s as a makeshift construction camp for Dillon Dam. The town was named after Marshel Silverthorn, an original settler who was appointed judge of the Miners' Court in Breckenridge in the 1880's. After a dam was completed in 1963, the town housed workers constructing a tunnel under the Continental Divide for the Eisenhower Memorial Tunnel and also for another tunnel under the Continental Divide at the Henderson Mine. Incorporation occurred in 1967.

Dillon—Located where the Snake River and Ten Mile Creek met the Blue River, Dillon may have been the La Bonte's Hole mentioned as a rendezvous site by fur trappers in the early 1880s. Its origins as a town, however, have to do with the mining economy. Built to

service mines elsewhere, railroad tracks of the Denver & Rio Grande reached Dillon in 1882, and those of the Denver, South Park, and Pacific in 1883. Incorporation occurred that same year.

The town's vitality flagged in later decades. In 1929, the Denver Water Department bought land around the reservoir and began building a dam across the Blue River in the late 1950s. Final evacuation of the town occurred in 1960, and buildings were moved to Breckenridge, Frisco, and Silverthorne. Other buildings were moved to the relocated town site on a nearby hill. The new Dillon continues to service travelers and vacationers.

Montezuma – Prospectors settled at this site in 1865, choosing the name of Montezuma, the Aztec emperor who had been surrounded by riches, in hopes that the site would live up to its name. It did. This was the site of the first silver strike in Summit County, and a town of some renown emerged in the 1870s. Formal incorporation occurred in 1881. Transportation always was a problem for the miners, however. One answer was a rough road across nearby Webster Pass, but the more powerful solution was found in the 1883 arrival of the Denver, South Park, and Pacific railroad tracks at the Keystone siding, still seven difficult miles away.

Devaluation of silver in 1893 evaporated some of Montezuma's liveliness. However, as one historian put it, it's a town that has "never been boring, never lackluster." At an elevation of 10,200 feet, Montezuma is one of the highest municipalities in the nation.

Frisco – Settlement of Frisco has been traced to a cabin built at the site in 1873. The town was incorporated in 1880 and the following year had a reported population of 150. Rich timber resources at the mouth of Ten Mile Canyon served the proliferating mines and the advancing railroads that arrived in 1882. The mining evaporated in the 1890s, but the town hung on perilously through the 20th century until new roads from Denver—first Highway 6 across Loveland Pass in 1939 and then Interstate 70 through Eisenhower Tunnel in 1973—created the infrastructure for an escalating tourism and recreation economy.

Blue River – Unlike most towns of the region, Blue River has no origins in the mining era. Instead, it was incorporated in 1972 at the behest of developer Robert Theobald as a residential community. In fact, businesses were and continue to be prohibited. Hence, while most towns rely on sales taxes to operate municipal services, Blue River relies almost entirely on property taxes. Its identity is tied inextricably to that of Breckenridge, with which it shares a border on the north. Most residents work in Breckenridge, and Breckenridge's municipal water supply, the Goose Pasture Tarn, is within the municipal borders of Blue River. Blue River also vies for one of North America's highest incorporated towns, with elevations that range from 9,600 feet to around 10,600 feet.

Breckenridge – The oldest continuously occupied community in the Colorado mountains, Breckenridge's settlement can be traced to 1859. In the first full year of the Pikes Peak gold rush, prospectors found enough gold in the Blue River and its tributaries to inflame the greed of an estimated 8,000 Argonauts, nearly all of them men. They named their central camp Breckinridge, to honor the nation's vice president, but modified the spelling when his Confederate sympathies violated their Unionist ardor.

Underground mining continued after the easy surface picking had been picked. Among the subterranean discoveries was a 17-pound gold nugget, the largest ever found in the

United States. Then, giant hydraulic mining operations called dredges were put out onto the waterways, moving vast quantities of rock to sift out the flour-like gold residue. The mining ended in 1942.

Commercial skiing was first developed on Peak 8, which began operations in 1961. In the 1998–99 and 1999–2000 winters, Breckenridge became the busiest ski resort in North America.

Grand County History of Grand County has been dated to at least 7,000 years ago, when hunters killed bison north of Kremmling. The county's settlement history begins about 1861, when guide Jim Bridger led Capt. E. L. Berthoud across the pass that now bears his name, giving the new city of Denver a general route to Salt Lake City. The hot springs in the middle of Grand County became one of Denver's first mountain resorts. In addition to tourism, consistently a strong element of the county's economy, cattle ranching, logging, and molybdenum mining have all been economic pillars. Municipalities include Fraser, Granby, Grand Lake, Hot Sulphur Springs, Kremmling, and Winter Park. Hot Sulphur Springs was site of the first winter carnival west of the Mississippi, while Winter Park was among Colorado's first ski areas.

Kremmling – Although there had been several settlers in the region previously, Kremmling's founding can be dated to 1884, when a merchant from Dillon, Rudolph Kremmling, opened a store at the confluence of Muddy Creek and the Colorado River, opposite the Blue River, near where the Colorado issues out of Middle Park and through the Gore Range. The town was incorporated in 1904, when the Denver, Northwestern, and Pacific Railroad arrived from across Rollins Pass.

Ranching has been the dominant economic pillar during the past century, although logging became important for significant portions after World War II. Many residents have worked at the processing mill for the Henderson molybdenum mine since it opened in 1976. Kremmling has increasingly become a bedroom community for Summit County.

Park County Ringed by peaks that range above 14,000 feet, Park County is nearly synonymous with South Park, a basin with an elevation of nearly 10,000 feet. Colorado's first discovery of gold may have occurred here in the 1830s, with prospectors assuredly flooding the park in 1859 and 1860. Park County was created by the territorial legislature as one of the original 17 counties in Colorado.

Mining for precious minerals has long ceased to be economically significant in Park County, and ranching has also largely been abandoned as the water rights have been assigned chiefly to cities along the Front Range. Residents of Park County today are tied most directly to the economies of metropolitan Denver or to Summit County.

Fairplay – Among the oldest towns in Colorado, Fairplay's origins can be traced to 1860. As the fortunes of the nearby mining camp of Tarryall flagged, those of Fairplay surged when prospectors fanned across the surrounding streams collecting into the South Platte River to look for gold dust.

After wearing a variety of names, the settlement was incorporated under the name Fairplay in 1867. It is located at an elevation of 9,957 feet and remains the county seat.

Alma—Founded in 1873, a short distance below the legendary Buckskin Joe, Alma remains today with a base elevation of 10,350 feet, considered the highest incorporated

town in North America. It serves as a bedroom community for Breckenridge, which is located 15 miles and a Continental Divide crossing away.

Lake County History of Lake County is bound up with mining. The first excitement occurred at California Gulch in 1860 and lasted several years. During a lull, the first silver mine was found near Homestake Peak in 1874. The greatest discovery occurred soon after, when the black sand that had clogged the placer operations of gold miners was determined to be incredibly rich silver ores. The realization launched one of the 19th century's most spectacular boomtown rushes. Millionaires were being created with an ease that seems to not have been eclipsed in Colorado until arrival of the dot-com millionaires of recent years.

Mining waxed and waned in successive decades, waxing most prominently after World War II when low-grade molybdenite deposits were extracted at the Climax Mine atop Fremont Pass. The mine at one time employed more than 3,000 people, was the state's second highest consumer of electricity, and was the top single taxpayer in counties within or adjacent to the White River National Forest. Climax ceased operations in 1982, as Leadville looked increasingly to the prospering Interstate 70 corridor for jobs. The last mine, the Black Cloud, shut down in 1999.

Leadville – The story of Leadville is almost identical to that of Lake County. Incorporated in 1879, Leadville soon after was the second most populous city in Colorado. Colorado's best newspapers were there, along with its most desperate criminals and its gaudiest wealth. With considerable justification, Leadville described Denver as a suburb. After all, the mines of Leadville were paying for the mansions of Denver.

For most of the 20th century, however, Leadville became a workingman's town. The town's self-esteem deflated in the early 1980s with suspension of molybdenum mining, and Leadville continues to struggle toward a new identity, one that it hopes will not make it so directly dependent on service jobs located in adjoining Summit and Eagle counties.

Eagle County Originally part of Summit County at statehood in 1876, Eagle County was created in 1883 after mining prospectors from Leadville found likely prospects at the head of the Eagle River. Mining faded around 1900, and ranching and farming came to dominate, provoking a change of the county seat from Red Cliff to Eagle in 1921. Agriculture, mining at the Eagle Mine (at one time the nation's greatest source of zinc), and a small amount of tourism continued to be Eagle County's economic foundation until the 1960s. Vail ski area began operations in 1962, at its start the nation's largest ski area, a distinction it retains after several expansions. In 1982 it was joined by Beaver Creek, which is Colorado's newest ski area on public land.

Eagle County today is dominated by Interstate 70, which enters the county at Vail Pass and exits at Glenwood Canyon. Principal rivers are the Eagle, which meets the Colorado River near Dotsero, and the Frying Pan River, which drains the southern portion of the county.

In addition to municipalities, other noteworthy population centers are Burns, Edwards, Eagle-Vail, El Jebel, McCoy, State Bridge, and Wolcott. While most of the county falls within the Vail economic sphere, the municipality of Basalt and the El Jebel community

are much more strongly influenced by and aligned with Aspen and other Pitkin County centers of commerce and culture.

Vail – Sheep ranching, potato farming, and other agricultural pursuits were the primary uses of the Gore Valley until 1957, when a ghost company was formed to buy up private property at the base of a mountain ridge now known as Vail Mountain while seeking a Forest Service special-use permit for a ski area. The new ski areas opened in 1962.

Incorporation of a town was accomplished in 1966, and annexations since have resulted in a town 10 miles in length and, in places, no more than a few hundred yards wide.

Minturn – Located along the Eagle River, just north of Interstate 70, Minturn's history is closely aligned with that of the Denver & Rio Grande Railway. It was first called Bocco, after a settler, but after arrival of the railroad tracks in 1887 the town was renamed after one of the railroad directors. Incorporation occurred in 1904.

Minturn was a division point, where railroad crews changed, and there were also repair shops and even a turntable. Because of the steep grade going to the tunnel at Tennessee Pass, itself the highest Continental Divide crossing of a railroad in North America, extra locomotives were needed. These locomotives were attached and detached at Minturn. Through much of the 20th century, many residents also worked at the Eagle Mine, located several miles away at Gilman. Mine operations began slowing in the 1970s and were suspended altogether in 1985. Railroad operations, meanwhile, were suspended in 1997. Today, Minturn is a bedroom community for resorts more directly along Interstate 70, but it also has a modest tourism economy of its own.

Red Cliff – Intent on finding the same wealth that had suddenly attracted 12,000 people or more to Leadville, prospectors settled Red Cliff in 1879. The town was incorporated in 1880, and the Denver & Rio Grande Railway tracks from Leadville arrived there the next year. When Eagle County was fragmented from Summit County in 1883, Red Cliff was established as the first county seat.

The surrounding mines never yielded silver or gold ores remotely as rich as had been found elsewhere in Colorado. However, the nearby Eagle Mine at Gilman emerged as a major zinc producer, attracting miners from New Mexico in the 1930s, giving Red Cliff a strong Hispanic identity that it retains today. The mine substantially reduced operations in 1977 and was completely shuttered by 1985. The public school in Red Cliff closed in 1993 and regularly scheduled church services were suspended in 2000, but the town is seeing new construction, extensive remodeling, and appreciated real estate prices that make it a bedroom community for Interstate 70 resort employees.

Avon – Avon was settled by farmers and ranchers of English descent who, it is thought, saw elements of Stratford River in this Eagle River Valley. Patenting homesteads, they raised cattle, grew lettuce and, after about 1940, grazed sheep.

However, there was little in the way of a community center or commercial district until shortly before the arrival of the Beaver Creek ski area. Envisioning a future real estate boom that has indeed happened, the Benchmark Co. fostered incorporation in 1978. From that thin population base, Avon has surged in population, and during both the 1980s and 1990s was one of the fastest growing towns in Colorado.

Eagle – As homesteaders trickled down the Eagle River, a store was established at the mouth of Brush Creek in 1887. After numerous name changes, residents settled on Eagle,

and almost immediately began bidding to get the county courthouse, arguing for the centrality of their location. Finally, in 1921, they succeeded. The courthouse was a strong component of Eagle's identity, as were the surrounding ranchlands to which town merchants and servicemen catered. Increasingly, beginning in the 1970s, the town developed into a bedroom community for resorts in the upper Eagle Valley, a trend that increased in the 1990s.

Gypsum – As was the case with so many other communities across Western Colorado, Gypsum's beginnings came on the coattails of the Leadville boom and the nearly simultaneous expulsion of Ute tribesmen. The first identified settler of Gypsum was Orion W. Daggett, who began hunting game for the Leadville miners in 1882. Only two years later, 32 ranches were being cultivated in the Gypsum Creek Valley. Further vitality was injected by arrival of the Denver & Rio Grande Railway in 1887. The town, however, was not incorporated until 1911.

Ranching continued to dominate the economy of Gypsum until well toward the end of the 20th century. However, mining of gypsum and manufacturing of wallboard became important in the 1990s even as the town became tied, as a support base, for resort and recreation economy of the upper Eagle Valley. Within the municipal limits is the Eagle County Regional Airport, the second busiest airport in Colorado during winter months.

Pitkin County Pitkin County was named for Frederick Pitkin, governor of Colorado at the time of the battle between Ute Indians and the U.S. Army on the edge of the Ute reservation. In the aftermath of that battle, Utes were forced onto reservations in the deserts, opening most of the Western Slope to settlement. Aspen (initially called Ute City) was one of the first, and richest, silver strikes. Two railroads scrambled to provide service; the Denver & Rio Grande got there first.

Aspen's period of intense mining success was brief, curtailed in 1893 by the demonetization of silver but continuing somewhat abated for several more decades and finally faltering altogether. Into that void came tourism, first in the form of the gasoline-powered boat tow up Aspen Mountain in the late 1930s. World War II both interrupted but ultimately hastened the development of skiing. Veterans who had trained at nearby Camp Hale returned to help create a commercial resort at Aspen. Success at Aspen spawned the additional ski areas of Highlands, Buttermilk, and Snowmass, sealing Pitkin County's prominence as a resort area.

Aspen – Known originally as Ute City, Aspen flourished as one of the West's most prominent silver mining towns in the 1880s and early 1890s, reaching an apex in 1893 when the town had 12,000 residents, four schools, three banks, six newspapers, two theaters, an opera house, and a brothel district.

Aspen's fame as a ski town was informally launched in the late 1930s when a Swiss avalanche expert joined with the Aspen Ski Club to cut a race course on Aspen Mountain and construct a 'boat tow'—two massive sleds pulled by an old mine hoist and a gas motor—that lurched and sometimes spilled skiers up the mountain. After World War II, a member of the 10th Mountain Division and a Chicago industrialist started Aspen down the road toward development as a major resort. The 1949 Goethe Bicentennial Convocation inaugurated Aspen's reputation as an internationally renowned gathering place for music, art, and other cultural events. Aspen likewise earned an international

reputation for skiing when the town in 1950 hosted World Alpine Championships. From these twin foundations Aspen has become one of the world's best-known small towns.

Basalt – Creation of Basalt was provoked by arrival of the Midland Railroad. Achieving a shortcut under the Continental Divide, railroad tracks descended the Fryingpan River in 1887, hoping to beat the Denver & Rio Grande tracks ascending from Glenwood Springs for the rights to transport Aspen prodigious silver ores. The location was accordingly called Aspen Junction, a name amended to Basalt when incorporation occurred in 1901.

In 1918 the Midland Railroad ceased operations and Aspen's silver-mining economy continued to wither, leaving Basalt with a severely weakened economy. Basalt clung to a slender existence until after the Aspen skiing economy began to flourish after World War II. Always known for its fishing and scenic setting, Basalt emerged as a community with its own distinct identity in the 1990s. Located primarily in Eagle County, a portion of Basalt is also in Pitkin County.

Snowmass Village – There have been several Snowmasses in Pitkin County, all stemming from a pair of mountains in the Elk Range that are likewise and aptly named. The original Snowmass, located along the Roaring Fork River and U.S. Highway 82, is now called Old Snowmass. In the 1950's, another member of the 10th Mountain Division envisioned a ski area on Baldy and Burnt Mountains and in 1957 started the permitting process with the Forest Service. In 1967, Snowmass-at-Aspen opened. The base village incorporated in 1977 as Snowmass Village.

Garfield County Created in 1883, Garfield originally included what is now Rio Blanco County. At its creation Garfield's county seat was at Carbonate, a mining camp north of Glenwood Canyon. When the excitement eroded and the reality of the marginal minerals and the abundant snow were realized, county offices were moved to Defiance, soon renamed Glenwood Springs.

Garfield County always has had a diversity of economic interests. Glenwood Springs has been the focus of tourism, first and continuously at the hot springs, later at the Sunlight Ski Area, and throughout by hunting on the White River Plateau. Coal mining continued into the 1980s, while natural gas exploration continues to the present. Grazing of livestock, both cattle and sheep, remains a conspicuous component of the county's economy to this day.

A final component of the county's heritage is reflected at Trappers Lake, in the far northeastern corner of Garfield County, where a Forest Service report in 1919 contained the nugget for the concept of formal wilderness.

Carbondale – Among the first American visitors to the land at the confluence of the Roaring Fork and Crystal Rivers was Richard Sopris, who later became mayor of Denver. Although Sopris found much that he thought should discourage settlement, 20 families thought otherwise and in 1881 homesteaded at what they called Carbondale, in honor of the Pennsylvania town where several had originated.

Ranching and potato farming began, and Carbondale's future as a supply center was assured by arrival of the Aspen-bound Denver & Rio Grande railroad in 1887. Incorporation occurred in 1888. Railroad tracks were laid up the Crystal River in 1882, to service coal mines and the Yule marble quarry. Coal continued to be a dominant

economic influence well into the 1970s even as Carbondale became a bedroom community for Aspen and then even a community center focused on recreation.

Glenwood Springs – In 1881, Yomas Lindgren—a miner from Leadville—started the first commercial operation of the hot springs. That same year Fort Defiance was created, and by 1885 a town had been incorporated, this time as Glenwood Springs. The Denver & Rio Grande and Midland Railroad trains arrived in 1887, from opposite directions. Amid those comings and goings, John “Doc” Holiday died at the Glenwood Hotel.

A federal building was erected in 1919 and in 1928 it was occupied by the White River National Forest. Other milestones include opening of the Holiday Hills Ski Area in 1948 (now known as Sunlight), withdrawal of Exxon oil shale funding in 1982, completion of Interstate 70 through Glenwood Canyon in 1992, and the death of 14 firefighters on Storm King Mountain in 1994.

New Castle – As its name suggests, New Castle’s origins are bound tightly to the high-grade coal reserves found in the adjacent Grand Hogback. The land had been settled soon after the Ute evacuation, and by 1883 a platted town site had been sold along with the name Grand Butte. In 1888, coal mining began, the Denver & Rio Grande tracks arrived, and the town was incorporated.

Inspired by a vein 50 feet thick, coal mining continued for several decades, but a series of horrific mine disasters followed. In 1896, an explosion in the Vulcan Mine killed 49 men. Three years later, methane gas in the Consolidated Mine caught fire, forcing closure. Another explosion, killing 37 miners, occurred in a new Vulcan Mine in 1913. In 1916, yet another mine explosion killed three men. That virtually ended coal mining, but the same year sheep were introduced to the ranges adjacent to New Castle. That agricultural theme continued to be a dominant one for most of the 20th century.

Silt – Although settled in the early 1880s and reached by railroad in 1888, Silt was not incorporated until 1915. It served during the 20th century as a supply center for surrounding farms and ranches.

Rifle – The town was settled in 1882 and incorporated in 1905. Theodore Roosevelt slept there in 1901, at the Winchester Hotel. Not until the presidency of Richard Nixon, however, did the town get significant national exposure, and only then in quixotic ways.

First, in 1969, the Atomic Energy Commission detonated an atomic bomb 14 miles to the southwest at Rulison, hoping to shake loose subterranean oil reserves. Again in 1973 the agency detonated a bomb, this time 36 miles northwest of Rifle, and for the same purpose.

Christo, a landscape artist, gave Rifle enduring fame in 1972, when he chose nearby Rifle Gap to unfurl his massive curtain of orange fabric in a project called Valley Curtain. The curtain fluttered across the chasm for a day before being ripped from its anchors by winds.

Parachute – The first settlers arrived in 1882. A post office was established there in 1885 under the name Parachute and an oil shale mining district was created in 1890. The town was platted in 1891 under the name Parachute, but the name was changed to Grand Valley in 1904, reflective of the nearby river that was then called the Grand (now it’s the Colorado). Incorporation occurred in 1908. However, the naming uncertainty continued.

In 1980, while excitement mounted about development of the oil shale reserves, the town reverted to the original name of Parachute.

Major funding for the oil shale effort was withdrawn on May 1, 1982. Housing on adjacent Battlement Mesa that had been built in anticipation of oil shale workers has instead been purchased by retirees, who enjoy the temperate winters, mild summers, ever-resplendent air.

**Rio Blanco
County**

The first documented white visitors to Rio Blanco County were the party led by Franciscan friars Dominguez and Escalante, who reached the White River in 1776. John Charles Fremont passed through the county in 1844, and John Wesley Powell wintered near present-day Meeker in 1868-69. His presence is remembered in a place called Powell Park.

After the Ute Reservation was dissolved, the valley of the White River was opened to homesteaders in the early 1880s. The county was established in 1889, with Meeker as the county seat. Livestock grazing was and continues to be an important component of the county's economy. Lands in the public domain along the White River were reserved for federal administration as the second national forest in the country by President Benjamin Harrison in 1891.

Meeker – Incorporated in 1885, Meeker was established around the recently vacated headquarters for the U.S. Army. From the outset, Meeker's identity was merged with that of the surrounding private rangelands and even more with the federal lands. Both cattle and sheep were grazed, not always in harmony. Of all the towns amid and adjacent to the White River National Forest, Meeker has changed least in the past half-century.

Hunting season continues to be the busiest period of every year. What is believed to be the world's largest elk herd can be found mostly in the eastern side of Rio Blanco County, and the largest migratory herd of mule deer in North America were centered for many years in the valley of Piceance Creek.

Rangely – Rock art and artifacts abundantly testify to presence of Indians of the Fremont culture around Rangely. The modern history, however, is strongly tied to mineral resources. Vast oil and gas resources were discovered in the late 1930s, and for a time the Rangely oil basin was considered the most abundantly producing field in the United States. That field today continues to produce gas and oil. Coal east of Rangely is also mined for an electrical generating plant in Utah. Positioned 18 miles from Dinosaur National Monument, Rangely is also home to Colorado Northwest Community College. The town was incorporated in 1947.

**American
Indians**

Before the settlement of the communities listed above, several bands of Ute Indians occupied the mountains of the White River National Forest. Their residence and culture are important to understanding the history of the planning area. These bands are now federally recognized as the Ute Indian Tribe of Fort Duchesne, Utah; the Southern Ute Indian Tribe of Ignacio, Colorado; and the Ute Mountain Ute Tribe of Towaoc, Colorado. The Ute tribes have requested that a brief account of their history be withheld from this FEIS until they prepare certain documents. When the Ute history is complete, it will be incorporated into the White River Forest Plan as part of the amendment process.

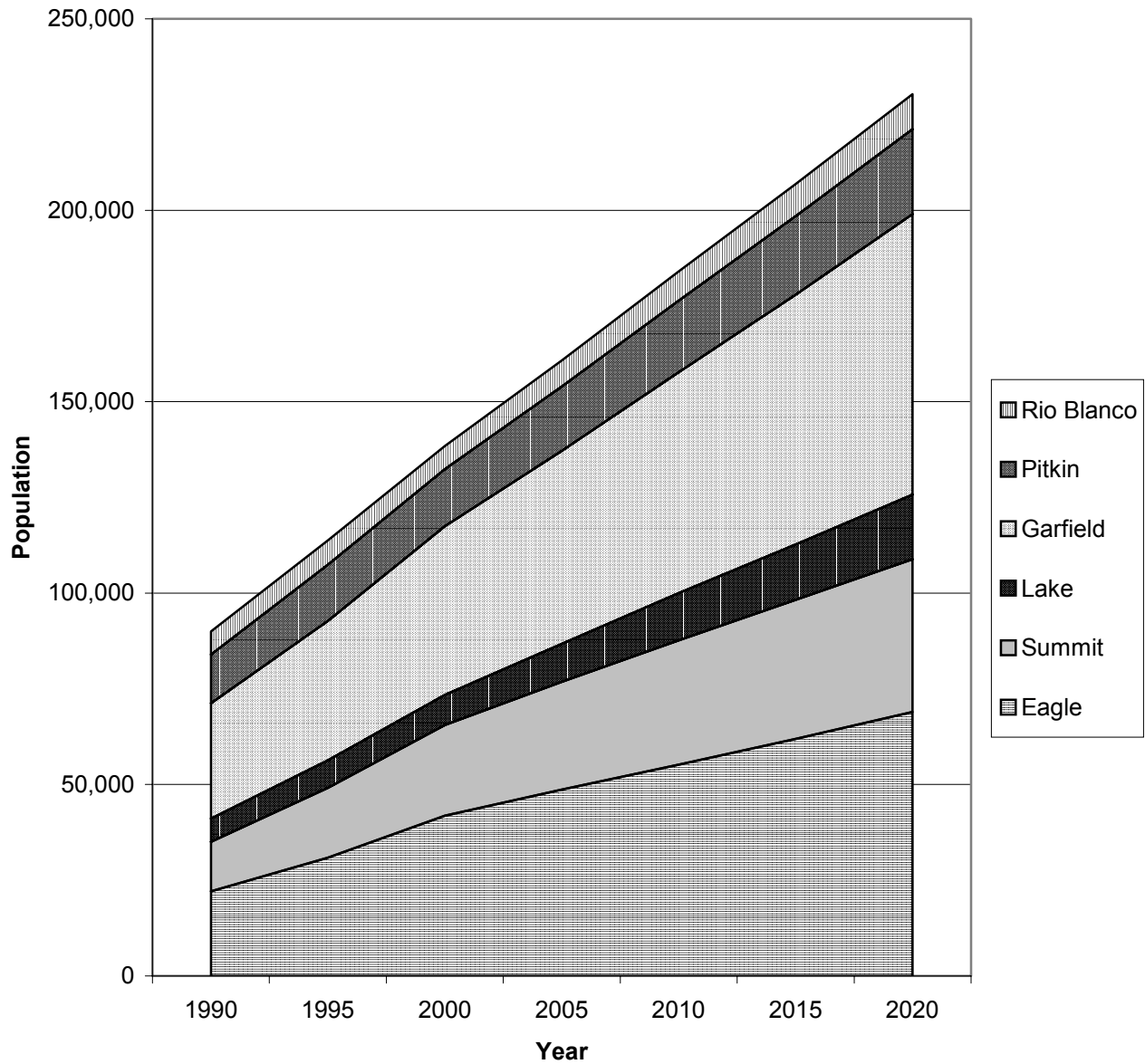
POPULATION

Population In the first half of the 1990s, weak economies on both coasts of the U.S., technological advances in communications, and changing preferences of baby boomers were some of the factors that prompted a migration to the central Rocky Mountains. The beauty, recreation opportunities, and close proximity of the White River National Forest to Denver are additional reasons that migration to this part of Colorado has been dramatic. High growth rates in mountain communities continue today and are expected to continue in the foreseeable future. Since 1990, population in the six-county area has increased 54 percent and is expected to double by 2010.

Figure 58 shows actual and projected changes in population from 1990 to 2020 based on recent data from the Colorado State Demographers Office. Garfield, Eagle, and Summit counties account for nearly 80 percent of the area's population today and are projected to account for the same percentage in 2010. These counties, which make up the Interstate 70 highway corridor in this area, are projected to grow more than 2.5 percent annually in next two decades. This compares with a projected growth rate for the U.S. of 0.8 percent and a rate for Colorado of 1.7 percent. From 1990 to 2000, Eagle and Summit counties ranked as the tenth and fifteenth fastest growing counties in the US—Eagle County grew by 90 percent and Summit County grew by 82 percent. **Figure 59** illustrates this recent and projected growth in percentage terms.

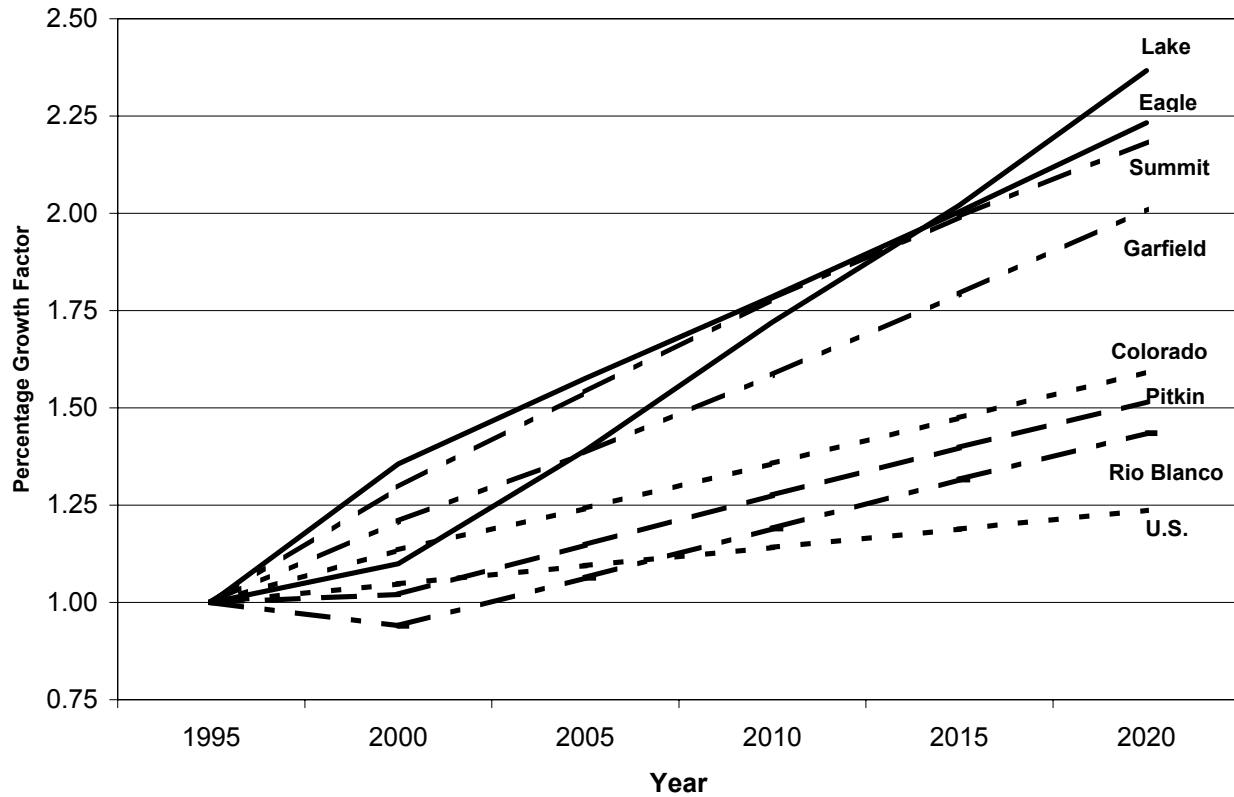
While Eagle, Summit, and Garfield counties can expect growth rates that are slightly moderated from the past decade, the other three counties can expect somewhat faster growth than was experienced in the 1990s. Lake and Pitkin are at the opposite extremes of these projected growth rates. Lake is projected to double from its size in 1990 by 2020, with an average annual growth rate of 3.9 percent; an increasing need for housing that can be afforded by service and retail workers will keep Leadville growing quickly in the coming years. In contrast, Pitkin County has adopted a policy of controlled growth and should experience a more modest increase in population. Rio Blanco County is not predominantly a resort or tourism-oriented area and is thus projected to grow at about the same rate as Pitkin county.

Figure 58
Population in the six-county area, 1990–2020



Source: Colorado State Demographers Office, June 2001

Figure 59
Population percentage growth factors in the six-county area, 1995–2020



Source: Colorado State Demographers Office, June 2001

A look at population changes for individual communities gives an even better picture of what is happening in the area influenced by the White River National Forest. As shown in **Table 157**, high or very high growth is common in the area. Half of the municipalities grew by 50 percent or more. Those communities close to other towns with higher housing prices have shown the greatest increases. The towns of Avon, Gypsum, and Eagle—all west of Vail on Interstate 70—have either doubled or tripled in the past ten years. Basalt, just down the road from Aspen, and New Castle, close to Glenwood Springs, have seen tremendous growth. But relatively slower growth in other communities can still pose great challenges. Kremmling, with a 35 percent change in population since 1990, has not seen this kind of growth in decades. High housing prices in primary tourist areas combined with locations that are still very desirable have driven permanent residents to look down valley (or over mountain passes) for more affordable communities in which to live.

Table 157
Population in area municipalities, 1990–2000

Municipality	County	April 1990	April 2000	% change 1990-2000
Colorado Average	--	--	--	31%
I-70 Corridor/Front Range Influence				
Avon	Eagle	1,798	5,561	209%
Gypsum	Eagle	1,750	3,654	109%
Eagle	Eagle	1,580	3,032	92%
Breckenridge	Summit	1,285	2,408	87%
Silverthorne	Summit	1,768	3,196	81%
Fairplay	Park	387	610	58%
Blue River	Summit	440	685	56%
Frisco	Summit	1,601	2,443	53%
Dillon	Summit	553	802	45%
Kremmling	Grand	1,166	1,578	35%
Vail	Eagle	3,716	4,531	22%
Alma	Park	148	179	21%
Leadville	Lake	2,629	2,821	7%
Minturn	Eagle	1,066	1,068	0%
Red Cliff	Eagle	297	289	-3%
Montezuma	Summit	60	42	-30%
Roaring Fork & Colorado Valleys				
Basalt	Eagle	126	729	479%
New Castle	Garfield	679	1,984	192%
Carbondale	Garfield	3,004	5,196	73%
Silt	Garfield	1,095	1,740	59%
Parachute	Garfield	658	1,006	53%
Rifle	Garfield	4,858	6,784	40%
Snowmass Village	Pitkin	1,449	1,822	26%
Glenwood Springs	Garfield	6,561	7,736	18%
Aspen	Pitkin	5,049	5,914	17%
White River Valley				
Meeker	Rio Blanco	2,098	2,242	7%

Source: Colorado State Demographers Office, June 2001

Population statistics only account for permanent residents. However, seasonal fluctuations, particularly from recreation and tourism, are important in all of these counties. Temporary populations from tourism in Eagle and Summit Counties can quadruple the number of persons driving, using water, calling upon emergency services,

and shopping at local grocery stores. In addition, seasonal workers, often missed in April census counts, are temporary residents who affect the demand for housing and local government services. So while permanent populations have and will expect to register dramatic increases, they are only a portion of the real impacts of growth upon communities.

ENVIRONMENTAL JUSTICE

A specific consideration of equity and fairness in resource decision-making is encompassed in the issues of environmental justice and civil rights. As required by Executive Order 12898, all federal actions must consider potentially disproportionate effects on minority or low-income communities. Principles for considering environmental justice are outlined in Environmental Justice Guidance under the National Environmental Policy Act (Council on Environmental Quality 1997). Those principles are recognized and have been considered in this analysis.

Tables 158 and 159 provide demographic statistics for identifying potential communities of concern. While several racial groups increased in population over the last decade, the significant story is about those of Hispanic origin. These tables show that between 1990 and 2000, residents of Hispanic origin grew faster than the general population. This was especially true along the Interstate 70 corridor. Summit County had the largest change, going from 2.5 percent in 1990 to nearly 10 percent in 2000. Lake County has the largest proportion of Hispanic residents (36 percent), while Eagle County has the highest number (9,664).

Table 158
Racial component change of population by county, 1990–2000

County	Total Population		Non-Hispanic White and Other		Hispanic Origin White and Other		Black/ African-American		American Indian- Native Alaskan		Asian- Pacific Islander		All Hispanic Any Race	
	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000
	21,928	41,659	85.6%	74.2%	13.2%	21.9%	0.2%	0.3%	0.5%	0.7%	0.5%	0.9%	13.3%	23.2%
Eagle	12,881	23,548	96.0%	86.8%	2.4%	9.0%	0.2%	0.7%	0.6%	0.5%	0.7%	0.9%	2.5%	9.8%
Summit	6,007	7,812	75.1%	61.6%	23.5%	34.0%	0.2%	0.2%	0.8%	1.3%	0.3%	0.4%	23.9%	36.1%
Lake	29,974	43,791	93.1%	81.0%	5.5%	15.5%	0.3%	0.4%	0.7%	0.7%	0.4%	0.5%	5.6%	16.7%
Garfield	12,661	14,872	94.4%	90.8%	3.7%	5.9%	0.3%	0.5%	0.4%	0.3%	1.1%	1.2%	3.8%	6.5%
Pitkin	5,972	5,986	95.0%	92.7%	3.8%	4.3%	0.2%	0.2%	0.7%	0.8%	0.4%	0.3%	4.0%	4.9%
Rio Blanco														
COLORADO	3,296,384	4,303,261	80.9%	74.6%	12.5%	15.4%	4.1%	3.9%	0.9%	1.1%	1.9%	2.4%	12.9%	17.1%

Source: Colorado State Demographers Office, August 2001

Table 159
Population by race and Hispanic origin by county and municipality in 2000, percent of total

County	Total Population	Single Race							Two or More Hispanic/Latino Races of Any Race
		Non-Hispanic White and Other	Hispanic White and Other	Black/ African-American	American Indian/ Native Alaskan	Asian/ Pacific Islander			
Lake	7,812	61.6%	34.0%	0.2%	1.3%	0.4%	2.6%	36.1%	
Eagle	41,659	74.2%	21.9%	0.3%	0.7%	0.9%	1.9%	23.2%	
Garfield	43,791	81.0%	15.5%	0.4%	0.7%	0.5%	1.8%	16.7%	
Summit	23,548	86.8%	9.0%	0.7%	0.5%	0.9%	2.1%	9.8%	
Pitkin	14,872	90.8%	5.9%	0.5%	0.3%	1.2%	1.3%	6.5%	
Rio Blanco	5,986	92.7%	4.3%	0.2%	0.8%	0.3%	1.7%	4.9%	
COLORADO	4,301,261	74.6%	15.4%	3.8%	1.0%	2.3%	2.8%	17.1%	

White River National Forest

Table 159 continued

Municipality	County	Total Population	Non-Hispanic.		Hispanic White and Other	Black/ African- American	American Indian/Native Alaskan	Asian/ Pacific Islander	Two or More Races	Hispanic/ Latino of Any Race
			White and Other	Other						
Red Cliff	Eagle	289	36.0%	59.9%	0.7%	0.7%	0.3%	2.4%	61.9%	
Minturn	Eagle	1,068	53.5%	41.7%	0.3%	2.8%	0.6%	1.2%	44.5%	
Avon	Eagle	5,561	57.3%	37.0%	0.8%	0.7%	1.0%	3.2%	40.0%	
Carbondale	Garfield	5,196	65.9%	30.2%	0.7%	0.5%	0.7%	2.0%	32.1%	
Gypsum	Eagle	3,654	66.6%	29.7%	0.2%	1.3%	0.3%	2.0%	31.3%	
Leadville	Lake	2,821	72.0%	23.9%	0.1%	1.3%	0.4%	2.3%	25.5%	
Silverthorne	Summit	3,196	72.1%	21.3%	1.0%	0.7%	1.0%	4.0%	23.5%	
Parachute	Garfield	1,006	74.8%	17.8%	0.8%	1.6%	1.1%	4.0%	19.8%	
Eagle	Eagle	3,032	80.4%	16.1%	0.4%	0.6%	0.5%	2.0%	17.2%	
Rifle	Garfield	6,784	81.6%	14.7%	0.4%	0.7%	0.3%	2.3%	16.3%	
Silt	Garfield	1,740	83.7%	13.3%	0.2%	1.3%	0.0%	1.5%	14.2%	
Glenwood Springs	Garfield	7,736	83.9%	12.3%	0.2%	0.7%	0.9%	1.9%	13.3%	
New Castle	Garfield	1,984	86.7%	11.1%	0.3%	0.6%	0.4%	0.9%	11.9%	
Basalt	Eagle	2,681	85.2%	11.1%	0.5%	0.5%	1.4%	1.3%	11.7%	
Dillon	Summit	802	87.5%	10.0%	0.9%	1.0%	0.1%	0.5%	10.3%	
Kremmling	Grand	1,578	89.4%	7.7%	0.1%	0.3%	0.4%	2.3%	8.6%	
Vail	Eagle	4,531	89.9%	5.7%	0.3%	0.5%	1.7%	1.9%	6.2%	
Aspen	Pitkin	5,914	90.9%	5.7%	0.4%	0.2%	1.5%	1.2%	6.1%	
Breckenridge	Summit	2,408	91.4%	5.2%	0.4%	0.3%	1.1%	1.5%	5.4%	
Fairplay	Park	610	91.6%	4.3%	1.3%	1.0%	0.3%	1.5%	4.9%	
Meeker	Rio Blanco	2,242	94.2%	4.1%	0.0%	0.7%	0.2%	0.8%	4.7%	
Frisco	Summit	2,443	94.3%	2.7%	0.1%	0.2%	0.9%	1.8%	3.5%	
Alma	Park	179	92.7%	3.4%	0.0%	2.2%	0.6%	1.1%	3.4%	
Snowmass Village	Pitkin	1,822	95.4%	2.6%	0.2%	0.1%	0.7%	1.0%	2.6%	
Montezuma	Summit	42	97.6%	2.4%	0.0%	0.0%	0.0%	0.0%	2.4%	
Blue River	Summit	685	96.8%	2.0%	0.0%	0.0%	0.1%	1.0%	2.0%	
COLORADO	All	4,301,261	74.6%	15.4%	3.8%	1.0%	2.3%	2.8%	17.1%	

Source: Colorado State Demographers Office, August 2001

Nine communities in the area have a greater proportion of Hispanics than the statewide average. Most of these towns are home for workers who commute to the tourism centers of Vail, Aspen, and Summit County.

Low-income populations are more difficult to determine in the planning area. Because of the high cost of living, somewhat higher wages in the area, and many seasonal workers, normal poverty statistics are not useful in identifying those with low incomes. The discussion later in this section regarding the high cost of living in the planning area suggests that many households have great difficulty in making ends meet. Because of these conditions, the proportion of relatively low-income households is likely higher than in other areas around the state.

HOUSING

Housing Housing may be the most important issue for this part of Colorado. With large population growth and increases in seasonal employment, housing is needed for residents and temporary workers alike. Recent data show that the number of housing units throughout the area has increased, but at very different rates.

Table 160 displays the growth in housing units between 1990 and 2000. Twenty-six area municipalities listed show increases ranging from 2 percent in Meeker to an increase of nearly 400 percent in Basalt. Six of the eight municipalities with the largest increases in housing units are located along Interstate 70, and five of those are located in Eagle or Summit Counties. Surprisingly, four communities had reductions in housing units since 1990. Vail and Snowmass Village showed reductions of about 800 and 600 housing units, respectively. The reasons behind this unusual trend in light of rising demand for housing is not known.

Although housing in most communities has increased, **Table 161** suggests that it did not keep up with population growth. This table compares the change in housing units with the increase in population for the same period.

Table 160
Housing units in area municipalities, 1990–2000

Municipality	County	April 1990	April 2000	% change 1990-2000
Colorado Average	--	--	--	22%
I-70 Corridor/Front Range Influence				
Avon	Eagle	1,344	2,557	90%
Gypsum	Eagle	642	1,210	88%
Eagle	Eagle	624	1,116	79%
Frisco	Summit	1,628	2,727	68%
Silverthorne	Summit	975	1,582	62%
Blue River	Summit	428	563	32%
Breckenridge	Summit	3,316	4,270	29%
Red Cliff	Eagle	98	122	24%
Dillon	Summit	1,087	1,280	18%
Fairplay	Park	289	337	17%
Kremmling	Grand	560	646	15%
Minturn	Eagle	434	448	3%
Leadville	Lake	1,519	1,514	0%
Alma	Park	150	147	-2%
Vail	Eagle	6,167	5,389	-13%
Montezuma	Summit	124	35	-72%
Roaring Fork & Colorado Valleys				
Basalt	Eagle	72	356	394%
New Castle	Garfield	277	731	164%
Carbondale	Garfield	1,119	1,821	63%
Silt	Garfield	481	668	39%
Rifle	Garfield	2,069	2,586	25%
Glenwood Springs	Garfield	2,882	3,353	16%
Aspen	Pitkin	4,004	4,354	9%
Parachute	Garfield	405	415	2%
Snowmass Village	Pitkin	2,314	1,734	-25%
White River Valley				
Meeker	Rio Blanco	1,031	1,054	2%

Source: Colorado State Demographers Office, June 2001

Table 161
Population and housing growth in area municipalities, 1990–2000

Municipality	County	% change in population	% change in housing	% population growth less housing growth
Colorado Average	--	31%	22%	8%
I-70 Corridor/Front Range Influence				
Avon	Eagle	209%	90%	119%
Breckenridge	Summit	87%	29%	59%
Montezuma	Summit	-30%	-72%	42%
Fairplay	Park	58%	17%	41%
Vail	Eagle	22%	-13%	35%
Dillon	Summit	45%	18%	27%
Blue River	Summit	56%	32%	24%
Alma	Park	21%	-2%	23%
Gypsum	Eagle	109%	88%	20%
Kremmling	Grand	35%	15%	20%
Silverthorne	Summit	81%	62%	19%
Eagle	Eagle	92%	79%	13%
Leadville	Lake	7%	0%	8%
Minturn	Eagle	0%	3%	-3%
Frisco	Summit	53%	68%	-15%
Red Cliff	Eagle	-3%	24%	-27%
Roaring Fork & Colorado Valleys				
Basalt	Eagle	479%	394%	84%
Snowmass Village	Pitkin	26%	-25%	51%
Parachute	Garfield	53%	2%	50%
New Castle	Garfield	192%	164%	28%
Silt	Garfield	59%	39%	20%
Rifle	Garfield	40%	25%	15%
Carbondale	Garfield	73%	63%	10%
Aspen	Pitkin	17%	9%	8%
Glenwood Springs	Garfield	18%	16%	2%
White River Valley				
Meeker	Rio Blanco	7%	2%	5%

Source: Colorado State Demographers Office, June 2001

Almost all municipalities found themselves in need of more housing. The need is especially acute in the eastern portion of the planning area. In nearly all municipalities that are strongly influenced by the Front Range, population growth surpassed housing growth—up to 119 percent in Avon. This puts tremendous pressure on communities such as Leadville and Kremmling that are within commuting distance of employment centers with higher housing costs. Two Park County communities near Breckenridge, where numerous employees of the Breckenridge area reside, also fell seriously short of housing. The data suggest that Fairplay and Alma are sharing the serious housing difficulties found in Leadville and Kremmling. Vail, with a reduction in housing units, still registered an increase in population and thus rated high using this indicator of communities with

housing problems. So despite an increase of over 4,500 housing units in the past decade, housing remains a critical issue for the eastern side of the planning area.

The Roaring Fork and Colorado valleys show the same trend as the eastern part of the area. Even Basalt and New Castle, with very high increases in housing units, did not see enough growth in housing to keep up with population growth. Again, bedroom communities to Aspen and Glenwood Springs, such as Silt and Rifle, did not see enough housing units added in the past decade. Snowmass Village, like Vail, experienced a reduction in housing while population was growing—a sure indication of severe housing issues.

These data give only a simple indication of housing problems in the planning area. What is not possible to see is that housing shortages may be very critical in certain price ranges—that is, ‘affordable’ housing for many service and retail workers in the area.

The planning area is known internationally for its four-season resorts; consequently, some of the most expensive real estate in the country might be anticipated for these counties. This is exactly what has been found in recent studies. In a cost of living study for Colorado counties, Garner and Eckert (1998) found that Eagle and Summit had the highest housing costs in the state. For the same size home, these counties were 80 percent and 64 percent higher, respectively, than the average throughout Colorado. Park County was seventh at 36 percent higher than average and Garfield County was ninth at 32 percent higher. (Pitkin and Lake counties were not surveyed). The study found that housing was the single most important factor in determining the overall cost of living. For this reason, these same counties ranked among the most expensive places to live in Colorado.

The Northwest Colorado Council of Governments (2001) has conducted cost of living studies for mountain counties, most recently in 2000. The study established profiles for four typical households, two that rent and two that own. **Table 162** shows a summary of each household. The study found that the cost of living in five mountain counties, all within the White River National Forest planning area, was much higher than a ‘standard city’ in the U.S. What was surprising was that the cost of all goods and services were not much different than those found in the standard city, with one exception—housing. **Table 163** shows relative housing costs for the four profiles. A two-bedroom rental unit shared by three roommates, each with an annual income of \$20,000, cost them 20 percent to 170 percent more than it would in the standard city. A three-bedroom home of 1,400–1,800 square feet occupied by a family of four with an annual income of \$58,000 cost them 87 to 920 percent more than it would in the standard city. With such a situation, employers such as school districts and retailers have a difficult time recruiting and keeping employees.

Table 162
Northwest Colorado Council of Governments 2001 Cost of Living Study—housing profiles

Profile # 1: Renter with two roommates	Profile # 2: Renter with one roommate
Income: \$20,000 Family: One person Ownership/Rental: Rental Type of Housing: Two-bedroom unit of approximately 1000 square feet. No amenities. Assumes 1.5 people per bedroom. Rent and utilities expenses are shared by three people.	Income: \$34,000 Family: One person Ownership/Rental: Rental Type of Housing: Two-bedroom unit of approximately 1200 square feet. Some amenities. Assumes 1 person per bedroom. Rent and utilities expenses are shared by two people.
Profile # 3: Homeowner—Family of four	Profile # 4: Homeowner—Family of four
Income: \$58,000 Family: Four persons Ownership/Rental: Ownership Type of Housing: Three-bedroom unit of approximately 1400 - 1800 square feet. Condominium or town home.	Income: \$72,000 Family: Four persons Ownership/Rental: Ownership Type of Housing: Three or four bedroom unit of approximately 1800 - 3000 square feet. Detached single family home.

Source: Venturoni, Powerpoint™ presentation, March 2001

Table 162
Northwest Colorado Council of Governments 2001 Cost of Living Study—relative housing cost

Location	Profile # 1	Profile # 2	Profile # 3	Profile # 4
County				
<i>Eagle County</i>	158.8%	158.5%	353.3%	177.4%
<i>Garfield County</i>	121.8%	121.4%	230.7%	128.7%
<i>Grand County</i>	130.2%	129.9%	186.8%	111.3%
<i>Pitkin County</i>	272.5%	272.4%	819.0%	512.0%
<i>Summit County</i>	159.4%	158.5%	270.8%	119.8%
Municipality				
<i>Basalt</i>	190.8%	190.9%	258.1%	172.1%
<i>Frisco</i>	168.7%	168.0%	214.7%	124.1%
<i>Silverthorne</i>	129.2%	128.5%	191.3%	96.2%
Standard City US	100.0%	100.0%	100.0%	100.0%

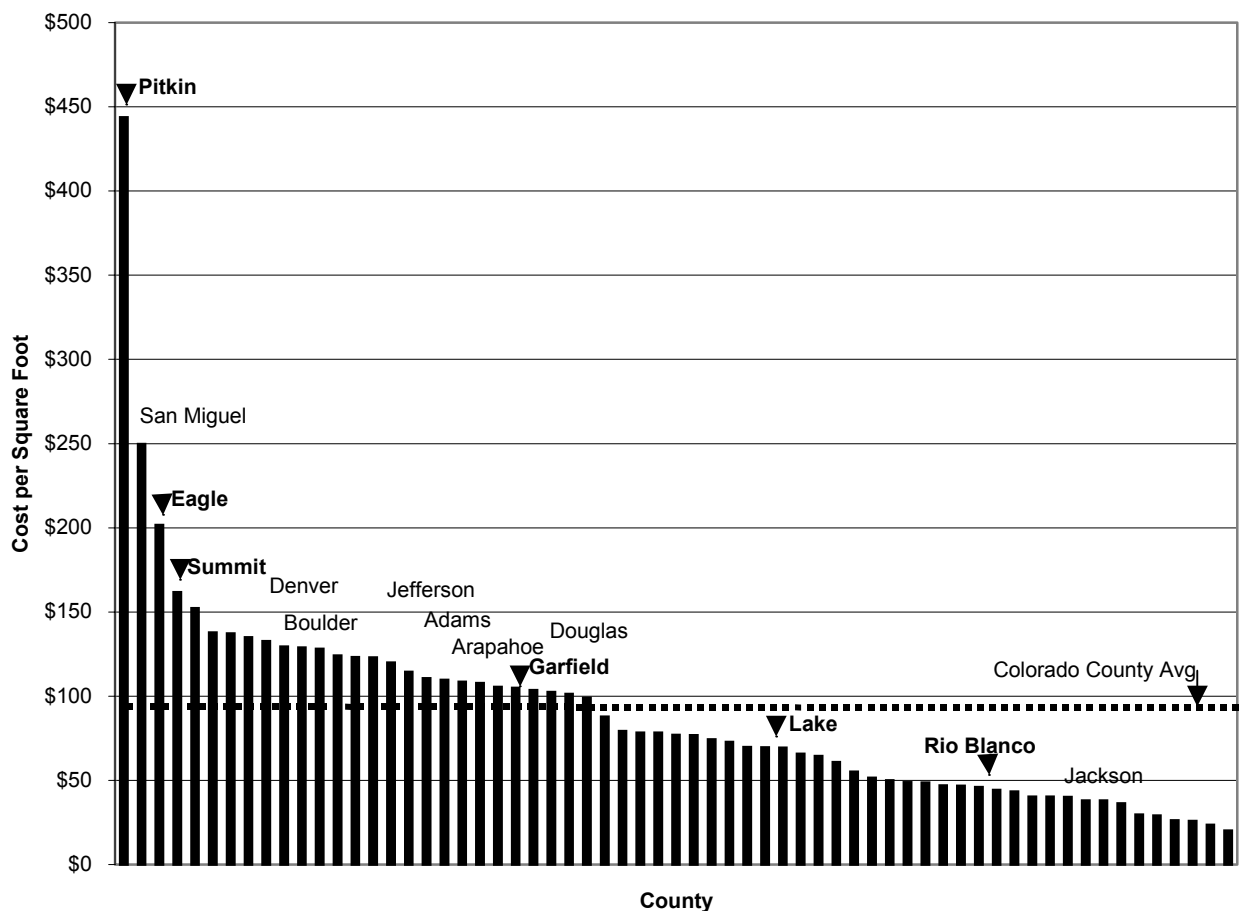
Source: Venturoni, Powerpoint™ presentation, March 2001

The Colorado Division of Housing provides annual data on the average cost per square foot of housing purchases. These data for 2000 are displayed in **Figure 60**. Pitkin, Eagle, and Summit counties were three of the four most expensive places in Colorado to purchase housing. At costs ranged from \$160 to \$440 per square foot, these prices exceeded any county average in the Denver metro area. Garfield County was on par with the Denver area and slightly above the Colorado state average, while Lake was somewhat

White River National Forest

below the state average. Rio Blanco remains the exception and lowest cost location near the White River National Forest, with housing costs at about half the state average.

Figure 68
Purchase cost of housing by county, 2000



Source: "Cost of Housing Analysis for Colorado Counties," Colorado Division of Housing, July 2001

Extraordinary housing costs have led to the development of affordable housing programs throughout the area. Studies by various local housing authorities and non-profit organizations continue to investigate the problems and explore potential solutions in both the short and long terms. The solution for most employees today is longer commutes, even over some of Colorado's highest mountain passes in the winter.

TRANSPORTATION

Transportation and commuting

Several facets of the planning area make transportation a vital concern, including: a world-class tourism destination, full-service communities in some of the most scenic parts of the U.S., and commuting by workers of all types from all directions. The planning area is accessible by car, plane, and train, but growth is changing the character of the transportation landscape.

Interstate 70 is the primary route for car and truck traffic into the planning area. Summit County is slightly more than an hour's drive from the Denver metropolitan area. Much of the Dillon District and Summit County are in full view upon emerging from the Eisenhower Tunnel at 11,000 feet of elevation. With the rapid growth of Denver in recent years, traffic on Interstate 70 has increased tremendously. It is not uncommon for eastbound traffic on Sunday afternoons—summer or winter—to produce bumper-to-bumper conditions from Silverthorne to Denver. During the summer of 2001, a new record was set in which 50,000 vehicles traveled through the tunnel in a day. In addition to weekend tourists, some employees regularly commute between Denver and Summit County or beyond. The Colorado Department of Transportation has initiated a large-scale study to examine the problem and alternative solutions. The following is an excerpt from the stated purpose and need for this study:

There is significant traffic congestion occurring along the I-70 Mountain Corridor in the mountainous portions of Colorado, primarily during the weekends. Corridor congestion is expected to increase over the next 20 years and beyond. This need to increase corridor capacity is acute for the travelers seeking access between the Denver metro area and US 40, along I-70 to SH 9, and in the Vail valley. During weekdays the Vail valley is experiencing commuter-like traffic patterns that are expected to become more congested over time. The need is predominantly due to the number of Front Range users and tourists desiring access to the mountains for purposes of recreation. Due to the growth projected to occur within the corridor, residents and second homeowners residing within the mountain corridor would also compound the congestion problem. Current congestion degrades accessibility for the mountain residents and businesses, as well as the mobility of interstate traffic. The motor carriers providing freight services necessary to serve residents, businesses and visitors to the mountains, and interstate commerce also add to the corridor traffic. (JF Sato, July 2001)

Highway traffic issues are not limited to Interstate 70. Commuters flock to state highways both morning and night as they travel between their residences and distant places of employment. Colorado Highway 82 from Aspen to Glenwood Springs often resembles rush hour in a more urban setting. Commuters from Leadville create a line of headlights on US 24 over Tennessee Pass (10,424 feet) towards Vail and on Colorado Highway 91 over Fremont Pass (11,318 feet) to Summit County on early winter mornings and evenings as they drive to and from service and retail jobs. A steady flow of workers from Kremmling keep watch for deer in the twilight hours as they negotiate Colorado Highway 9 to and from Silverthorne or Dillon. Employees who work in Breckenridge travel the

highest part of Highway 9 (11,541-foot Hoosier Pass) to return home where accommodations are more reasonably priced. Commuting has affected the infrastructure of the planning area and will continue to change it for years to come.

Commercial air traffic is another means for entering the planning area. Air traffic has increased greatly in recent years. JF Sato, contractor for preparing the Interstate 70 study, offers the following comments on the air component of travel in the area.

While annual traffic at the Aspen airport has hovered between 200,000 and 250,000 passengers from 1990 to 1997, traffic at the Eagle airport has seen nearly a 2,000% increase. More than 166,000 passengers came through the Eagle airport in 1997. Scheduled flights used to occur only in the winter but summer flights now have become frequent.

Train access adds another dimension to the transportation network of the planning area. The Amtrak station in Glenwood Springs has one stop from the east and another from the west each day. The scenic route from Denver to Glenwood Springs remains a popular tour that is often written about in travel magazines and newspapers across the country. Although train travel remains a small portion of overall transportation, passenger counts have increased greatly in recent years.

Environmental consequences

DIRECT AND INDIRECT EFFECTS

Population Population growth can be categorized as either economics-driven or amenity-driven. In the first case, people will move to an area because it offers jobs. In the second, people will move to an area simply because of the scenic beauty, recreation opportunities, excellent climate, or services available in a community. Both factors play important roles in the recent population booms of the White River area.

Potential effects of the 2001 Forest Plan alternatives on amenity-driven population changes are considered first. Many retirees from across the country are expected to make Summit, Eagle, and Garfield counties their new home in the decade to come. One important reason for their migration is recreation and scenic amenities provided by the White River National Forest. Many of these retirees currently have a second home in the area and plan to make it their primary residence upon retirement. Nothing in any of the management alternatives would significantly alter recreation and scenic opportunities of the White River to measurably encourage or discourage the anticipated migration of retirees.

Changes driven by economics could be less significant than amenity-driven changes. In the Economics discussion that follows in this section, changes in employment and income are estimated for each alternative. It is anticipated that at the experienced budget level between 1,200 and 1,800 jobs will be generated between 1999 and 2010. At the full budget level, the estimates range from 1,500 to 2,100. Most of these jobs will be located in the Eagle-Summit-Lake sub-area and will be generated because of summer recreation. This information suggests that population changes driven by national forest-associated jobs will be seasonal. Most current residents in the labor force are fully employed.

Individuals who might be drawn to the area for employment reasons would most likely come for the summer, and if they can find affordable housing in the area, they may choose to stay year-round.

**Environmental
justice**

The presence of minority groups in the study area is documented in the *Affected Environment* portion of this section. Data on low-income households were available, but because of the high cost of living in the area, they were ineffective in determining true low-income populations. Continuing interaction with communities having high proportions of minorities, especially those of Hispanic origin, and lower income households will occur during forest plan implementation. Summary documents of this EIS and the 2001 Forest Plan have also been printed in Spanish.

There is no evidence to believe that minority or low-income groups will be adversely or disproportionately affected by the alternatives that have been presented in this document. Results from a recent survey support this notion. The National Survey of Recreation and the Environment (Cordell et al. 1997) provided the Forest Service with a profile of the individuals participating in various recreational activities on the national forests in the Rocky Mountain Region (Montana, North Dakota, South Dakota, Nebraska, Kansas, Idaho, Utah, Nevada, Arizona, New Mexico, and Colorado). The survey revealed that the rates of participation in recreational activities available on National Forest System lands are very similar between minority groups and Caucasians. Therefore, impacts resulting from changes in recreation opportunities under any alternative would not be expected to have a disproportionate impact on any minority group.

The survey also revealed that the percentage of participants from low-income groups was similar or lower than participation rates among higher income groups for all activities surveyed. Impacts resulting from changes in recreation opportunities under any alternative would not be expected to have a disproportionate impact on any low income group.

Housing

For those who are drawn to the area for employment, affordable housing will be the single most difficult obstacle. There are already a high number of households that have a housing cost burden, that is, they must spend more than 30 percent of their income on rent or mortgage payments. Because skiing and other recreation provided by the national forest is expected to have a smaller share of total economic activity by 2010 for all alternatives (see **Table 172** in the Economics section), the impact of the forest on housing will not be significant. However, because housing may be the most critical social issue of the area, it is examined in more detail in the cumulative effects section below.

Transportation

The effect of alternatives upon transportation issues should be similar to those for housing issues. Tourists, residents, and commuters are the three important components of congestion on Interstate 70 and local highways. Tourists seeking recreation opportunities on the forest, and households whose livelihood is associated with those opportunities, make up the direct and indirect effects on transportation systems. There will be increases in traffic as both groups increase in number over the next decade. Much of this increase will be seen in the no-action alternative.

CUMULATIVE EFFECTS

The cumulative effects for demographic and economic considerations are very inter-related, and therefore best discussed together. Please see the cumulative effects subsection within *Economics*.

Economics

Affected environment

INTRODUCTION

Economic growth is regarded as a primary engine for population growth. People generally move to places where jobs are available, or conversely, to where services are available. The first group moves to make a living, the second to spend it. The first group is easily identified by employment data, the second by income data. The six-county area has both of these very identifiable groups.

EMPLOYMENT

Employment data presented here were prepared by the State of Colorado in conjunction with county governments and the Forest Service. They include economic conditions in 1999 as well as projections to 2020.

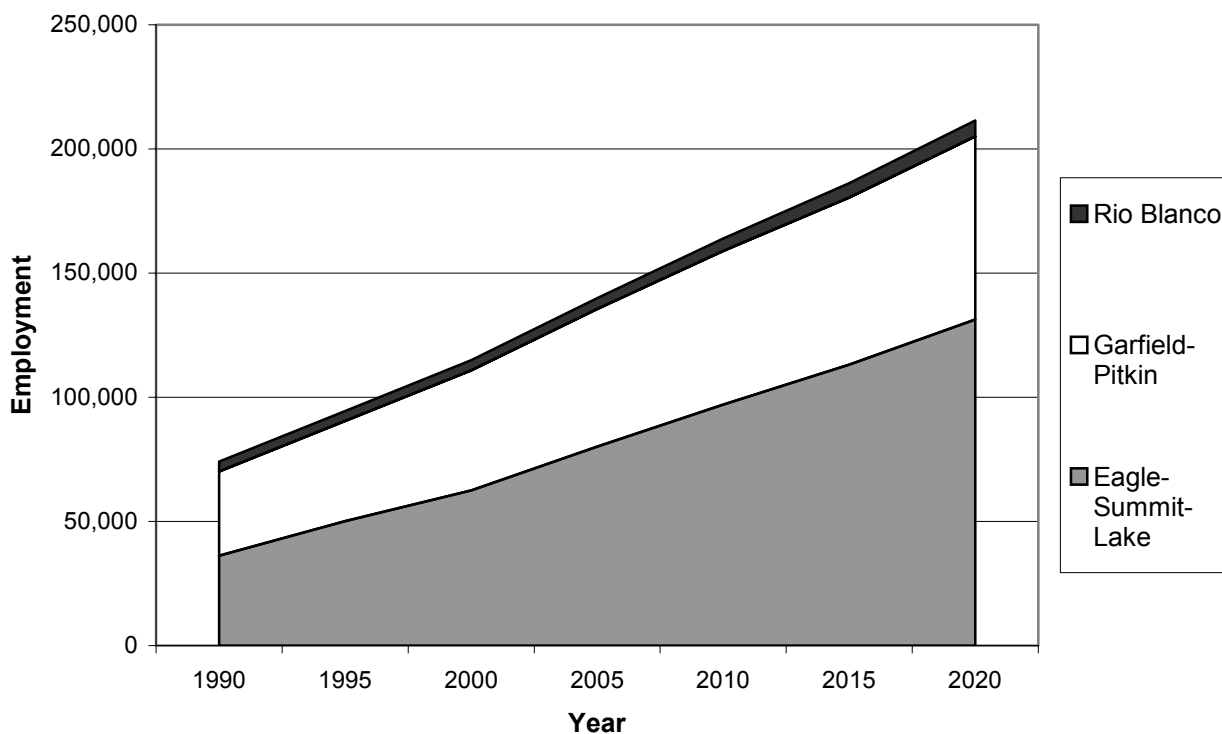
The economy around the White River National Forest is dominated by tourism. Almost 60 percent of all workers are employed in the trade and service industries (**Table 164**). Also apparent is that real estate development, both commercial and residential, is contributing to this booming economy. More than 20 percent of all workers are employed in the construction, finance, insurance, and real estate industries. That leaves about 10 percent of all jobs in government (primarily state and local) and less than 10 percent in all other industries combined. This pattern is displayed by most of the counties in the area. The exception is Rio Blanco County, in which government, agriculture, mining, and manufacturing constitute more than 50 percent of all employment. The makeup of Rio Blanco County is characteristic of traditional rural western counties, a way of life once shared by other mountain communities in the planning area decades earlier when local economies depended on natural resource commodity production.

Table 164
Employment by major industry and county, 1999

Industry	Eagle	Summit	Lake	Garfield	Pitkin	Rio Blanco	Total
Agriculture	808	428	1	955	395	350	2,937
Mining and manufacturing	446	307	150	796	362	492	2,553
Construction	6,437	2,698	292	4,751	2,027	301	16,506
Transportation/utilities	1,105	552	53	743	543	150	3,146
Wholesale and retail trade	7,981	6,398	620	6,320	4,864	560	26,743
Finance, insur. & real estate	2,784	1,631	128	1,678	1,782	148	8,151
Services	12,511	9,547	763	7,146	7,727	561	38,255
Government	3,172	2,142	749	3,898	2,176	1,130	13,267
Total	35,244	23,703	2,756	26,287	19,876	3,692	111,558

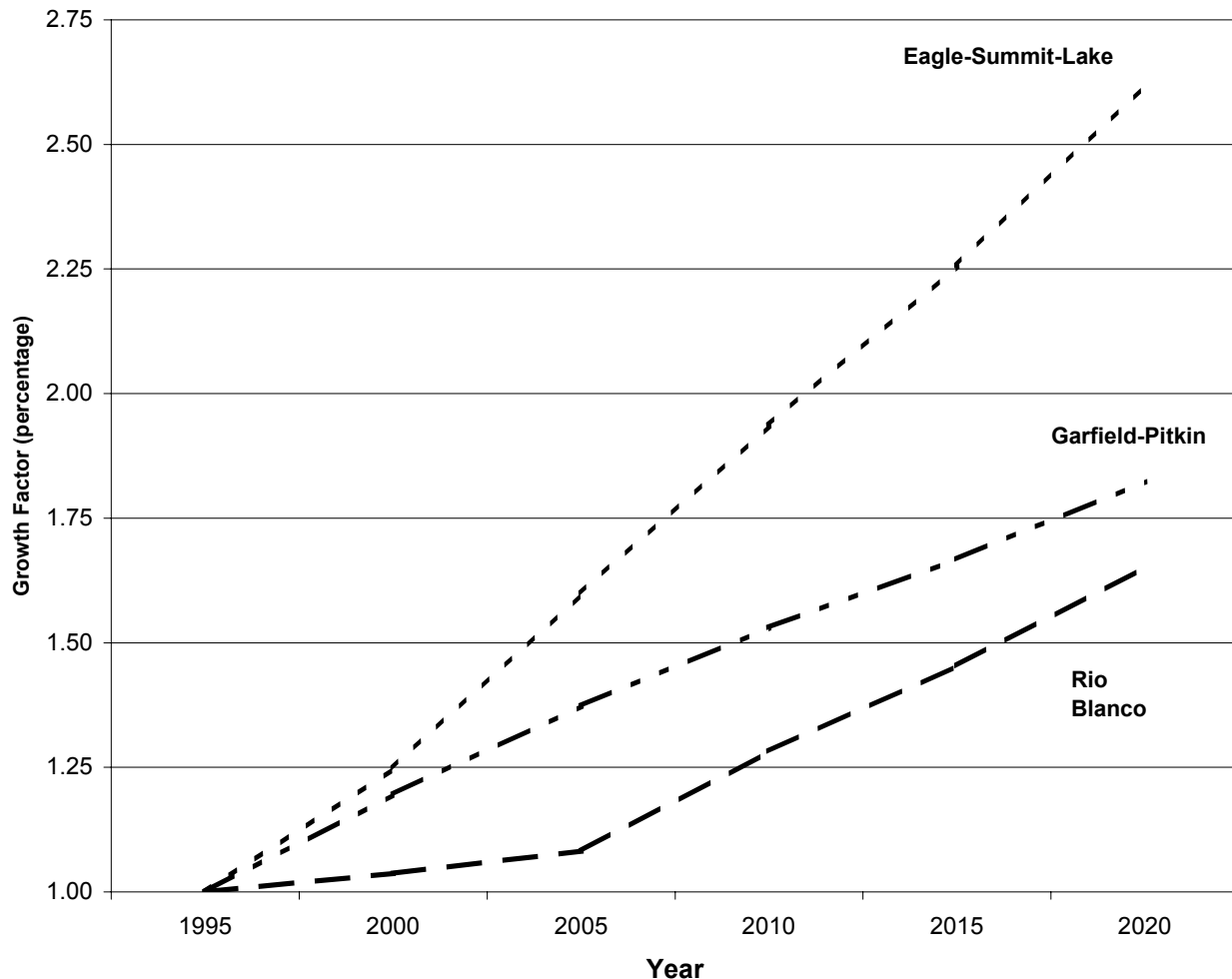
Source: Colorado State Demographers Office, June 2001

Figure 61
Employment in the six-county area, 1990–2020



Source: Colorado State Demographers Office, June 2001

Figure 62
Employment growth factors in the six-county area, 1995–2020



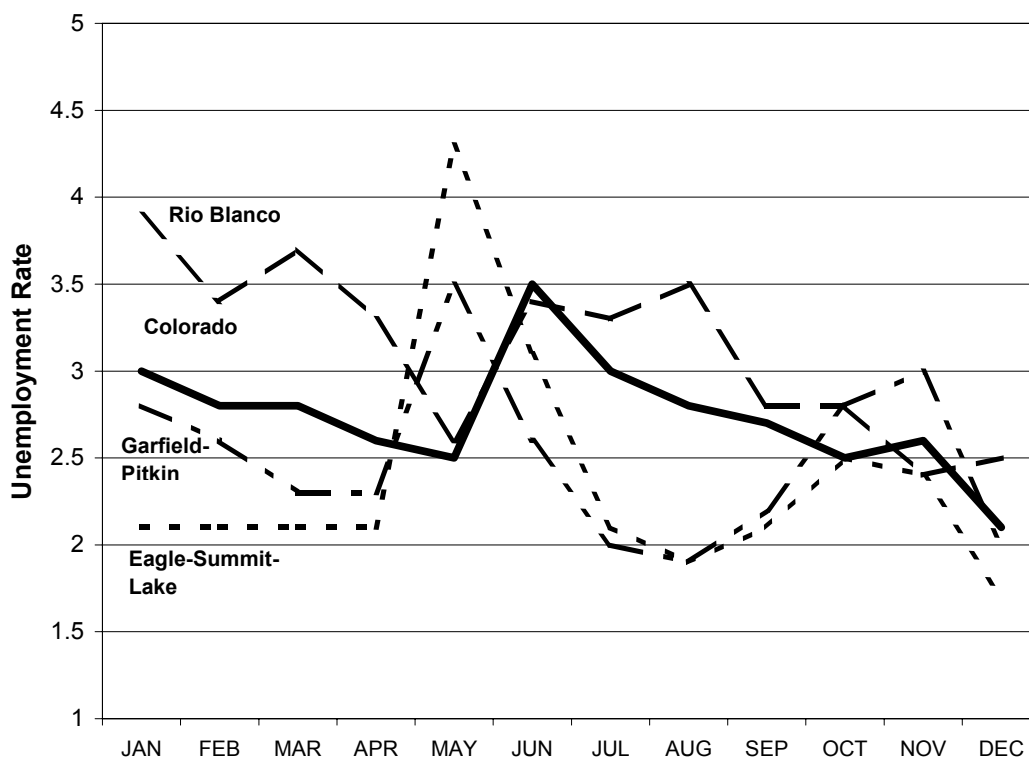
Source: Colorado State Demographers Office, June 2001

Employment has been exploding in the planning area. **Figures 61** and **62** show recent job growth and projections to 2020. In both numbers and percentages, the Eagle-Summit-Lake sub-area dominates. In 1990, this area was 49 percent of the area total—only a few percentage points larger than the Garfield-Pitkin sub-area; in 2000 it was 54 percent. By 2020, employment in the eastern part of the planning area will grow to become 2.5 times larger and constitute 62 percent of all workers in the planning area. Garfield-Pitkin should continue to experience steady growth, adding more than 25,000 jobs between now and 2020. Despite this growth, Garfield and Pitkin counties will shrink to 35 percent of total planning area employment. Rio Blanco County also is projected to add 2,500 jobs in the next 20 years, but its share of the area total will fall to 3 percent.

Because a vibrant and growing tourism industry dominates the planning area economy, unemployment is atypical of most regions. Full employment is often associated with an

unemployment rate of about 4 percent. As **Figure 63** shows, unemployment in the planning area and Colorado as a whole was extremely low in 2000. Seasonal patterns of employment are evident, with unemployment near 2 percent during the winter and summer recreation seasons. At this rate, many jobs go unfilled. The lack of affordable housing within reasonable commuting distances has limited the work force and put upward pressure on wages. It has also drawn in foreign workers who are willing to suffer the long commute hours for service and retail sector wages.

Figure 63
Unemployment rate, by month, in the planning area and state, 2000



Source: Colorado Labor Market Information, July 2001

INCOME

Per capita personal income in the planning area is, on average, similar to that in Colorado as a whole. The differences by county, however, can vary remarkably (**Table 165**). Pitkin County residents have a per capita income that is nearly three times that of Lake County residents and twice that of those living in Garfield and Rio Blanco Counties.

Sources of personal income also provide insight into the economy around the White River National Forest. Earnings (income received by business owners and employees) account for a very high proportion of income in Summit, Eagle, and Pitkin Counties. The residence adjustment, however, indicates that many individuals who work in these

counties take their profits and wages with them when they drive home at night. Seventeen percent of the earnings in Pitkin County leave at the end of the day, and much of that goes to residents of Garfield and Rio Blanco Counties. Three to 4 percent of earnings in Eagle and Summit also leave those counties; much of it going to Lake County residents, who bring almost as much back to their county as all income earned within it.

Dividends, interest, and rent also vary tremendously in the area. About 19 percent of Colorado personal income comes from dividends, interest, and rent, but Pitkin County residents average nearly double that ratio. Lake and Rio Blanco county residents receive a much smaller share of their income from these sources. Transfer payments (income received from government sources, such as welfare and social security) are the final source of personal income. Transfer payments in the area range from 11 percent to a very low 2 percent. In some tourism-oriented areas in Colorado and the nation, retirees are an important component of the local economy and their transfer payments can constitute a sizable portion of personal income. This is not currently the case in the area around the White River National Forest.

Table 165
Personal income by source and county, 1999 (in dollars and percent)

Income & source	I-70 Corridor/Front Range Influence			Roaring Fork & Colorado Valleys		White River Valley	6-County Area
	Eagle	Summit	Lake	Garfield	Pitkin	Rio Blanco	Total
<i>Total (millions of \$)</i>	1,454,083	796,855	161,834	1,070,823	869,280	153,820	4,506,695
<i>Per capita income (\$)</i>	36,435	35,309	20,690	25,083	58,604	25,254	33,654
Percent of total income							
<i>Net earnings</i>	81%	81%	41%	67%	78%	79%	76%
<i>Residence adjustment</i>	-3%	-4%	34%	5%	-17%	-8%	-3%
<i>Dividends, interest, rent</i>	20%	20%	15%	20%	36%	17%	23%
<i>Transfer payments</i>	3%	3%	10%	9%	2%	11%	5%
Total*	100%	100%	100%	100%	100%	100%	100%

Note: *May not add due to rounding

Source: Colorado State Demographers Office, June 2001

ECONOMIC DEPENDENCY

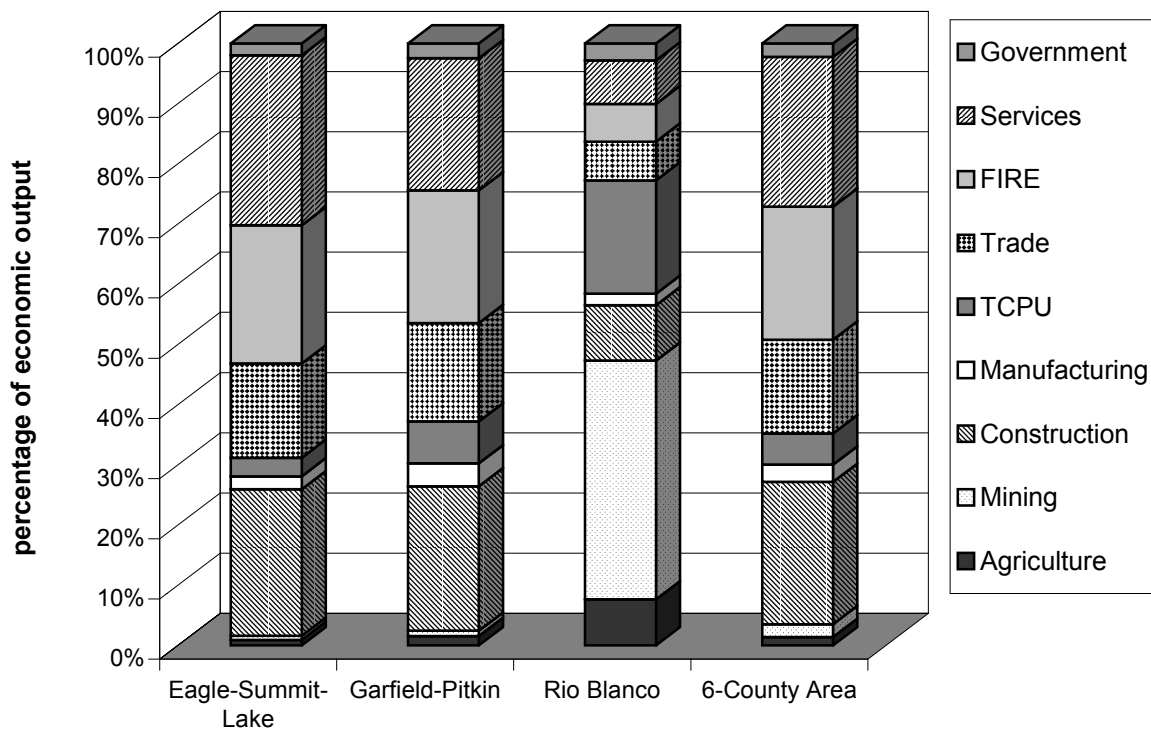
Every economy has one or more 'engines' that ultimately provide residents with jobs and income. In a real sense, area jobs and income depend on the size and vitality of these engines.

The economic dependency of the planning area can be discerned by breaking down employment into three components: basic industries, indirect basic industries, and local resident service (sometimes called induced) industries. *Basic industries* are those that bring money in from outside the area. This is done by exporting goods and services, or selling them to non-residents. Tourism, including second homes, is the major export industry of the planning area. Other, significantly smaller, export industries are mining,

livestock, and small manufacturing. *Indirect basic industries* are those that support the basic industries. These commonly include local suppliers of goods and services to basic industries. Wholesale trade and trucking would be examples of indirect basic industries. The third component is *local resident services*. These industries provide local residents such services as grocery stores and medical care.

By incorporating the concept of economic multipliers to basic industries, **Figure 64** displays the total effect that major industries have on the economy of the entire planning area. Sales of goods and services in the trade and services industries to non-residents provide 41 percent of all economic activity. Finance, insurance, real estate, and construction account for another 46 percent. Activity related to the sale of second homes and business development is larger than traditional tourism itself. All other industries provide only 13 percent of the economic activity.

Figure 64
Source of area economic output by major industry, 1999



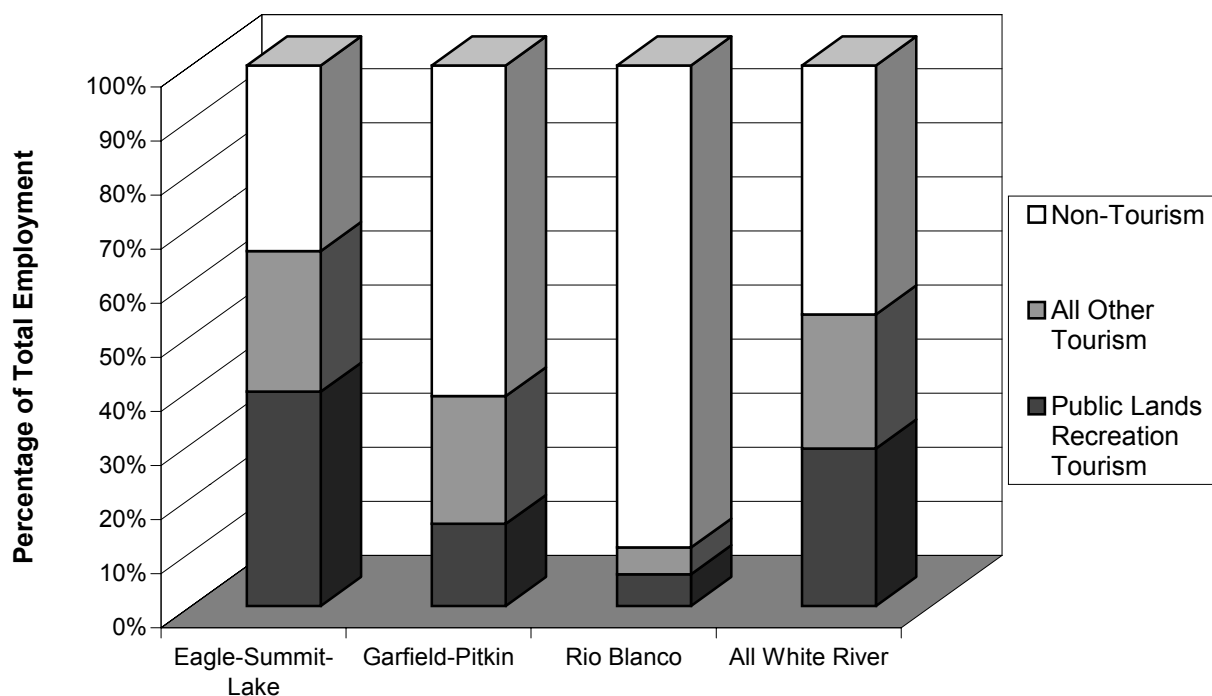
Source: Colorado State Demographers Office and USDA Forest Service

White River National Forest

The pattern described for the entire planning area applies to both the Eagle-Summit-Lake and Garfield-Pitkin sub-areas. Rio Blanco County is very different, with coal mines and oil and gas wells accounting for 40 percent of the economic activity, and transportation and utilities accounting for another 19 percent. Agriculture, construction, finance-insurance-real estate, trade, and services each account for six to nine percent of economic activity in the county. Thus, Rio Blanco County still retains a profile that is typical of commodity-based economies.

Tourism In the past several years, the Colorado State Department of Local Affairs/Demography Section, the Forest Service, the Bureau of Land Management, and the Colorado Tourism Office have partnered to improve understanding of employment in the tourism industry in Colorado. Tourism customarily includes the spending of all visitors to the area and includes a variety of individual industries. Tourism in this study includes both traditional tourists as well as owners of second homes. The partnership has defined tourism as the basic portion of the following eight industries: recreation services, hotels and lodging places, eating and drinking establishments, retail, transportation services, real estate, education services, and automotive service stations. For presentation in this EIS, total tourism employment includes basic, indirect, and resident service components. **Figure 65** shows all jobs associated with tourism on public lands, tourism on private lands, and non-tourism economic activities.

Figure 65
Tourism-generated and total employment, 1999



Source: Colorado Tourism Project and USDA Forest Service

From the perspective of tourism alone, the economy of each sub-area is markedly different. Tourism that is based on public lands recreation is most prominent in Eagle-Summit-Lake counties, accounting for 40 percent of all employment. Surprisingly, Garfield-Pitkin counties do not rely on public lands tourism nearly as much as do the counties located on the eastern side of the national forest. Only 15 percent of the employment in the Roaring Fork and Colorado valleys can be attributed to this kind of tourism. Although Rio Blanco County is the least reliant on public lands tourism, this does not imply that such tourism is unimportant to employment in the county.

The importance of tourism associated with activities on private lands was found to be quite large. In both the Eagle-Summit-Lake and Garfield-Pitkin sub-areas, a significant 24 percent to 26 percent of employment can be attributed to private land tourism. In Rio Blanco County, the portion of employment associated with private lands was found to be almost as large as that on public lands. While much economic activity is apparently driven by those who never step foot upon National Forest System lands, BLM-administered lands, or other public lands, this activity is occurring in a setting dominated by public lands. While it takes more than a wonderful setting provided by public lands to generate tourism activity, such a setting is nonetheless an indispensable part of most private land-based tourism in this part of Colorado.

Skiing has long been associated with the White River National Forest and its surrounding communities. The tourism project provided important insight into the economic importance of various tourist activities. **Figures 66 through 69** display the relative importance of eight different tourist activities within the planning area as a whole and within the three sub-areas. As expected, skiing is the largest tourism driver of employment in all areas except Rio Blanco County. In Eagle-Summit-Lake counties, skiing towered over the next more important activities. While skiing was important to Garfield-Pitkin counties, it did not dominate there.

Figure 66
Tourism-generated employment by category, six-county area, 1999

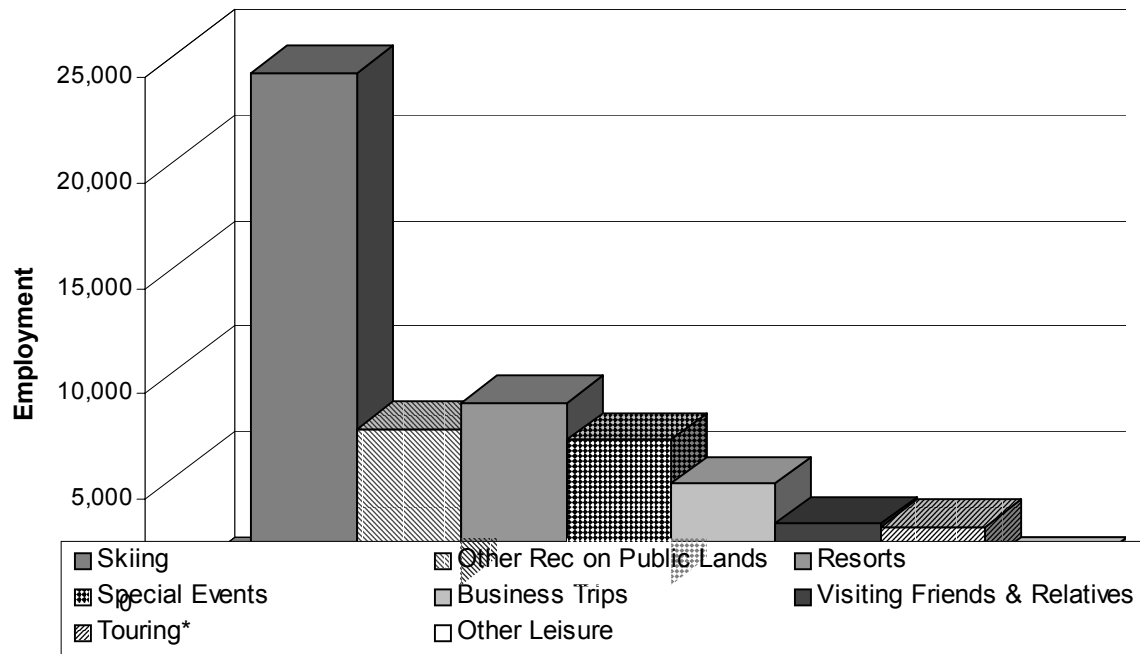


Figure 67
Tourism-generated employment by category, Eagle-Summit-Lake counties, 1999

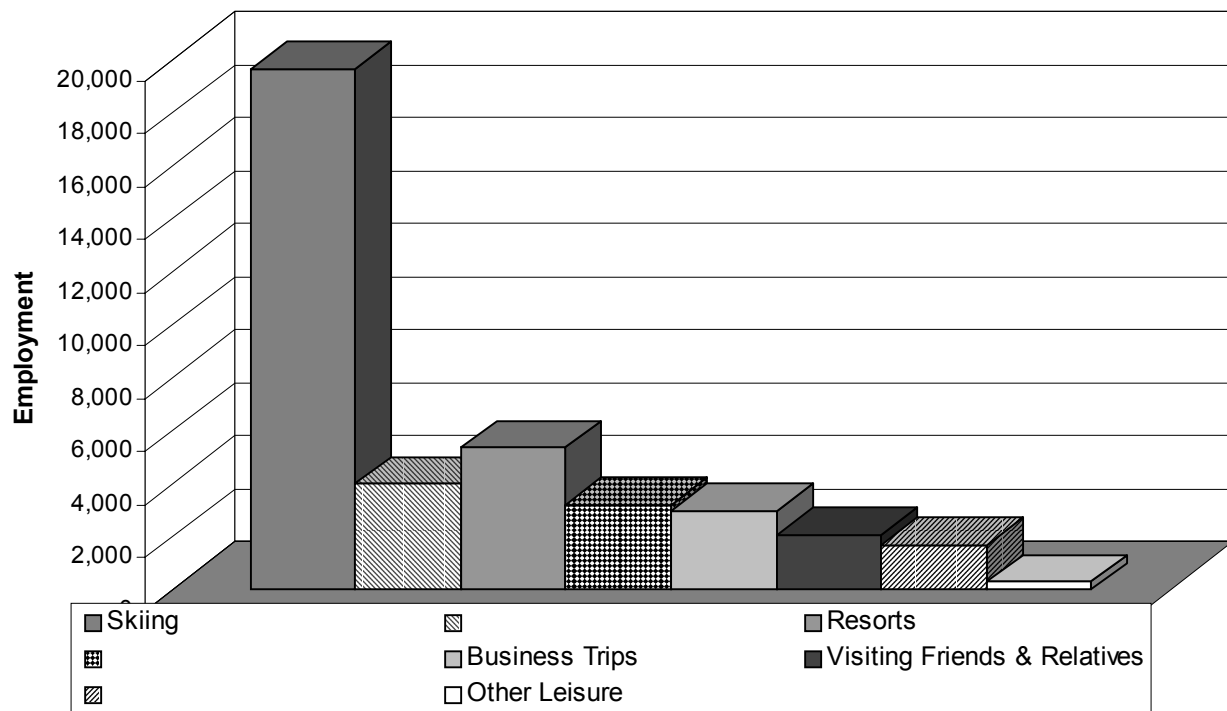


Figure 68
Tourism-generated employment by category, Garfield-Pitkin counties, 1999

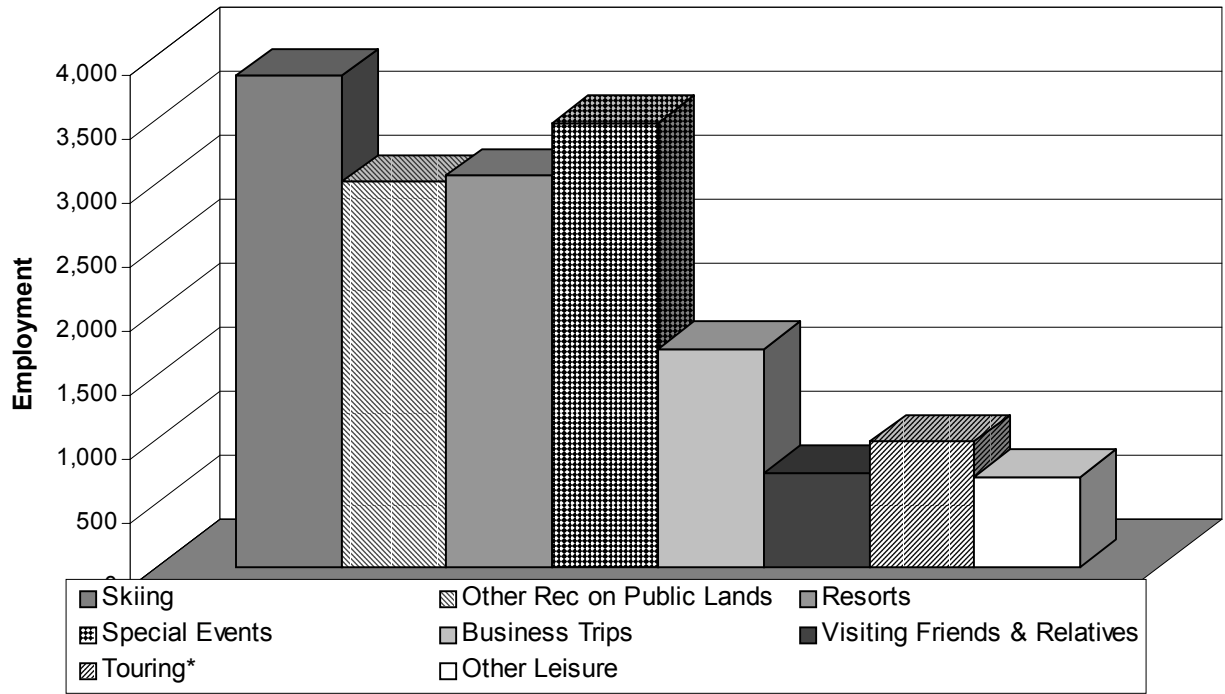
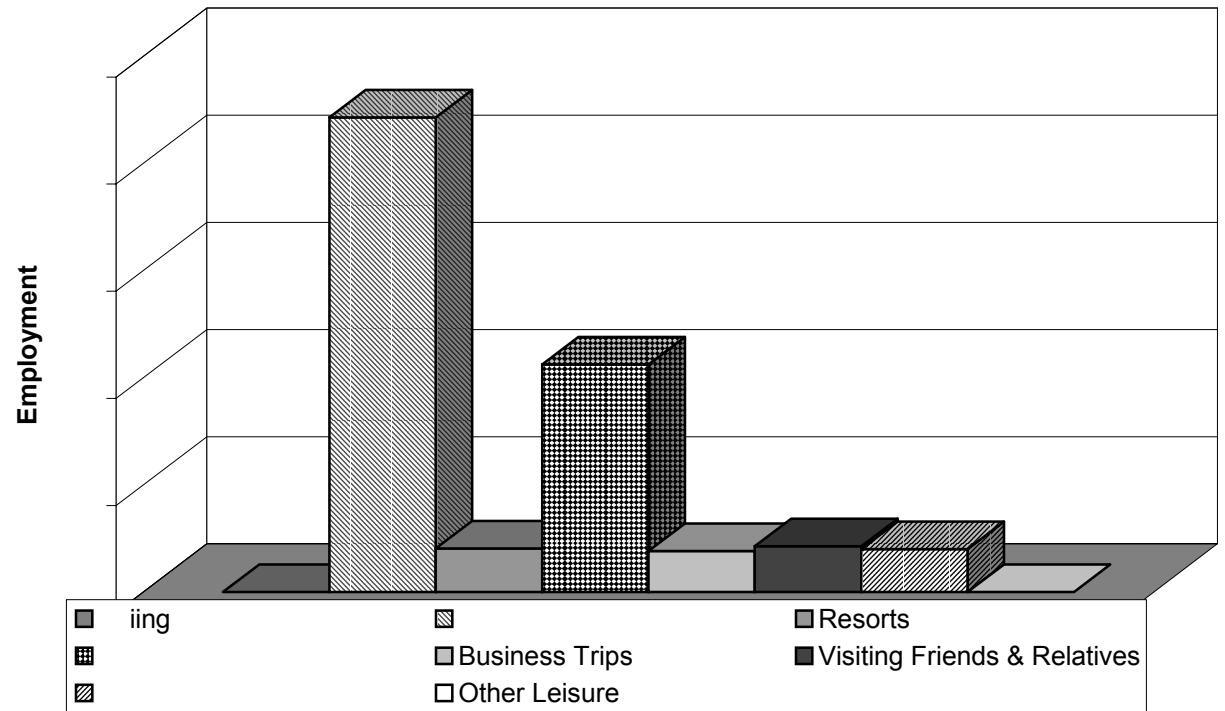


Figure 69
Tourism-generated employment by category, Rio Blanco County, 1999



The next most important employment-generating activities were generally split among three tourist activities: private-land or resort activities, summer and fall recreation on public lands, and special events. This closeness is probably the product of successful marketing by four-season resorts and communities that need summer tourism to complement the winter season. Special events, such as the Aspen Music Festival, are now immensely popular. Activities on private lands or resorts, such as golf, tennis, and swimming, are proving to be as popular as hiking, biking, and camping on the White River National Forest. In Rio Blanco County, summer and fall activities on the national forest still dominate the tourism landscape. Special events, such as the international sheep dog competition each September, have become an important element in the tourism of this sub-area.

Tourism is inherently seasonal, and so is tourism employment. By associating activities with seasons, the general flow of tourism employment throughout the year is displayed in **Figure 70**. As expected, skiing accounts for most tourism employment in the winter. What may not be expected is that about 25 percent of tourism-related employees in the winter are not associated with skiing. Even more surprising may be the role of public land recreation during the summer. The natural beauty of the White River National Forest draws thousands to this part of Colorado each summer, but those who recreate on the national forest do not spend large amounts of money locally. Rather, it appears they spend it for many other kinds of activities while enjoying the mountain backdrop in more developed surroundings. Employment generated by spending related to recreation on the public lands is only 29 percent of all summer tourism employment.

This finding is crucial for understanding the current role of national forest management in the economy of the planning area. In decades past, tourism employment was synonymous with recreation on the national forest, for skiing, hiking, or fishing. This is not as true today and is not expected to be true in the future. Aging baby boomers combined with well-developed resorts and communities have transformed the Interstate 70 corridor into a destination where recreation on the national forest is increasingly a complementary activity rather than a primary one. Retaining the option of recreating on the forest is highly valuable, but the actual engagement is less important economically than it has been in decades past. The tourist economy may now be characterized in this way: enjoyment of a mountain backdrop provided by the White River National Forest in a variety of privately-developed settings and special events with the option of occasional hiking, biking, or fishing on public lands. The White River National Forest will be known internationally for skiing in the years ahead, but summer activities on private and community lands are more than equal partners in this tourism-based economy.

Contribution of the White River National Forest

The White River National Forest provides jobs and income to the planning area through a variety of resource programs. **Table 166** shows that spending associated with downhill skiing on National Forest System lands dominates, providing over 90 percent of all national forest-related jobs and labor income (labor income includes compensation to both employees and proprietors). Hunting and fishing-related jobs in the area are very small relative to other types of recreation. The smallest job provider is timber harvesting. This is primarily because there is no large processing facility located in the planning area. In total, jobs associated with management activities on the White River National Forest currently provide a quarter of the planning area jobs and labor income, contributing more to the local economy than any other national forest in the Rocky Mountain Region.

Table 166
White River National Forest contributions to the area economy by program, 1999

Major industry	Employment (jobs)	Labor income (\$ million)
<i>Recreation use</i>	26,474	646.4
<i>Skiing</i>	21,827	525.4
<i>Other recreation</i>	4,647	121.0
<i>Fish and wildlife use</i>	1,845	59.5
<i>Grazing</i>	221	3.4
<i>Timber harvest</i>	33	0.7
<i>Forest service expenditures</i>	333	12.3
<i>Total forest management</i>	28,906	722.3
<i>Forest total as a percent of total area</i>	25%	23%

Source: Colorado State Demographers Office and USDA Forest Service

Table 167
White River National Forest contributions to the area economy by major industry, 1999

Major industry	Employment (jobs)	Labor income (\$ million)
<i>Agriculture</i>	451	11.2
<i>Mining</i>	343	19.6
<i>Construction</i>	6447	16.8
<i>Manufacturing</i>	1,304	30.7
<i>Transportation</i>	788	32.6
<i>Wholesale trade</i>	656	28.3
<i>Retail trade</i>	8,834	183.2
<i>Finance, insurance and real estate</i>	912	27.9
<i>Services</i>	14,619	350.8

White River National Forest

Government	456	20.1
Other	96	1.1
Total forest management	28,906	722.3
Forest total as a percent of total area	25%	23%

Source: Colorado State Demographers Office and USDA Forest Service

Table 167 portrays the same information by major industry. Comparing this table with Table 3-149 provides some insight into the economic role of national forest-related activities in the planning area. Because of the strong recreation component to uses of the White River National Forest, trades and services are the most affected sectors in the local economy. About 37 percent of all trade and service employment in the area is attributable to activities on the forest. The connection with mining and manufacturing is surprisingly strong. Over half of all mining and manufacturing employment is related to activities on the forest. About 25 percent of all transportation/communication/utilities jobs, 15 percent of all agriculture jobs, 4 percent of all government (federal, state, and local) jobs, and 8 percent of all finance, insurance, and real estate jobs in the area are in some way related to the use and management of White River National Forest (finance, insurance, and real estate industry effects do not include second-home sales). Many of these connections are not caused directly by users of the national forest, but result from the ‘multiplier effect’ through indirect business activities or through spending by local residents who are employed in these businesses.

Urbanization Community growth in the planning area is evidenced through population growth, increased personal income, more jobs, a greater diversity of businesses, and real estate developments. This rapid growth is occurring on private lands in mountain valleys, which are often surrounded and limited by public lands or contain terrain that cannot be built upon. One result of this growth is the loss of a small-town atmosphere. In its place are characteristics of the city and the suburb, brought temporarily by the tourist and second-home owner or permanently by new residents and workers, leading to urbanization.

There is much discussion and speculation regarding the link between four-season resorts and community growth. Some towns such as Vail were established around ski areas. Some, such as Aspen and Breckenridge, existed well before skiing developed. As these towns grew, and as recreation grew in terms of both number of visitors and types of recreation opportunities, more services were needed. Consequently, other towns grew to house and supply workers and provide support services within commuting distance. This affected towns such as Basalt/El Jebel, Carbondale, Eagle, Frisco, Gypsum, Glenwood Springs, New Castle, Rifle, and Silt. Some of these towns now are large enough to provide an economic base and amenities needed to support economic ventures other than resort-based recreation. While ski resorts have been the historical engines of growth, they have given way to a ‘critical mass’ of tourism diversity that now includes performing arts, business conferences, and outlet retail centers. Skier visits throughout the area have been growing much slower than growth indicators. What started decades ago as a traditional seasonal ski economy has now developed into a very diverse year-round tourism-based economy.

Other factors that have contributed to area growth include breathtaking scenery, a dry climate, the promise of small-town atmospheres with big-city amenities, and international visitors. Telecommunication technology and improved transportation access have also played a role. These factors, coupled with national demographic trends and a very robust national economy over the last decade, have drawn many permanent residents and second-home owners to the White River National Forest area.

Environmental consequences

DIRECT AND INDIRECT EFFECTS

Jobs and income Direct and indirect effects on planning area jobs and income are generated by changes in recreational uses of the national forest; agency expenditures (salaries, equipment, contracts); and the use of timber and forage resources. An increase in recreation or timber production may mean an increase in jobs and income to local counties. In addition, if production is decreased in one resource and increased in another, there is a shifting of jobs from one industry to another. To estimate changes in income and employment for each alternative, the forest used a computer model calibrated to economic variables provided by the State of Colorado. County governments in the planning area were involved in the development of the data, and agreed with the State of Colorado on the economic data. See Appendix B for a more detailed discussion of this analysis.

Table 168 displays estimated employment in the year 2010 throughout the planning area that is attributable to the White River National Forest. A base year of 1999 was used as a starting point; thus, the table reflects how jobs might change from 1999 levels. Estimates are provided for both the experienced and full budget levels and listed by resource. The jobs displayed are annual average jobs. The highs and lows of seasonality are averaged out in this table but will be discussed later.

In all cases, the proportion of jobs associated with each program remains nearly constant. Skiing and recreation or wildlife-related jobs dominate contributions from the national forest, which is expected to continue the strong trade and service orientation of national forest-generated jobs (see **Table 169**). Wholesale and retail trade and services industries will continue to account for nearly 85 percent of all jobs associated with the national forest. The increase attributable to skiing—up to 550 jobs—is primarily due to an increase in day skiers from the Front Range. Consequently, most of these job increases will be experienced in the Eagle-Summit-Lake sub-area. Downhill skiing will continue as the largest employment generator from the White River National Forest, but up to two thirds of total job growth attributable to the forest will come from wildlife-based (viewing wildlife, fishing, hunting) and other forms of non-skiing recreation. Most of this job growth can be expected in the summer season and should be well distributed throughout the planning area.

Jobs generated from the expenditure of funds to manage the White River National Forest alone will, in most cases, continue to exceed those generated from grazing and timber harvest combined. These impacts are primarily the result of Forest Service employees and their personal spending in the area.

Table 168
Change to employment by program by alternative in 2010

Resource	Total number of jobs contributed by alternative									
	Base year (1999)	No Action B	C	D	E	F	I	K		
Experienced budget level										
<i>Skiing</i>	21,827	22,374	22,374	22,019	22,374	22,374	22,019	22,374		
<i>Other</i>										
<i>recreation</i>	4,647	5,499	5,499	5,491	5,499	5,370	5,344	5,403		
<i>Fish and wildlife use</i>	1,845	2,182	2,182	2,182	2,182	2,006	2,182	2,182		
<i>Grazing</i>	221	221	221	221	221	243	221	221		
<i>Timber</i>										
<i>harvest</i>	33	78	28	57	28	121	33	66		
<i>Forest Service expenditures</i>	333	333	333	333	333	333	333	333		
Total forest management	28,906	30,687	30,637	30,303	30,637	30,447	30,132	30,579		
Percent change from 1999	---	6.1%	6.0%	4.8%	6.0%	5.3%	4.2%	5.8%		
Full budget level										
Total forest management	28,906	30,957	30,878	30,566	30,877	30,754	30,363	30,852		
Increase from experienced budget level	---	270	241	263	240	307	231	273		

Table 169
Change to employment by major industry by alternative in 2010

Total number of jobs contributed by alternative										
Resource	Base year (1999)	No Action B	C	D	E	F	I	K		
Experienced budget level										
Agriculture	451	476	475	473	475	489	472	474		
Mining & Manufacturing	1,647	1,822	1,785	1,797	1,785	1,810	1,767	1,805		
Construction	447	478	478	474	478	472	470	476		
Transportation/utilities	778	833	833	829	833	822	824	830		
Wholesale and retail trade	9,490	10,168	10,164	10,057	10,164	10,040	9,991	10,123		
Finance, insurance, & real estate	912	949	948	942	948	944	939	947		
Services	14,619	15,393	15,387	15,166	15,387	15,305	15,106	15,355		
Government	552	568	567	565	567	565	563	567		
Total forest management	28,906	30,687	30,637	30,303	30,637	30,447	30,132	30,579		
Percent change from 1999	---	6.1%	6.0%	4.8%	6.0%	5.3%	4.2%	5.8%		
Full budget level										
Total forest management	28,906	30,957	30,878	30,566	30,877	30,754	30,363	30,852		
Increase from experienced budget level	---	270	241	263	240	307	231	273		

Tables 169 shows the distribution of forest management-related impacts on the major industries in the area. What stands out is that nearly 90 percent of all jobs and 80 percent of all labor income that are expected in the trade and service sectors. Government (mostly local); transportation; construction; and finance, insurance, and real estate (FIRE) account for another 8 percent of all jobs and 13 percent of all labor income. These estimates again confirm that in this part of Colorado, national forest uses will continue to serve primarily the recreating public and those industries associated with tourism.

For all alternatives, job growth is expected to continue. There is no alternative where jobs associated with the national forest are expected to decline. The alternatives do vary in how fast or slow the job growth may be (Figure 71). Alternative B, the no-action alternative, is expected to generate the highest level of employment. All other alternatives represent a slower rate of growth, from an additional 1,200 jobs for Alternative I to an additional 1,700 jobs for Alternatives C and E. Again, seasonality is not shown in this figure.

Figure 71
Growth in employment effects by alternative, 1999-2010

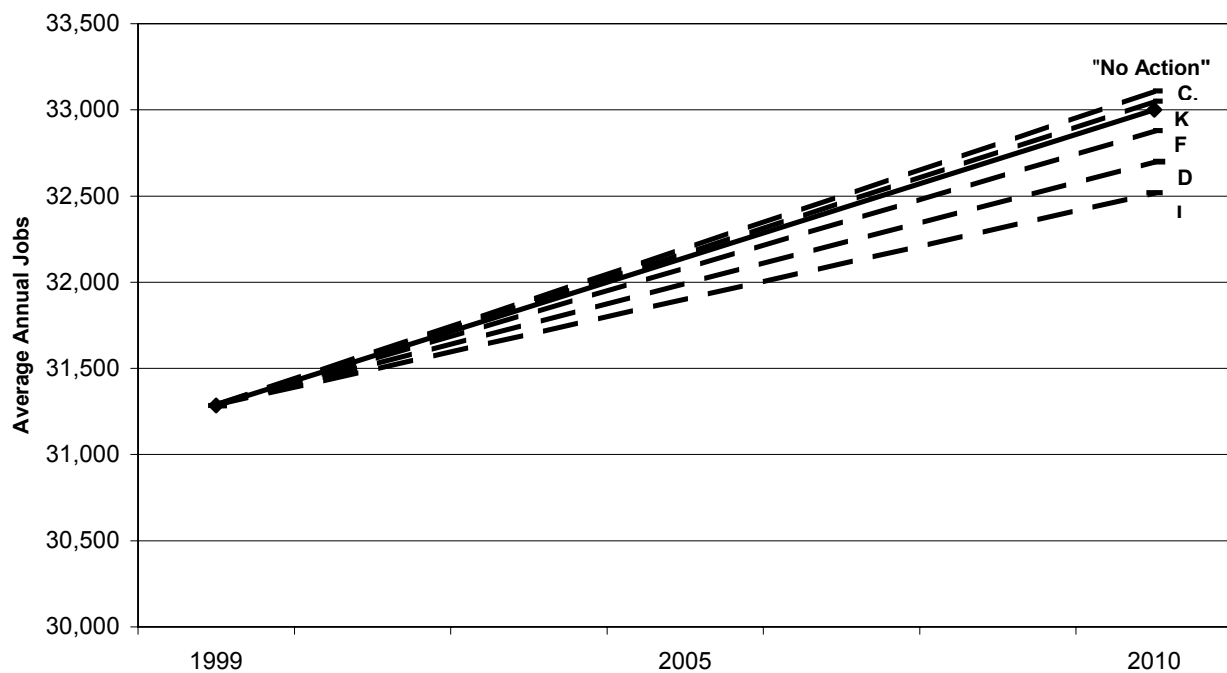


Table 170
Change to labor income by program in 2010, in millions of 1999 dollars

Resource	ALTERNATIVE							
	Base year (1999)	No Action B	C	D	E	F	I	K
Experienced budget level								
<i>Skiing</i>	525.3	538.3	538.3	529.9	538.3	538.3	529.9	538.3
<i>Other recreation</i>	121.1	143.2	143.0	143.0	143.0	139.9	139.1	140.5
<i>Fish and wildlife use</i>	59.5	70.3	70.3	70.3	70.3	64.7	70.3	70.3
<i>Grazing</i>	3.4	3.4	3.4	3.4	3.4	3.6	3.4	3.4
<i>Timber harvest</i>	0.7	1.6	0.6	1.2	0.6	2.5	0.7	1.4
<i>Forest Service expenditures</i>	12.3	12.2	12.2	12.2	12.2	12.2	12.2	12.2
Total forest management	722.3	769.0	767.8	760.0	767.8	761.2	755.6	766.1
<i>Percent change from 1999</i>	---	6.5%	6.3%	5.2%	6.3%	5.4%	4.6%	6.1%
Full budget level Total	722.3	778.4	776.3	769.0	776.3	771.6	763.9	775.4
<i>Increase from experienced budget level</i>	---	7.8	7.5	6.5	7.5	6.8	5.8	7.4

Table 171
Change to labor income by major industry in 2010, in millions of 1999 dollars

Resource	ALTERNATIVE							
	Base year (1999)	No Action B	C	D	E	F	I	K
Experienced budget level								
<i>Agriculture</i>	11.2	12.1	12.1	12.0	12.1	11.9	12.0	12.0
<i>Mining & Manufacturing</i>	50.3	56.1	55.5	55.6	55.5	55.1	54.8	55.6
<i>Construction</i>	16.8	17.9	17.9	17.7	17.9	17.7	17.6	17.8
<i>Transportation/utilities</i>	32.6	34.6	34.6	34.4	34.6	34.2	34.2	34.5
<i>Wholesale and retail trade</i>	211.5	227.5	227.3	225.2	227.3	224.1	223.6	226.5
<i>Finance, ins. & real estate</i>	27.9	28.2	29.2	29.0	29.2	29.0	28.9	29.2
<i>Services</i>	350.9	369.9	369.6	364.6	369.6	367.5	363.0	369.0
<i>Government</i>	21.1	21.7	21.6	21.5	21.6	21.7	21.5	21.5
Total	722.3	769.0	767.8	760.0	767.8	761.2	755.6	766.1
Percent change from 1999	---	6.5%	6.3%	5.2%	6.3%	5.4%	4.6%	6.1%
Full budget level Total	722.3	778.4	776.3	769.0	776.3	771.6	763.9	775.4
<i>Increase from experienced budget level</i>	---	7.8	7.5	6.5	7.5	6.8	5.8	7.4

Table 170 displays the labor income effects of each alternative (labor income is compensation paid by business proprietors to employees and themselves). The patterns for labor income are similar to those for employment. The dominant recreation-related jobs tend to be within the retail and service industry and are generally low paying. Range-related jobs in the agriculture sector are also low paying. These agricultural jobs are often accompanied by strong cultural and family values that provide important non-monetary compensation. Timber-related jobs tend to be higher paying than either recreation or range-related work. There are a very small number of individuals in the timber industry located in the planning area. **Table 171** offers a picture of income effects by major industry.

The changes displayed in the above tables (**Tables 170 and 171**) do not occur equally throughout the planning area. The largest proportion of employment and income impacts will occur in the Eagle-Summit-Lake sub-area. Skiing-related employment will increase by about 2 percent from 1999, with virtually all of the increase occurring in the Eagle-Summit-Lake sub-area.

The largest economic impact in the planning area will be generated from wildlife-based and other recreation-related activities. This follows primarily from the growing impact of Front Range residents upon the eastern side of the national forest. Pitkin and Garfield counties will also see economic impacts attributable to non-skiing recreation; these counties already have a sizable non-skiing component to their tourism, and estimates suggest it will increase. About 10 percent of the impacts from other recreation should occur in Rio Blanco County.

Impacts resulting from timber harvest will be very small because the planning area lacks sizable milling or processing capabilities; any timber impact expected would result primarily from logging activity. Timber is routinely transported to mills outside the planning area, and these mills may be affected by changes in timber harvest. Large mills that process timber from the White River National Forest are those located in Saratoga, Wyoming, and Olathe and Montrose, Colorado. Up to six additional jobs per million board feet (MMBF) of timber could be affected in these communities. Modest changes resulting from grazing and timber are likely to occur in the Rio Blanco sub-area, but more than half of anticipated timber activity would occur in the Eagle-Summit-Lake sub-area.

Economic impacts at the full budget levels are roughly similar to those at the experienced budget levels. Employment would increase by less than one percent compared with experienced budget levels. The reason for this small change is that recreation will occur without regard to budget limitations on the national forest. It is assumed in this analysis that any changes in the quality of recreational facilities or experiences will not affect the spending patterns of the recreating public.

CUMULATIVE EFFECTS

Cumulative effects analysis is designed to reveal the context of alternative impacts within the planning area. This is done by comparing total changes in the planning area *with* each alternative to total changes *without* any of them. While past actions have set the stage for current social and economic conditions, it is current and reasonably foreseeable actions that strongly influence conditions in the future.

Socio-economic changes in the six-county planning area are caused by actions initiated by individuals, businesses, governments, and other organizations. Millions of decisions will be made by thousands of players over the next decade, all affecting such things as employment, housing, and transportation. It is impossible to account for these decisions separately. It is appropriate, then, to use larger-scale estimates of socio-economic indicators anticipated throughout the planning period.

The State of Colorado, with participation by all county governments in the planning area, has made projections out to 2020. These projections are comprehensive, including all the individual decisions by parties within the planning area. They also consider national and international factors, such as markets and demographics. Implicitly, these projections also include effects caused by management decisions for the White River National Forest. In the cumulative effects analysis, Alternative B (no action) is assumed to be the set of management decisions contained within the projections.

A forest plan is a long-range document that looks out a decade or more. Within this planning horizon, there are always short-term variances. Early in 2001 the U.S. economy began feeling the consequences of a downturn. The events of September 11, 2001 accelerated these consequences. Any time the economy slows, tourism-dependent areas will usually experience a greater impact than those not so reliant upon tourists. The White River area is strongly dependent upon tourism, and the consequences of this slowdown have been apparent. Skier-days are down from last year, retail sales are lagging, and even credit ratings of ski area corporations have been reduced. Are the economic and political events of 2001 going to make a fundamental and lasting impact on tourism in the White River area? It seems unlikely—but it is also too early to tell. The cumulative effects analysis presented here retains the long-term perspective, and therefore has not been modified in response to recent events.

Jobs and income

Table 172 shows employment and labor income for the planning area. The first two columns present the 1999 base year and that portion of the base year attributable to use and management of the national forest. The next column shows state and local government projections for 2010. Included in the projections are employment and income effects attributed to the current direction (or no action) alternative, Alternative B. The remaining columns show the separate effects of each alternative at the end of the first decade or 2010.

Table 172
Cumulative economic impacts, 2010

Economic Indicator	1999			2010						
	6-County		White	6-County	White River National Forest					
	Total	River NF	Total	B	C	D	E	F	I	K
<i>Experienced budget level</i>										
Employment										
Total (jobs)	111,558	28,906	163,920	30,690	30,640	30,300	30,640	30,450	30,130	30,580
% of base	100.0%	25.9%	100.0%	18.7%	18.7%	18.5%	18.7%	18.6%	18.4%	18.7%
% change from no action (Alt B)	---	---	---	---	-0.2%	-1.3%	-0.2%	-0.8%	-1.8%	-0.4%
Labor income										
Total (\$ million)	\$3,146	\$722	\$4,596	769	\$768	\$760	\$768	\$761	\$756	\$766
% of base	100.0%	22.9%	100.0%	16.7%	16.7	16.5	16.7	16.6	16.4	16.7
% change from no action (Alt B)	---	---	---	---	-0.1%	-1.2%	-0.1%	-1.0%	-1.7%	-0.4%
Full budget level										
Employment										
Total (jobs)	111,558	28,906	163,920	30,960	30,880	30,570	30,880	30,750	30,360	30,850
% of base	100.0%	25.9%	100.0%	18.9%	18.8%	18.6%	18.8%	18.8%	18.5%	18.8%
% change from no action (Alt B)	---	---	---	---	-0.3%	-1.3%	-0.3%	-0.7%	-1.9%	-0.4%
Labor income										
Total (\$ million)	\$3,146	\$722	\$4,596	\$778	\$776	\$769	\$776	\$772	\$764	\$775
% of base	100.0%	22.9%	100.0%	16.9%	16.9%	16.7%	16.9%	17.0%	16.6%	16.9%
% change from no action (Alt B)	---	---	---	---	-0.3%	-1.2%	-0.3%	-0.8%	-1.8%	-0.4%

Table 173
Cumulative seasonal impacts from winter recreation by economic sub-area, 2010

Indicator	1999				2010								
	Tourism	WRNF	Tourism		White River National Forest Related								
	Total	Related	Total	B	C	D	E	F	I	K			
Eagle-Summit-Lake Counties													
Winter seasonal employees	50,600	41,750	55,580	43,020	43,020	42,170	43,020	43,020	43,020	42,160	43,020		
Winter seasonal households with housing cost burden	7,100	5,800	7,800	6,000	6,000	5,900	6,000	6,000	6,000	5,900	6,000		
% of winter seasonal totals	100.0%	81.7%	100.0%	76.9%	76.9%	75.6%	76.9%	76.9%	76.9%	75.6%	76.9%		
% change from no action (Alt B)	--	---	--	--	0.0%	-1.7%	0.0%	0.0%	0.0%	-1.7%	0.0%		
Garfield-Pitkin Counties													
Winter seasonal employees	14,890	8,290	17,810	8,430	8,430	8,420	8,430	8,430	8,430	8,420	8,430		
Winter seasonal households with housing cost burden	2,000	1,100	2,400	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100		
% of base	100.0%	55.0%	100.0%	45.8%	45.8%	45.8%	45.8%	45.8%	45.8%	45.8%	45.8%		
% change from no action (Alt B)	--	---	--	--	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		

Two observations can be made regarding the context of social and economic impacts. First, although skier days and other recreation on the national forest will grow, the relative importance of National Forest System recreation use and commodity outputs to the economy is shrinking as other economic activities, such as professional conferences and the development of second homes, gain in importance. What in 1999 accounted for 26 percent of all employment will in 2010 account for about 19 percent. While total employment is expected to grow by 52,000 jobs, employment attributable to the national forest is expected to grow by less than 2,000 jobs. Labor income attributable to the national forest is predicted to be no more than 17 percent of the area total in 2010, compared to 23 percent in 1999. This suggests that growth apart from forest-related tourism will be in industries and occupations yielding much larger earnings and profits. Viewing these estimates another way, 97 percent of job growth and 96 percent of labor income growth in the planning area will not be attributable to national forest activities.

Second, the no-action alternative (Alternative B) would be the largest contributor to the economy. In comparison to Alternative B, all other alternatives range from 0.1 percent to 1.8 percent smaller. This indicates that management direction in other alternatives would provide a modest dampening effect in the area, causing somewhat slower growth.

Economic dependency

The *Affected Environment* section discussed the role of tourism and economic dependency of the planning area. Based on the information in **Table 172**, none of the alternatives are expected to alter the area's dependence on tourism. The proportion of tourism attributable to public lands recreation will shrink over the next decade, but there is no indication that this will alter the anticipated role of tourism. The one area that may be enhanced over time is the role of the scenic backdrop provided by the national forest. Individual and business decisions, separately and collectively, over the next decade will continue to rely on the valuable scenic and recreation amenities offered by the White River National Forest. None of the alternatives is expected to alter these trends—either for the planning area as a whole or for sub-areas.

Transportation

The *Demographics – Affected Environment* section discussed the issue of transportation in the planning area. Based on the information presented in this chapter, none of the alternatives will alter the area's dependence on tourism; therefore, none would alter the basic transportation difficulties. Most of the alternatives do not measurably change the projected expectations of local commuting or tourists using Interstate 70.

Population and Housing

Cumulative effects on indicators such as population and housing can stem from those for employment. Because the economic impacts of the alternatives are largely recreation-based, population and housing effects are likely to be seasonal and sub-area specific.

Depending upon the alternative, up to 550 additional jobs (in annual average terms) associated with skiing are estimated for the Eagle-Summit-Lake sub-area in 2010. While these changes are small on a percentage basis, they come during the winter season when the demands for housing and local government services are the highest and local abilities to meet the demand are stretched the most. To best understand these impacts, jobs are converted to number of employees during a typical winter month. Because of the high cost of living throughout the planning area, multiple job holding is common. Multiple job holding is considered in the transformation of jobs data to numbers of employees. This has been done for both the Eagle-Summit-Lake and Garfield-Pitkin sub-areas.

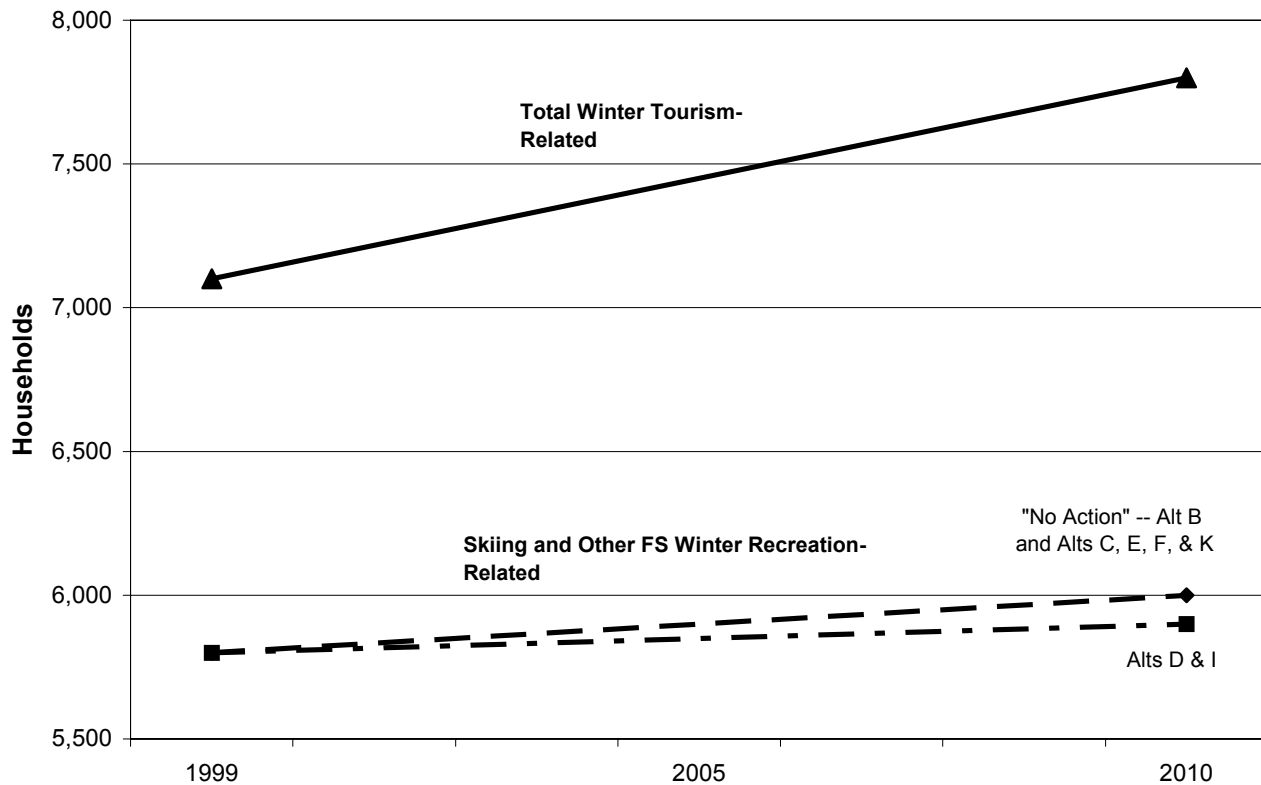
The results are shown in **Table 173**. Since downhill skiing on the national forest dominates the winter tourism season, it is not surprising that over 80 percent of winter seasonal tourism employees are associated with the White River National Forest. It is estimated that more than 40,000 individuals in the Eagle-Summit-Lake sub-area were in some way associated with winter tourism in 1999. State projections for 2010 show a total of 5,000 more employees from winter tourism overall. As part of this total, 1,300 more employees would be associated with skiing on the national forest (Alternative B). This same increase could be expected for Alternatives C, D, E, F, and K. A somewhat smaller growth of 400 employees would be expected for Alternatives D and I. This smaller increase might moderate the number of tourism employees anticipated overall for 2010. While this difference is not large, it could be expected to ease the growing demand for housing and local government services in these counties. A neutral effect could be expected for Alternatives B, C, D, E, F, and K.

Many of the employees (and their families) associated with skiing earn lower wages and have great difficulty acquiring affordable housing. Those households that spend more than 30 percent of their income for rent or mortgage payments are sometimes classified as having a housing cost burden. Using this concept, **Table 173** includes a glimpse as to how the alternatives might affect such households. Methodologies for making these estimates were borrowed from a study completed for the Summit Housing Authority (The Housing Collaborative 2001) and a study done for Healthy Mountain Communities (RRC Associates 1999). Further details are available in FEIS Volume 3 Appendix B.

For those employees and their households associated with winter tourism in 1999, about 7,100 households are estimated to have a housing cost burden in the Eagle-Summit-Lake sub-area. Of these, 5,800 are associated with winter recreation on the White River National Forest. In 2010, the total number of households increases by 700 and those associated with the national forest increase by 200. Looking across the table reveals that all alternatives except D and I have a neutral effect. For Alternatives D and I, 100 fewer households might have this burden. The difference among alternatives is very small (1.5 percent) although the estimating procedure is admittedly rough. Nonetheless, Alternatives D and I offer some likelihood of reducing the demand for affordable housing. These results are also portrayed in **Figure 72**.

The same analysis is presented for the Garfield-Piñon sub-area. Differences among alternatives for these two counties are negligible.

Figure 72
Households with a housing cost burden in Eagle-Summit-Lake Counties by alternative, 1999–2010



Environmental justice Environmental justice refers to the disproportional impacts upon minority and low-income populations. It was stated above that such disproportional impacts are not expected to result directly or indirectly from any of the alternatives. This statement remains true when considering the collective decisions of other individuals, businesses, and organizations.

Urbanization In the past decade, marketing of real estate development in the planning area has relied upon the amenities of the White River National Forest. Given the projections of growth in the area, there is no reason to believe that any of the alternatives will significantly modify these expectations. Private land development, tourists in greater number, and community transportation issues will be neither enhanced nor moderated in any meaningful way through any alternative. However, the national forest is committed to working with local governments through the implementation of the revised forest plan to best manage the problems of urbanization.

Local governments

Affected environment

INTRODUCTION

The fiscal condition of local governments in an area that has a strong tourism-based economy is affected in several ways by its proximity to a national forest. More visitors and more workers increase the demands on counties, municipalities, and special districts. Revenue sources include sales and lodging taxes from area visitors, property taxes from real estate developments, and payments for public lands from federal land management agencies. Costs include higher demand for police, fire, and search-and-rescue services; increased needs for roads, sewer and water systems, and public buildings; and more calls upon social services such as day care, welfare, schools, and medical facilities. Local officials generally recognize the relationships among tourism (including second homes), revenues, and costs, but studies that quantify these relationships are difficult to find. Looking at only the tax revenue side of a tourism-based economy is an incomplete viewpoint that can be misleading. A search for studies in the western U.S. that quantify the net cost of tourism on local governments yielded no information useful for this analysis. So while the extent of net impacts on local governments cannot be readily quantified, it is recognized that the burden of public lands-related tourism and visitors to public lands in general can be multi-faceted and sizable.

The following section examines federal payments and the role they play in local revenues. While the payments are intended to offset costs borne by local governments for the presence of public lands and their visitors, there is no data to determine the extent to which such costs are offset for White River National Forest counties.

Payments to counties Counties that contain National Forest System lands receive payments from the federal government to compensate the county for two costs: the first cost is that borne by local governments for serving visitors to the national forests (compensated by the 25% Fund); the second cost is the loss of property tax revenues (compensated by Payment in Lieu of Taxes (PILT) payments).

25% Fund payments. The costs borne by local governments for serving visitors to the national forests includes law enforcement and judicial services, rescue and other emergency services, and wear on local public infrastructures (such as parks, streets, and water and sewer systems). The 25 Percent Fund Act required payments equal to a 25 percent share of annual revenues coming from the sale of forest products, user fees, and special use permits (such as grazing) on each national forest. These payments were made to states, then distributed to the counties, with the restriction that they could be expended only on education or roads. The remaining 75 percent was not retained by the Forest Service, but rather deposited in the U.S. Treasury. These 25% Fund payments were not limited by annual congressional appropriations.

The Secure Rural Schools and Community Self-Determination Act of 2000 provided counties with an additional payment option. The new law offered counties an option for payments that do not fluctuate with national forest revenues. Fixed amounts based on

recent history unlink these payments from changing uses and revenues of a national forest. Under this option, counties receive the average of the three highest 25% Fund payments during the period of fiscal years 1986 through 1999. This option provides stability of payments but removes the opportunity for larger payments. The fixed amounts have additional requirements for their use. Counties had until September 30, 2001, to decide whether they would continue with annually varying 25% Fund payments or choose fixed amounts. Of the nine counties who have public lands managed by the White River National Forest, four have elected the fixed payment option and five have elected to continue with annually varying 25% payments. The counties electing fixed payments are Eagle, Gunnison, Rio Blanco, and Routt. The counties continuing with the 25% payments are Garfield, Mesa, Moffat, Pitkin, and Summit.

The amount a county receives from the White River National Forest 25% Fund is determined by the percent of national forest land located in that county. The White River National Forest is located in 10 counties. The Dillon District, located primarily in Summit County and administered by the White River, was originally part of the Arapaho National Forest. Recent legislation officially transferred administration of the Dillon District from the Arapaho to the White River National Forest. This transfer, however, did not change the distribution of 25% Fund payments. Summit County will continue to receive its share of 25% Fund payments based on counties making up the Arapaho National Forest. **Figure 73** shows the proportions received by all counties, including the Dillon District.

The White River National Forest (including the Dillon District) generated between \$7.8 and \$10.6 million in revenue annually from 1997 to 2000. The sources of revenue are shown in **Figure 74**. Recreation, primarily from ski area permit fees, is the dominant source and accounts for up to 85 percent of total revenues. Revenues vary annually depending on the number of skier visits, lift ticket prices, and other retail sales on National Forest System lands. Timber receipts are the second largest source at 11 percent, but these have generally fallen over the last five years. Grazing revenues at 2 percent are also falling, with gradual reductions in the demand for grazing. Other sources include permit revenues from such projects as electronic sites, power corridors, and mineral exploration. Revenue generated by the sale of extractable minerals (oil, gas, and coal) on National Forest System lands is collected by the Mineral Management Service in the Department of the Interior and administered through the Bureau of Land Management. Mineral revenues, therefore, are not shared locally through the Forest Service 25% Fund.

Figure 73

White River National Forest 25% Fund payments, average share among counties, 1997–2000

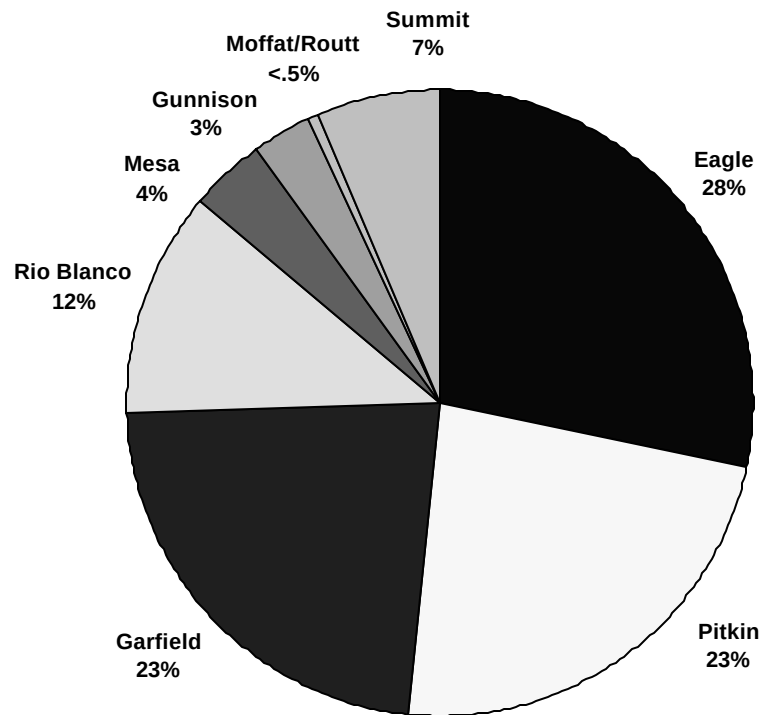
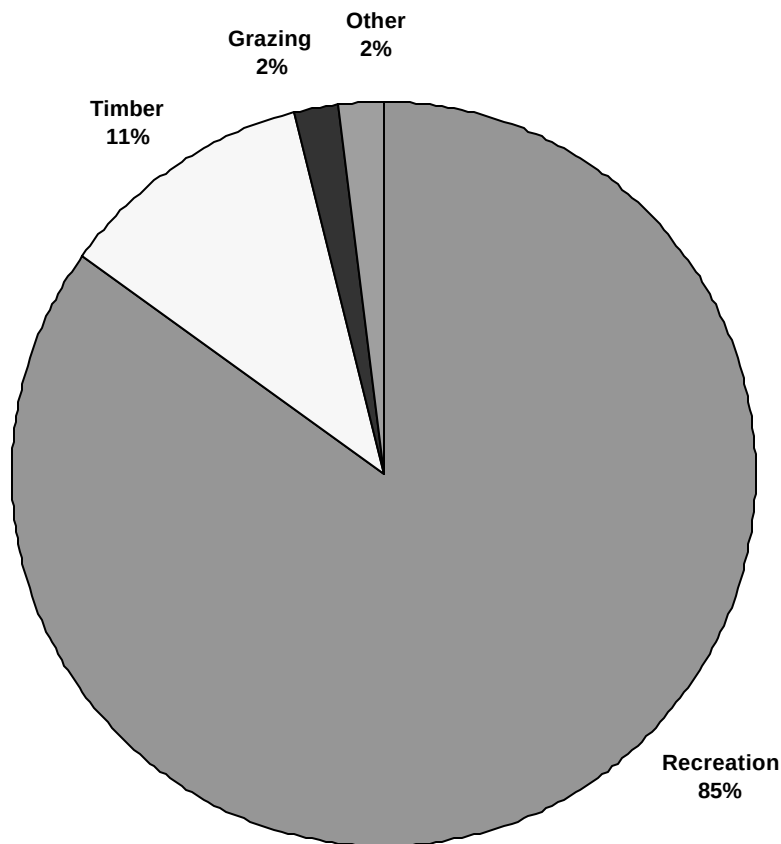


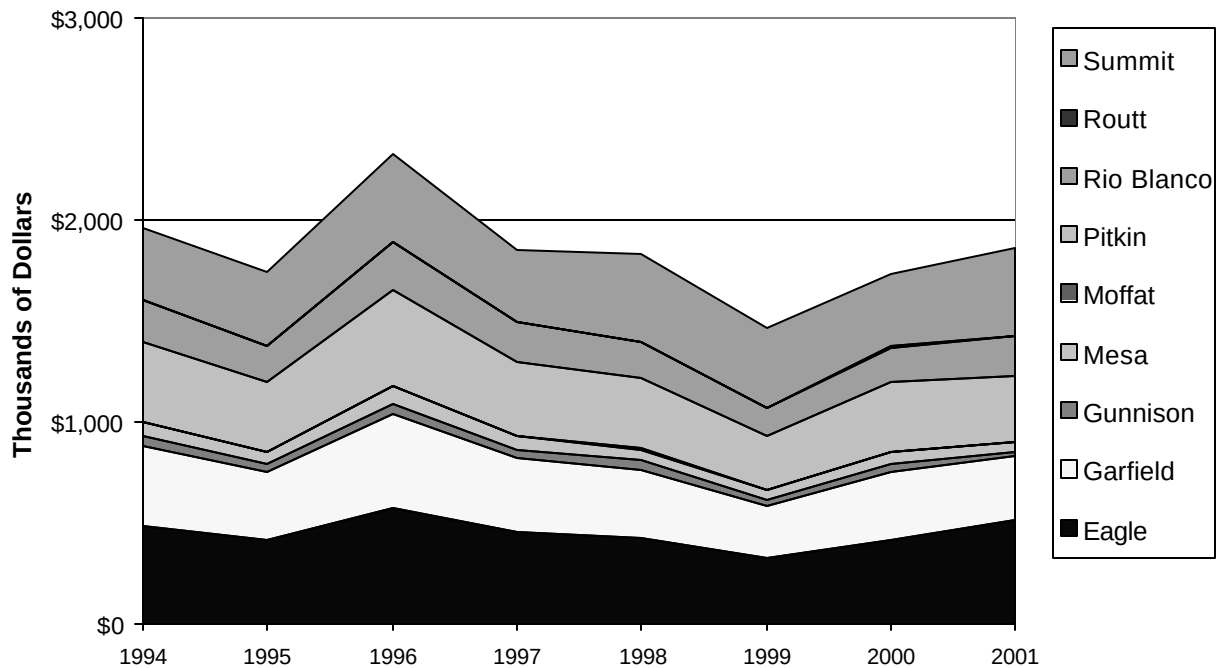
Figure 74
White River National Forest 25% Fund payments, average share by revenue source, 1997–2000



Source: USDA Forest Service

Figure 75 provides an historical view of 25% Fund payments since 1994. Payments in 2001 include fixed payments under the new legislation. Although the trend through 1999 was gradually downward, both fixed and variable payments have reversed the trend in recent years. Annual fluctuations are primarily attributable to variability in snowpack conditions and, consequently, ski area revenues.

Figure 75
White River National Forest 25% Fund payments, 1994–2001



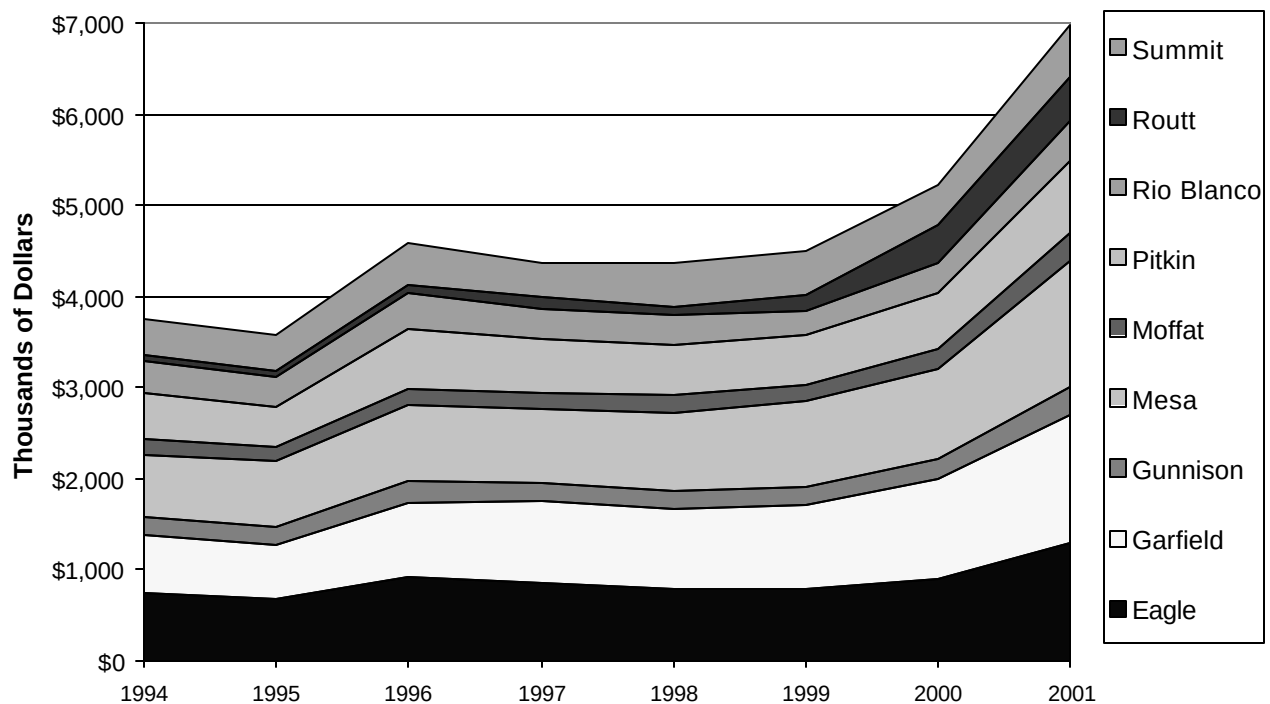
Source: USDA Forest Service

PILT Payments. *Payment in Lieu of Taxes (PILT)* is a payment determined by formula in the Payments in Lieu of Taxes Act of 1976. PILT is a federal revenue-sharing program designed to compensate local governments for the presence of tax-exempt federal lands within their jurisdictions. The formula takes into account such factors as other forms of revenue sharing, acreage, and population. These payments are made directly to counties and may be used for any purpose. PILT payments can be and recently have been limited by Congress through the appropriations process. Congress has not appropriated sufficient funds to fully pay counties since 1994, with the payments in 2000 being 42 percent of the formula-determined payment.

Because PILT payments are determined in part by other revenue sharing, it is important to understand the relationship for each county. Throughout Colorado it is common for PILT payments to adjust inversely and equally to changes in the Forest Service 25% Fund payments. For all counties but one in the planning area, increases in 25% Fund payments in one year will reduce PILT payments in the following year by the same amount (such changes do not take into account reduced appropriations by Congress). Consequently, increased Forest Service revenues may not result in increased federal payments received by these counties. Rio Blanco is the only county for which changes in Forest Service 25% Fund payments do not change their PILT payments.

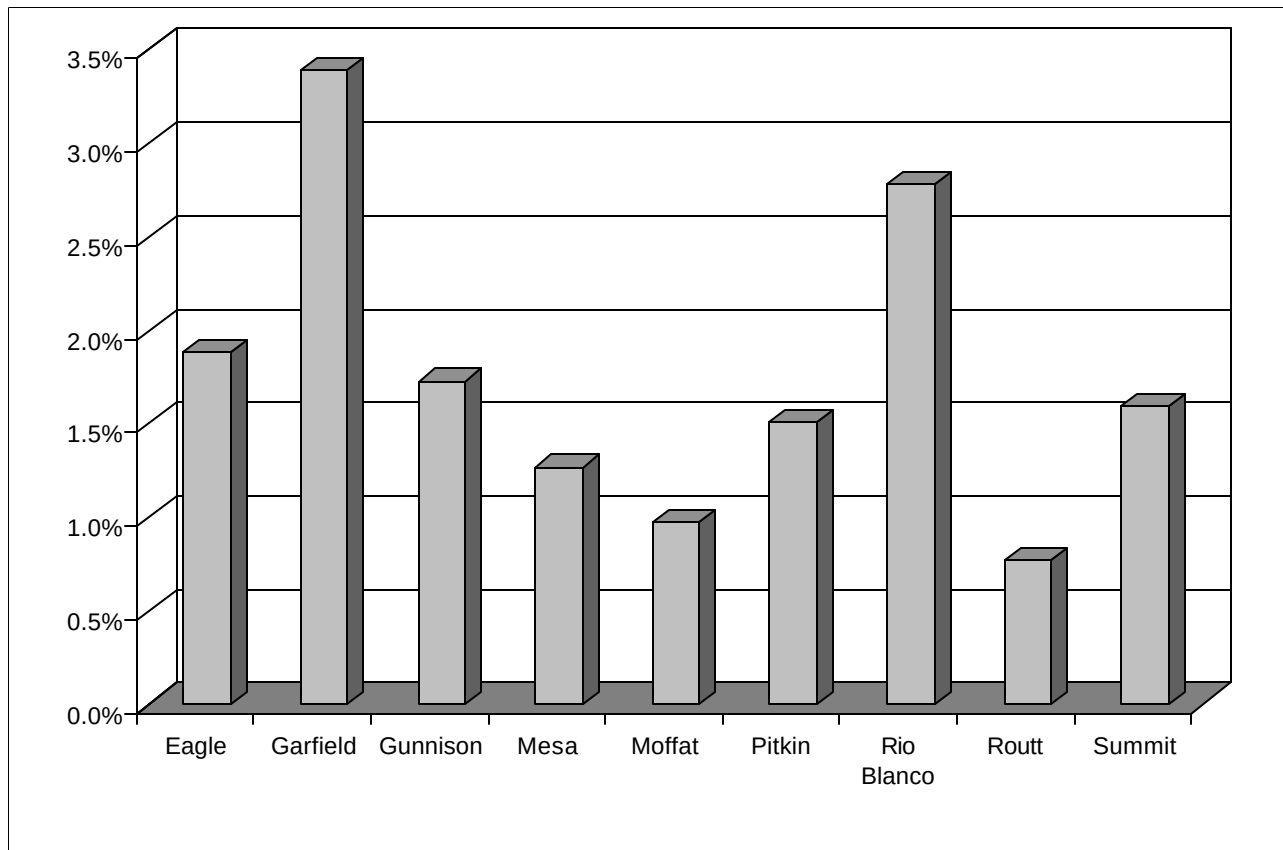
With this relationship in mind, the best portrayal of federal payments from land management agencies is to combine payments from the Forest Service and PILT. A recent history of total payments is shown in **Figure 76**. The scale on **Figures 75 and 76** are identical. PILT payments in the planning area have risen from \$1.8 million to \$5.1 million in the past seven years. Starting in 1999, PILT payments exceeded 25% Fund payments from all national forests in these counties. The trend for total federal payments is up for all counties.

Figure 76
PILT and 25% Fund payments to counties, 1994-2001



Source: USDA Forest Service, USDI Bureau of Land Management

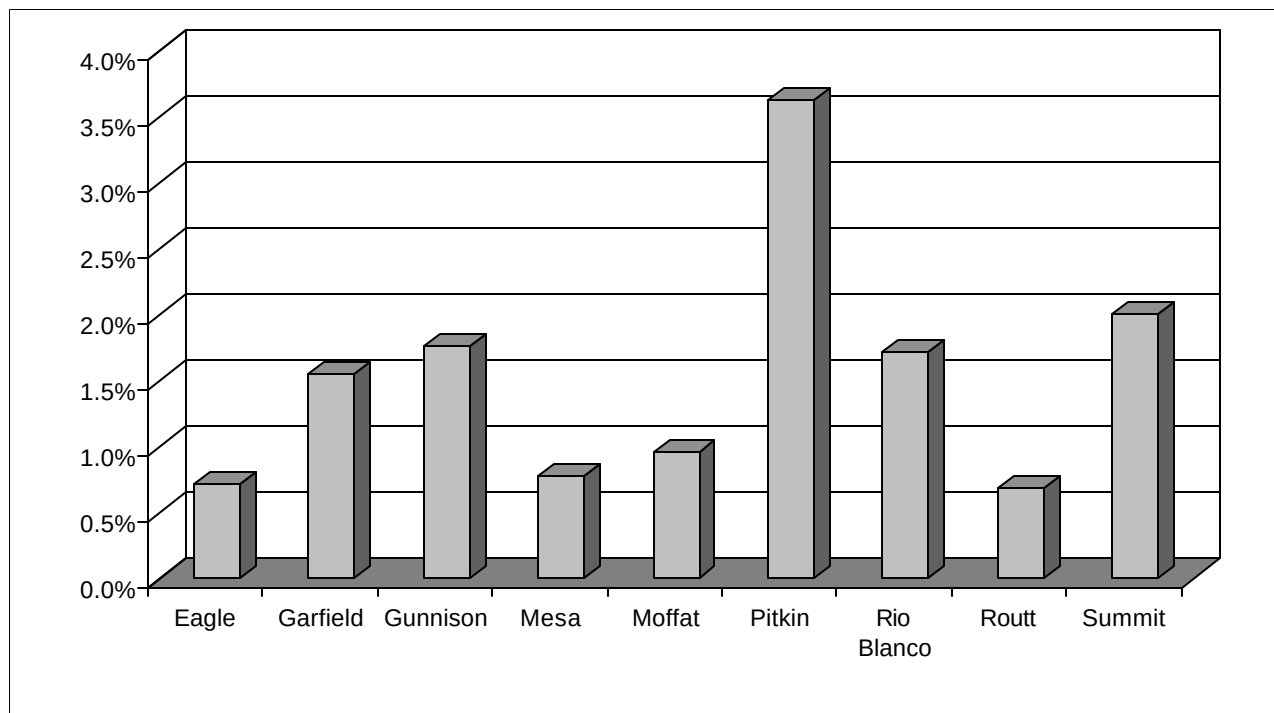
Figure 77
PILT and 25% Fund payments as a share of total county revenues, 1999



Source: USDA Forest Service

The importance of these payments to local governments is shown in Figures 77 and 78. Figure 77 displays the share of total county revenues in 1999 if these funds were not used for schools. Generally, total federal payments would constitute from one to two percent of general county revenues. If the payments were used only for schools, the results are somewhat more variable (see Figure 78). In Eagle, Mesa, Moffat, and Routt counties, these payments would amount to less than one percent of school district revenues. In Pitkin County, the payments would constitute nearly four percent of school district revenues. These figures demonstrate that while payments from the White River National Forest and other federal lands may be important elements of county and school budgets at the margin, they do not constitute sizable revenue sources.

Figure 78
PILT and 25% Fund payments as a share of total school district revenues, 1999



Source: USDA Forest Service

Intermixed lands As urbanization occurs, private development often increases near national forest boundaries. Homes situated adjacent to the national forest boundary typically offer more privacy, better views, greater opportunities for recreation and wildlife viewing, and more pleasant immediate surroundings than might be available further away from public lands. These amenities are highly valued by homeowners, but with these amenities come higher risks of wildfire and higher costs of services by local governments. Irregular boundaries, less-developed roads, and longer distances from community centers make for expensive law enforcement and emergency services. Where whole communities are closely situated near national forest boundaries, the risk of wildfire damage is even greater. Collaboration between the Forest Service and local governments can help all levels of government in controlling wildfire risks, planning for private land development, and carrying out their respective service obligations. One facet of collaboration is found in the specialized management of National Forest System lands where planned or current development of private land is intermixed. Management Area 7.1 is designed for such intermixed lands (see the Environmental Consequences section below for further discussion).

Environmental consequences

DIRECT AND INDIRECT EFFECTS

Effects on returns to counties **Table 174** displays the estimated annual Forest Service revenues and potential 25% Fund payment amounts for each alternative. At experienced budget levels, payments could increase up to 67 percent over 2000. The highest revenues and payments are expected under Alternative F, but modest increases could be expected for Alternatives B, D, and K as well. For those counties that elected to receive the fixed payments (Eagle, Gunnison, Rio Blanco, and Routt), there will be no variation among alternatives. All of the counties that elected to continue with 25% payments (Garfield, Mesa, Moffat, Pitkin, and Summit) may expect PILT to offset the payments by an equal and opposite amount. This observation does not account for appropriations by Congress that may pay less than the formula-determined amounts of PILT.

Table 174
Annual average revenue and payments to counties in 2010 (thousands of 1999 dollars)

		ALTERNATIVE						
County	Base year (2000)	B	C	D	E	F	I	K
Experienced budget level								
FS revenues	\$8,602	\$9,829	\$7,945	\$8,815	\$7,938	\$11,494	\$7,879	\$9,400
25% of FS revenues	\$1,720	\$2,457	\$1,986	\$2,204	\$1,985	\$2,874	\$1,970	\$2,350
Full budget level								
FS revenues	\$8,602	\$12,171	\$9,689	\$11,060	\$9,675	\$14,676	\$9,281	\$11,886
25% of FS revenues	\$1,720	\$3,043	\$2,422	\$2,765	\$2,419	\$3,669	\$2,320	\$2,972

Source: USDA Forest Service

Intermixed lands Management Area (MA) 7.1 is designed for intermixed lands—those areas where development on private lands adjoins the national forest boundary and can raise special problems related to wildfire and local government services. The specialized management of adjoining National Forest System lands is one way that the Forest Service and local governments can collaborate on solutions for these unique problems. Much public comment was received on the Draft Forest Plan regarding the lack of use of this allocation, especially in the draft preferred Alternative D. As **Table 175** shows, most alternatives have been modified in response to these comments. Acreages in the MA 7.1 allocation range from a low of zero in Alternatives B and D to a high of 12,905 in Alternative F.

Table 175
Intermixed management area lands, by county and alternative

Sub-area/County	ALTERNATIVE						
	B	C	D	E	F	I	K
I-70 Corridor/Front Range Influence							
<i>Eagle</i>	0	2,426	0	924	1,308	0	1,291
<i>Summit</i>	0	0	0	0	11,597	851	2,812
Roaring Fork & Colorado Valleys							
<i>Garfield</i>	0	0	0	0	0	0	0
<i>Pitkin</i>	0	5,287	0	0	0	3,299	3,648
White River Valley							
<i>Rio Blanco</i>	0	0	0	0	0	0	0

Source: USDA Forest Service

The location and extent of the MA 7.1 allocations reflect the areas that received the most widespread support by local governments. Other allocations were considered and supported by various local governments, but the set presented offers the mixes that were most widely supported.

Information to quantify the potential cost savings or increased effectiveness of services associated with each alternative is unavailable. However, because these areas were the most widely supported, it is likely that these lands would have the highest net benefits to local governments and communities. Continued collaboration during implementation should further increase the benefits of this and other management areas to all levels of government.

CUMULATIVE EFFECTS

Federal payments Cumulative effects analysis considers the consequences of the alternatives in concert with the consequences of other actions. As discussed in other parts of the *Communities* section of this chapter, state projections of population, employment, and income growth represent the collective consequences of other actions within the planning area. 25% Fund payments would not be affected by these actions, but PILT payments could be, because PILT calculations are based in part on county populations. None of the alternatives analyzed in this FEIS would substantively alter the population growth anticipated for the planning area. Thus, it is unlikely that PILT would be affected. It is also unlikely that any alternative would substantively change the role federal payments play in general county or school district revenues. As populations and tax revenues increase, it is likely that federal payments would play a lesser role in local and special government revenues.

Intermixed lands Private land development adjacent to the national forest boundary will become an increasing problem over the next decade. The value of Management Area 7.1 will continue to increase as development pressures increase. In that regard, the alternatives that have larger acreages of MA 7.1 (C, F, I, and K) will be much more valuable to both federal and local officials than the alternatives that have little or none (B, D, and E). Collaborative efforts with local governments during implementation of the revised forest plan also add value to these allocations.

Communities of Interest

Stakeholders

Affected environment

In recent years, the amount and level of conflict over natural resource issues has increased substantially. As a result, much attention has been devoted to increasing our understanding of the dynamics of these conflicts and what they mean for stakeholders and natural resource managers. Managers and stakeholders also need ways to better understand each other and work together to resolve or avoid conflicts. One approach found in the literature involves the development of a hierarchical model (VOAB) that considers stakeholder values, objectives, attitudes, and behaviors (Shields 2000). In this model, individual values are the highest and most stable of the four items. An individual's objectives are a proxy for her or his values; these objectives influence the individual's attitudes, which in turn, influence behaviors.

The following section focuses on stakeholder objectives for three reasons:

- Stakeholder objectives provide a good proxy for stakeholder values, and these values often underlie the positions stakeholders take on forest management issues.
- Attributes are variables that can be associated with objectives and that can be used to measure the level of achievement of the associated objective.
- For each forest plan alternative, the level of achievement of stakeholder objectives can be estimated by determining the values of the attributes.

Keeney (1992) defines an objective as a statement of what one desires to achieve. An objective is characterized by having a context (in this case, national forest management), an object (something that can be acted upon), and a direction of preference. An objective must address a single issue (such as amount of land allocated to roadless management), and that issue must have a sense of preference (such as, more is better than less). In addition, the issue must have one or more variables associated with it that is measurable (such as, number of acres allocated to roadless management), and it must respond to management. Key questions that help characterize the stakeholders of the White River National Forest include:

- Who are the stakeholders?
- What are their objectives for the national forest?
- Do these stakeholders have any objectives in common?
- How well are objectives met by each plan alternative?
- What are the consequences for each stakeholder group of each alternative?

Collectively, the answers provide information that is useful in implementing a collaborative approach to planning because they help in understanding stakeholders, their perspectives, and their desires for the White River National Forest.

Three types of data have been used to characterize stakeholders and their objectives: (1) statistical analysis of three surveys of Colorado national forest stakeholders, (2) content analysis of public comments on the DEIS and draft forest plan, and (3) results from six stakeholder group public meetings held in February 2001. The primary use of the first two sources of information was to characterize White River National Forest stakeholders and their objectives. The stakeholder meetings were then used to validate the information collected from the first two sources. This latter information was also used to identify the objectives to be tracked in order to illustrate the consequences of the alternatives to different stakeholders.

THREE SURVEYS

The first survey (referred to as PSI) (556 respondents, 467 usable for this analysis) was administered by mail in 1998 by The Colorado School of Mines to self-identified stakeholder groups with an interest in the Pike and San Isabel (PSI) national forests. The interest groups consisted of the Colorado Mountain Club (CMC), the Colorado Off-Highway Vehicle Club (COHVCO), and a group of senior citizens (SENIORS). This survey was designed to look at stakeholder values, objectives, attitudes, beliefs, and behaviors all within the context of the Pike and San Isabel national forests. The survey contained sets of questions designed to address each of these items, as well as a number of socio-demographic questions. The set of 31 objectives questions used in this survey is included in Appendix B. Most respondents for the PSI survey live near the Pike or San Isabel national forests and are members of one of the stakeholder groups. These respondents were predominantly from the southern Colorado Front Range area, and their stakeholder group affiliations were known.

The second survey (referred to as AR) was also administered by The Colorado School of Mines and was conducted in 1997. The survey instrument was mailed to 800 individuals on the Arapaho and Roosevelt national forests' planning mailing lists; there were 402 respondents (352 usable for this analysis). The survey was sent to individuals but not to businesses, government agencies, trade groups, or other groups. This survey contained the same sets of objectives questions as the PSI survey. Most respondents for the AR survey lived near the Arapaho and Roosevelt national forests; however, stakeholder group affiliations, if any, were not known. These respondents were predominantly from the northern and central Colorado Front Range. Because this sample was from the population of all stakeholders on the Arapaho and Roosevelt national forests' mailing lists, the responses were almost certainly from a broader collection of stakeholder groups than was the case for the PSI survey.

The third survey was the Colorado Survey (CS), commissioned by the White River National Forest and conducted by Colorado State University in 1995. It was developed and administered to gain knowledge about Colorado residents' values, attitudes, and behaviors relative to Forest Service management. Questions in the survey addressed a number of issues including forest values, general aspects of forest use and management, wilderness and roadless areas, and control of national forests, as well as a number of socio-demographics variables.

Characterization of stakeholder objectives was not one of the CS objectives. Therefore, in order to use this data set, it was necessary to determine which questions were appropriate

objectives questions. Seventeen questions were deemed suitable (see Appendix B, Table 3). Data for the CS (960 responses, 886 usable for this analysis) were obtained from a random sample of 1,800 potential respondents whose names were purchased from a commercial sampling firm. Individuals living along the Colorado Front Range as well as those living in other mountain counties of the state were sampled. Most of the demographics questions in the CS survey differed from those in the PSI and AR surveys; however, a few were comparable as will be discussed later.

Respondents for the CS were widely distributed across the western two-thirds of the state, with roughly 35 percent of them living near the White River National Forest, as defined by the six county economic impact area (Eagle, Garfield, Lake, Pitkin, Rio Blanco, and Summit counties). Many of the other respondents lived along the Colorado Front Range, thus providing some overlap with the area sampled in the PSI and AR surveys. Like the AR survey, information was not collected on respondent's affiliation with stakeholder groups; however, the sample can reasonably be expected to contain representatives of several groups. Unlike either the PSI or AR surveys, the sample frame used in the CS included a broader class of residents than those identified as either members of a specific stakeholder group (as was the case with the PSI) or interested enough in national forest issues to have been placed on a mailing list (as was the case with the AR). Thus, the CS probably includes responses from people who may care a lot about what goes on the White River National Forest but have not become engaged enough in the issues to be identified with a particular stakeholder group or be included on a mailing list. These are people who may have been largely unrepresented in the White River National Forest debates, at least prior to the comment period for the draft forest plan and DEIS.

Cluster analysis Cluster analysis was selected as the primary analysis tool for all three surveys. This technique categorizes respondents into clusters based on how similarly they respond to a set of questions. The data were clustered based on responses to the 31 objectives questions in the PSI and AR surveys and on responses to the 17 objectives questions in the CS. Two clusters of respondents resulted for all survey data sets.

There are many ways to summarize the results described above for the three surveys. The approach used here is to look at the five questions with which respondents have greatest agreement and the five questions with which they have greatest disagreement, by survey and cluster. Appendix B of the FEIS displays the mean responses to all questions by survey and cluster.

Table 176 shows the number of respondents in each cluster and presents the results for the questions with greatest agreement for each survey and for each cluster. The higher the numerical value shown in the table for each objective and cluster group, the more agreement cluster respondents indicate for the objective statement. Looking at the PSI survey, Cluster 1 respondents were in strongest agreement on reopening roads, requiring resource companies to restore lands after use, spending user fees locally, educating users about potential resource damage from both non-motorized and motorized recreation, and providing more information on uses of public lands. Cluster 2 respondents placed greatest importance on requiring resource companies to restore lands after use, restricting commercial use if trails and roads are severely overused or degraded, restoring high alpine trails, educating users about potential resource damage from both non-motorized and motorized recreation, minimizing erosion due to use of stream tributaries, and protecting wilderness areas and their biological resources as first priority.

Table 176
Five highest mean responses (greatest agreement), by cluster and by survey

Objectives Questions From PSI and AR Survey Responses	PSI Survey		AR Survey		Colo. Survey	
	Cluster 1 (191 Resp)	Cluster 2 (276 Resp)	Cluster 1 (194.Resp)	Cluster 2. (158 Resp)	Cluster 1. (576 Resp.)	Cluster 2 (310 Resp.)
1) Putting the funds collected from public land users to use in the local public land district.	6.25			5.44		
3) Reopening roads that have had off-highway vehicle interest in the past to motorized use.	6.54					
10) Minimizing erosion due to overuse of tributaries (i.e., creeks and streams) in the watershed.		6.36	6.56	4.92		
13) Restricting commercial (i.e., mining, timber, grazing) use if trails and roads are severely overused and degraded.		6.52	6.48			
15) Protecting wilderness areas and their biological resources as the first priority.		6.36	6.54			
18) Providing education for private property owners concerning wildlife habitat management plus fire safety and prevention.				5.11		
23) Providing information to all public land users concerning potential damage from both motorized and non-motorized recreation (i.e., agencies should visit organizations, work with volunteer/recreational groups).	5.75	6.40		5.15		
24) Providing more clearly defined information about uses of public lands (i.e., wilderness experience, motorized experience, and watershed issues) by encouraging people to visit agency offices.	5.52					
26) Requiring resource companies (i.e., mining, timber, grazing) to restore the land to its natural state after use.	6.44	6.88	6.86	5.44		
27) Increasing fees charged to industry users (i.e., mining, timber, grazing).			6.59			
31) Using resources to restore damaged high alpine trails (i.e., re-vegetate, restrict use to designated trails).		6.42				
Objectives Questions From Colorado Survey						
1) More importance should be placed on keeping National Forests healthy than on helping people use them in ways they want.					6.13	4.89
3) We should support the economic health of Colorado's small towns by harvesting some trees for lumber.						5.23
5) National Forests and other federal land should be the primary places where we protect threatened and endangered species.					5.47	
6) Areas of National Forests with no roads should be kept roadless.					6.15	
7) All remnants of historical value on National Forests (like old mining towns) should be preserved.						4.64
9) More National Forest land should be set-aside as designated wilderness.					5.67	
11) Expand the amount of Congressionally designated wilderness.					5.44	
12) Expand the amount of land to be retained as roadless area.					5.44	
15) Increase timber harvests in areas less suitable for wildlife.						4.96
16) Increase the number of trees grown and cut for lumber.						5.34

Table 177
Five lowest mean responses (greatest disagreement) by cluster by survey

Objectives Questions From PSI and AR Survey Responses	PSI Survey		AR Survey		Colo. Survey	
	Cluster 1 (191 Resp)	Cluster 2 (276 Resp)	Cluster 1 (194.Resp)	Cluster 2 (191 Resp)	Cluster 2 (276 Resp)	Cluster 1 (194.Resp)
2) Increasing the amount of public land acres managed as wilderness areas.	2.13			2.53		
3) Reopening roads that have had off-highway vehicle interest in the past to motorized use.		3.02	1.70			
4) Building new roads that are accessible to conventional automobiles (including wilderness areas).	3.03	2.20	1.27	2.55		
5) Increasing the number of campgrounds in the area.		3.90				
6) Designating more trails specifically for walkers and hikers.	3.16					
8) Improving four wheel drive roads so that they can be accessible to conventional automobiles.	1.54	2.09	1.35	2.00		
11) Maintaining grazing fees at levels that provide economic incentives for ranchers to continue ranching.			3.07			
15) Protecting wilderness areas and their biological resources as the first priority.	3.32					
17) Adding more land to the public domain.				3.18		
20) Maintaining affordable lumber prices by allowing additional timber harvesting.		2.88	1.92			
25) Eliminating commodity development (i.e. timber, mining, grazing) on public lands with considerable recreational resource value.				3.09		
29) Charging fees to visitors using public land resources.	3.32					
Objectives Questions From Colorado Survey						
8) National Forest lands should have more and better roads so more people can enjoy the forests.					2.62	
10) Restore all National Forests in Colorado to their natural state and prohibit all use of them.					2.34	1.28
11) Expand the amount of Congressionally designated wilderness.						2.05
12) Expand the amount of land to be retained as roadless area.						2.69
13) Dismantle some man-made facilities (ski areas, lake resorts, large campgrounds) to return these areas to their natural state.					3.82	2.00
14) Decrease the amount of grazing.						2.35
15) Increase timber harvests in areas less suitable for wildlife.					3.29	
16) Increase the number of trees grown and cut for lumber.					3.42	

For the AR survey, Cluster 1 assigned greatest importance to requiring resource companies to restore lands after use, restricting commercial use if trails and roads are severely overused or degraded, increasing fees charged to industry users, minimizing erosion due to use of stream tributaries, protecting wilderness areas and their biological resources as first priority, and restricting commercial use if trails and roads are severely overused or degraded. Cluster 2 placed greatest importance on requiring resource companies to restore lands after use, spending user fees locally, educating users about potential resource damage from both non-motorized and motorized recreation, educating private property owners on wildlife habitat management and fire safety and prevention, and minimizing erosion due to use of stream tributaries.

For the Colorado Survey, Cluster 1 placed greatest importance on keeping roadless areas roadless, placing greater emphasis on keeping national forests healthy rather than on helping people use them, setting aside more National Forest System land as wilderness, making federal land the primary place for protection of threatened and endangered species, expanding the amount of congressionally designated wilderness, and expanding the amount of land to be retained as roadless. Cluster 2 assigned greatest importance to supporting the economic health of Colorado's small towns by harvesting more timber, increasing timber harvests in areas less suited to wildlife, placing greater emphasis on keeping national forests healthy than on helping people use them, and preserving all remnants of historical value.

In each survey, the cluster with the larger number of respondents assigns greatest importance to more environmental/conservation concerns while the smaller cluster tends to assign greatest importance to more human use issues. While comparisons are easiest to make for the PSI and AR surveys, the same pattern is evident in the Colorado Survey as well. For the PSI and AR surveys, all four clusters assigned greatest importance to question 26, requiring resource companies to restore land to its natural state after use. Three of the four clusters ranked question 10, minimizing erosion due to overuse of tributaries in the top five, with PSI Cluster 1 being the exception. Three of the four also rated question 23, on educating public land users about potential resource damage in the top five with AR Cluster 1 being the exception. In the Colorado Survey only question 1 on keeping national forests healthy was ranked in the top five, according to mean responses of both clusters.

Table 177 presents results for the five questions with greatest disagreement for each cluster. In general, the same pattern holds here as for the 'greatest agreement' questions. In each survey, the cluster with a larger number of respondents disagrees most strongly with issues that relate to increased development, or increased use (such as reopening or improving existing roads, or increasing timber harvest), with possible negative consequences for ecosystems. The cluster with fewer numbers of respondents disagrees most strongly with issues relating to restriction of ecosystem use or resource production by humans (such as increasing land managed as wilderness and adding more land to the public domain), at the expense of either local economies or the freedom to use lands for activities such as motorized recreation. Within each survey there are some issues with which both clusters disagree.

In the PSI and AR surveys, all four clusters disagree on building new roads for access by conventional automobiles, even in wilderness, and on improving four-wheel drive roads so they can be accessible to conventional automobiles. In the CS, both clusters disagree

with the idea of restoring all national forests to their natural state, prohibiting all use of them, and dismantling some man-made facilities, including ski areas, to return these areas to their natural state.

**Cluster
respondents
demographics
summary**

Analysts also characterized the two clusters in each survey by looking at respondent demographics. The following percentages are averages taken across all three surveys because the patterns described are consistent within each survey, except where noted. The majority (60 percent) of respondents were male. However, environmental/conservation-leaning clusters in all three surveys have an appreciably higher percentage of females (43 percent) compared to human-use-leaning clusters (20 percent females). Cluster average ages ranged from 46 to 54 years, with the environmental/conservation-leaning clusters tending to be a few years younger, except in the AR survey, where the average ages were the same.

In terms of field of work, for all surveys and all clusters except Cluster 2 in the PSI survey, over half of the respondents were either professional/technical or trade worker/skilled technicians. Cluster 2 of the PSI survey had nearly 50 percent in those categories, but also had 35 percent retired respondents. In the Colorado and AR surveys, a greater percentage of respondents are in professional/technical positions in the environmental/conservation-leaning cluster than in the human-use-leaning cluster. In the PSI survey, the majority of retired respondents belong to the environmental/conservation-leaning cluster while the reverse is true for the other surveys, especially the CS.

A significant majority of respondents in all clusters in all surveys have some college education, if not a degree. The environmental/conservation-leaning clusters in all three surveys had higher percentages of respondents with at least one college degree. Conversely, in all three surveys, the human-use-leaning cluster had a higher percentage of respondents with some college but no college degree.

In all surveys and clusters, the highest percentage of respondents (25 percent) fell into the \$50,000 to \$74,999 income range. However, a far higher percentage of respondents to the CS had incomes below \$25,000 than was the case for either of the other surveys. The reverse was true for incomes higher than \$50,000. Only the \$35,000 to \$49,999 class had comparable percentages of respondents across all clusters and surveys.

**Summary of
cluster results**

In each survey, the cluster with a larger number of respondents tended to be more environmentally/conservation oriented. They more strongly supported management policies and activities that protect or restore ecosystems, such as increasing the amount of land managed as wilderness, restricting activities that damage the land and its resources, keeping roadless areas roadless, eliminating development on public lands, and designating more trails for hikers and walkers. The second and smaller cluster grouping for each survey more strongly supported management policies and activities that promote resource use and consumption. They had more interest in allowing access for off-highway vehicle use, harvesting timber and promoting grazing, and in general supporting activities that enhance economic well-being. In all three surveys, respondents in both clusters supported objectives relating to sustaining national forest ecosystems.

Finally, despite the differences between clusters within each survey, there are areas of agreement. First, respondents in all clusters care very deeply about how national forests in Colorado are managed. Second, most if not all respondents feel that sustaining wildland ecosystems is very important, with disagreement primarily arising over how this should be done and the nature and amount of human activities consistent with ecosystem

sustainability. Third, most respondents recognize that there are many classes of forest users, who all have a right to pursue legitimate activities. Fourth, many respondents in all surveys and clusters feel that public education about wildland management issues is very important.

SIMILARITIES BETWEEN CLUSTER RESULTS AND PUBLIC COMMENTS ON THE DRAFT REVISED FOREST PLAN AND DEIS

The draft forest plan, DEIS, and appendices were released for public review and comment in August 1999 for 90 days, a comment period that was eventually extended an additional six months to close May 9, 2000. More than 14,000 individual responses were received from a diverse array of stakeholders and interested parties from around the country. This set of responses was subjected to a detailed content analysis by a Forest Service content analysis team (CAT). The results of this analysis are summarized below (CAT Executive Summary 2000), and information from this summary is used here. More detail regarding the content analysis process and the agency response to comment can be found in FEIS Volume 2—Appendix A. The White River National Forest Land Management Planning web page, www.fs.fed.us/wrnf, also contains a link to this summary.

There are a number of issues, including stakeholder valuation of forest resources and perceptions of the role of government, where:

“In general, those who support Alternative I or D and those who support Alternative C fall into two camps. . .”

Often there is a fundamental lack of agreement over which activities are compatible with each other and with preserving the environment, as well as over the appropriate mix and amount of acceptable activities. As the summary states:

“It is clear that the preferred public land management approach of each group is rooted in basic differences in viewpoint and values regarding the utility and highest public benefit of National Forest System natural resources.”

The report also notes that:

Those favoring Alternative I tend to see National Forest System lands as whole ecosystems which intensive human activity disrupts. . . . Protecting the WRNF consists in minimizing human disturbance and mimicking natural processes. . . . Active management activities are thus often viewed as unnecessary and unwise meddling in complex natural systems that humans do not yet fully understand.” They believe intact forest ecosystems should be protected for their own intrinsic value, for the benefit of wildlife, and for the non-commodity benefits public lands offer to humans. . . . Those who favor Alternative I see the forest as an ecosystem whose long-term functioning is best preserved by restoring natural disturbance regimes such as fire, insect and disease cycles. . . . According to many proponents of both Alternative D and I, satisfying human desires for forest resources must take second place to satisfying the equal human need for natural forest ecosystems. . .

On the other hand:

While they value many similar forest characteristics, advocates of Alternative C perceive proper management of National Forest System lands differently. . .” “They also see national forests in terms of the resources they offer for human use, but identify a very different set of primary uses. Many of these users do express significant concern for the environment. However, they feel that negative impacts of human activity have been greatly exaggerated. “Those supporting Alternative C tend to see national forests as natural systems whose health is often threatened by unmanaged natural processes. They tend to favor a utilitarian or agricultural model whereby human ingenuity and modern timber management can maximize forest health for human benefit. . . . For these people, protection consists of managing these lands for sustainable resource extraction, controlling fire, and fighting insect and disease outbreaks aggressively.

In many ways, the two groups of respondents whose positions are outlined above resemble the two clusters of stakeholders identified in each of the three surveys. Advocates of Alternatives D or I are more environmentally/conservation oriented and have objectives for the White River National Forest with the same orientation. Advocates for Alternative C or its variants are more human use oriented and have objectives consistent with that orientation.

However, despite the differences between the two groups, there are areas of agreement. First, respondents in both groups care very deeply about how the White River National Forest is managed. Second, respondents in both groups feel that sustaining wildland ecosystems is very important, with disagreement primarily arising over how this should be done and the nature and amount of human activities consistent with ecosystem sustainability. Third, most respondents recognize that there are many classes of forest users, who all have a right to pursue legitimate activities. These are very similar to the areas of agreement between cluster respondents in the surveys.

STAKEHOLDER GROUP MEETINGS

The next step in this process involved validation of White River National Forest stakeholders’ objectives. Validation was accomplished through a series of six stakeholder group public meetings held on February 5, 6, and 12, 2001, in Glenwood Springs, Avon, and Denver. While these were public meetings, and therefore open to anyone, each one focused on objectives validation with a selected group of stakeholders. In the order the meetings were held, these groups were: motorized recreation, non-motorized recreation, government and other interests, ski interests, environmental/conservation interests, and second-home owners. The first product of these meetings was a complete set of notes on the results of the objectives validation for all groups.

The original raw notes for each group were then refined into a second product—objectives hierarchies (Keeney 1992) for each group. An objectives hierarchy is a more detailed method for presenting a set of objectives than the lists used for the surveys. In an objectives hierarchy, there are three categories of objectives, based on their specificity. The most general or all-encompassing objectives are called ‘strategic’ objectives, while somewhat more specific objectives are referred to as ‘fundamental’ objectives; the most specific are called ‘means’ objectives, in that they are the means for accomplishing the

higher order, more general objectives. The purpose for using objectives hierarchies here is to identify stakeholder objectives that are specific enough to link stakeholders to forest plan alternatives. Means objectives are specific enough that variables called attributes can be associated with them. These attributes measure the level of accomplishment of each objective under each plan alternative, and as such, provide the link between stakeholder objectives and forest plan alternatives.

Table 178 contains a portion of one of the objectives hierarchies developed from notes taken at one of the stakeholder meetings. There is one overall or strategic objective, under which two fundamental objectives fall. In turn, under the first fundamental objective there are four means objectives and under the second one, two means objectives. Attributes are associated with each of the means objectives. Appendix B of the FEIS provides a complete listing of the six objectives hierarchies developed for the six groups.

Table 178
A portion of an objectives hierarchy for one of the stakeholder groups

STRATEGIC OBJECTIVE ECI-1:	
Maintain/enhance ecologic integrity with all parts and processes at all scales across jurisdiction boundaries.	
FUNDAMENTAL OBJECTIVE ECI-1-1 UNDER STRAT. OBJECTIVE ECI-1	
Maintain/enhance viable populations of all species.	
MEANS OBJECTIVES UNDER FUNDAMENTAL OBJECTIVE ECI-1-1	
Objectives	Attributes
ECI-1-1-1: -Presence of lynx in the ecosystem.	-Acres of suitable lynx habitat
ECI-1-1-2: -Managing habitat for native, threatened, endangered, and sensitive species	-Acres of suitable habitat for T&E species -Population surveys & trends -Configuration of habitat in terms of adjacency & configuration to avoid isolation of habitat
ECI-1-1-3: -Ensure physical separation of bighorn sheep from domestic sheep	-Acres of management area designated for Bighorn Sheep and Acres of management area designated for sheep allotments
ECI-1-1-4: -Better defined suitability of land for livestock grazing	-Evaluation of non-livestock uses compared to livestock grazing—include both economic and ecological measures (use available measures)
FUNDAMENTAL OBJECTIVE ECI-1-2 UNDER STRAT. OBJECTIVE ECI-1:	
Manage transportation on the forest in a way that protects/enhances ecosystem integrity	

As an example of how an objectives hierarchy works, consider strategic objective ECI-1 in **Table 178**: “Maintain/enhance ecologic integrity with all parts and processes at all scales across jurisdiction boundaries.” This is a very general statement that can mean a number of different things. Fundamental objective ECI-1-1, “Maintain/enhance viable populations of all species,” is considerably more specific, but because of the number of possible species, it is still not specific enough to measure. Moving down to the means objectives, ECI-1-1-1, “Presence of lynx in the ecosystem,” is relatively easily (if indirectly) measured by the number of suitable acres of lynx habitat present on the White River National Forest. Means objective ECI-1-1-3, “Ensure physical separation of bighorn sheep from domestic sheep,” is measured by two attributes: the number of acres designated for management areas designated for bighorn sheep, and the number of acres in sheep grazing allotments. This approach works because no acre on the forest is allocated to both of these purposes.

Some the objectives in the six stakeholder group hierarchies are broad, and in some cases they address issues that are beyond the scope of this forest plan revision. These were removed as candidates for linkage to plan alternatives. Other objectives for which the White River National Forest has no data, or that will be addressed either in the transportation plan or in site-specific project planning, were also removed from consideration. The remaining objectives were categorized into three categories: those that can be linked to plan alternatives, those that are addressed using standards and guidelines, and those that are addressed at the site-specific (project) level. This last categorization was done at the means objective level.

The final results of this analysis are shown on the left sides of **Tables 179** and **180**, that is, the set of means objectives that can be linked to the plan alternatives, grouped into two categories. The two categories are: (1) commonly held objectives (means objectives held by two or more stakeholder groups) and (2) uniquely held objectives (those held by a single group). **Tables 179** and **180** represent a sample of all the objectives and attributes found in Appendix B.

As an example of what is meant by linking a means objective to plan alternatives, consider the two means objectives in **Table 178** discussed above. Objective ECI-1-1-1 relative to lynx habitat does not appear in **Tables 179** or **180**, while objective ECI-1-1-3 does. The reason for this is that lynx habitat is addressed by a forest plan standard and guideline and does not vary by alternative. Lands allocated to bighorn sheep or domestic sheep grazing do vary alternative, and are therefore of value in the alternative comparison.

Table 179

Representative stakeholder objectives, attributes, and impacts for commonly held objectives, by alternative

Commonly Held Objective			Attribute		Alternative						
Stakeholder(s)	Description	Objective Code	Description	Units	B	C	D	E	F	I	K
Motorized Recreationists; Non-Motorized Recreationists	Provide recreation opportunities not in crowded areas; Provide separation of uses	MR-1-2; NMR-1-1	Areas by Recreation Opportunity Class*	M Acres							
			SUMMER:								
			Roaded Modified & Natural	"	289.4	173.0	111.0	156.0	424.1	116.3	221.7
			Semi-Primitive Motorized	"	631.5	722.2	900.2	839.0	746.5	519.5	508.5
			Semi-Primitive, Non-Motorized + Primitive + Pristine	"	1,237.6	1,308.9	1,217.6	1,182.2	1,003.8	1,583.6	1,490.1
			WINTER:								
			Roaded Modified & Natural	"	218.8	89.5	60.5	84.2	348.5	70.0	53.7
			Semi-Primitive Motorized	"	948.6	841.9	779.8	986.0	852.3	456.7	828.0
			Semi-Primitive, Non-Motorized + Primitive + Pristine	"	1,014.5	1,281.9	1,392.0	1,121.2	987.6	1,696.1	1,345.4
Non-Motorized Recreationists; Skiing Interests	Provide high-quality non-motorized rec opportunities by incorporating separation of uses, opportunities for solitude, and desirable settings; Manage the Forest to preserve scenic, wildlife and other environmental values	NMR-1-1; SI-1-4-1	Naturally appearing landscapes*	M Acres	1,716	1,836	1,669	1,973	1,591	2,038	1,707

Table 179 continued

Commonly Held Objective			Attribute		Alternative						
Stakeholder(s)	Description	Objective Code	Description	Units	B	C	D	E	F	I	K
Non-Motorized Recreationists; Environmental/Conservation Interests	Identifying and protecting unique ecological values; Protect biodiversity	ECI-1-4-2; NMR-2-1	Recommended for Research Natural Areas	Acres	0	87,300	106,100	59,700	69,300	129,300	53,100
Non-Motorized Recreationists; Second Homeowners	Protect biodiversity; Protect water resources for natural habitat	NMR-2-1; HO-1-3	Stream or riparian restoration*	Miles	12	14	15	14	13	38	15
			Soil or water sources improved*	Acres	240	280	300	280	270	800	290
			Lakes & wetlands restored or enhanced*	Acres	23	27	29	27	26	78	28
Environmental/Conservation Interests; Second Homeowners	Roadless area protection; Prevent destruction of forest land and wilderness areas that could not be restored—destruction means things such as clear cutting and paved parking lots	ECI-1-2-1; HO-1-4	Lands managed for roadless characteristics	Acres	34,094	258,208	163,507	200,289	50,983	445,765	204,451
Environmental/Conservation Interests; Second Homeowners	Provide as much wilderness as possible—keep it the way it is knowing it's going to change anyway; Recommend more wilderness	ECI-1-2-1; HO-1-4	Recommended for wilderness	Acres	0	94,300	47,200	103,000	0	205,000	81,600

Table 180

Representative stakeholder objectives, attributes, and impacts for uniquely held objectives, by alternative

Uniquely Held Objective			Attribute		Alternative						
Stakeholder	Description	Objective Code	Description	Units	B	C	D	E	F	I	K
Non-Motorized Recreationists	Provide non-motorized areas in different ecosystems -at various elevations	NMR-1-4	Low Elevation Ecosystem Type Recommended for Wilderness*	Acres	0	18,622	17,502	22,028	0	38,857	12,970
Non-Motorized Recreationists	Be willing to set and enforce limits on recreation use	NMR-1-7	Establish carrying capacity of total use (non-Wilderness)	PAOT	159,960	116,940	92,330	108,650	175,970	94,960	116,700
Government & Other Interests	Continued stable and viable Forest utilization for historic/traditional uses	GO-1-1-3	Open Allotments	Number	51	20	24	8	34	21	23
Government & Other Interests	Maintain or improve the social & economic health of communities near the Forest	GO-1-1-5	Direct, indirect, and induced economic effects for employment	Avg Annual Jobs	33,113	33,054	32,700	33,054	32,883	32,523	33,004
Government & Other Interests	Improve the relationship between FS and local governments by working together where there are common or affected interests.	GO-1-3-1	Forest Plan Intermix Management Area Designation*	Acres	0	7,700	0	900	12,900	4,200	7,800
Skiing Interests	Provide a variety or broad range of safe skiing experiences	SI-1-2-1; SI-1-2-4	Skier density	Skiers/Acre	189	305	393	210	258	390	342
			Areas for back country non-motor rec (MA 1.31)	Acres	62,200	160,400	87,700	83,500	37,700	397,600	147,200

Table 180 continued

Uniquely Held Objective			Attribute		Alternative						
Stakeholder	Description	Objective Code	Description	Units	B	C	D	E	F	I	K
Environmental/Conservation Interests	Ensure physical separation of bighorn sheep from domestic sheep	ECI-1-1-3	Management Areas designated For Bighorn Sheep	Acres	7,700	92,700	111,200	91,200	22,300	133,900	130,400
			Lands suitable for sheep grazing	Acres	1,167,261	944,521	960,708	891,215	1,040,849	910,922	962,459
Environmental/Conservation Interests	Identify and protect unique ecological values	ECI-1-4-2	Special Interest Areas	Acres	328	9,141	30,720	4,457	2,613	17,200	24,269
Second Homeowners	Prevent destruction of forest land and wilderness areas that could not be restored—destruction means things such as clear cutting and paved parking lots	HO-1-4	Timber lands clearcut per year in Decade 1	Acres	680	245	510	245	1,050	285	580

Results are very consistent when comparing the objective sets from the stakeholder meetings to results from the surveys or public comment. Here the most strongly agreed with or disagreed with objectives from the three surveys (**Tables 176 and 177**) are compared to the stakeholder group objectives linked to forest plan alternatives (**Tables 179 and 180**). This comparison is somewhat difficult because the stakeholder group objectives are specific means-level objectives while the objective statements used in the surveys correspond more closely with general statements of strategic objectives. Even so, all four sets of objectives largely align themselves with two themes or underlying issues—ecosystem conservation versus human use and economic interests.

These issues correspond closely with the dichotomy defined by the two clusters identified for each survey. Many of the conservation issues relate to the amount of wilderness or to transportation issues such as the amount of roadless area and the system and non-system roads and trails. Included among these are six objectives that are among the six most strongly supported by at least one cluster and at the same time are among the five most strongly disagreed with by at least one other cluster. Similar or related ecosystem conservation issues are identified in **Tables 179 and 180**.

From **Table 179** these include the third listed objective (ECI-1-4-2/NMR-2-1) for protecting unique ecological values and biodiversity and the fifth objective (ECI-1-2-1/HO-1-4) for roadless area protection and wilderness establishment. These are commonly held objectives, both being held by the environmental/conservation interests, and the fifth also being held by second-home owners, and the third also being held by the non-motorized recreationists. Objectives included from **Table 180** are the first (NMR-1-4) for providing non-motorized areas in different ecosystems and at various elevations, the eighth (ECI-1-4-2) for protecting unique ecological values, and the last (HO-1-4) for preventing irreversible modification or destruction of forestland. Non-motorized recreationists, environmental/conservation interests, and second-home owners groups hold these objectives respectively.

This correspondence between strategic objectives from the survey clusters and means objectives from the stakeholder meetings is strong evidence that conservation issues are among those around which there is the greatest disagreement across a broad array of stakeholder groups. It appears that the idea of ecosystem conservation is not the source of disagreement, but rather the means by which such conservation can be achieved.

Human use and economic sustainability issues are also represented in this comparison. The two remaining issues showing both strong agreement and strong disagreement in the cluster analysis relate to timber harvesting. Conservation-leaning clusters strongly support restrictions on consumptive uses such as timber harvesting, grazing, and mining. All clusters in these two surveys strongly support requiring companies engaged in mining, timber harvesting, or grazing to restore the land to its natural state after use. This result also supports the notion that it is not the idea of ecosystem conservation that is the source of disagreement, but rather the means by which such conservation can be achieved.

Human use and economic interest objectives of stakeholder groups that are being linked to forest plan alternatives (**Table 180**) include the third objective (GOI-1-1-3) for continued stable and viable White River National Forest use for historical/traditional uses; the fourth objective (GOI-1-1-5) for maintaining or improving the social and economic health of communities near the White River National Forest; and the sixth

objective (SI-1-2-1) for providing a broad range of safe skiing experiences. One conclusion that can be drawn is that the same ecosystem conservation and human use dichotomy that helped create two clusters in each of the surveys is clearly identifiable in the stakeholder objectives that are linked to forest plan revision alternatives as well.

These results suggest that while there are many stakeholder groups, when individuals are considered in terms of all of their objectives for the White River National Forest, they aggregate into a much smaller number of groups. The results also suggest that there is some basis for agreement even across the aggregated groups. This is one reason why the public involvement component of a forest plan revision is so important—properly designed and implemented, it provides a forum for people to realize that there may be more agreement among individuals than their affiliations in different stakeholder groups may suggest.

Environmental consequences

DIRECT AND INDIRECT EFFECTS

The right sides of **Tables 179** and **180** show how the plan alternatives vary for each of the listed stakeholder attributes. The objectives and attributes displayed in these tables are not only representative but also effective for comparing alternatives. The alternatives are linked only to (a) means objectives, and (b) attributes that are influenced by the various plan alternatives and whose level of achievement can be estimated for each alternative.

Table 179 presents objectives that are similar in character and share common attributes. This is not to say that each stakeholder of a commonly held objective will desire the same results—some could prefer higher levels of the attribute, while others could prefer moderate levels. The desirability of specific attribute levels was not obtained from the stakeholders. Nonetheless, the common interests presented in **Table 179** can provide insight into how the alternatives benefit multiple stakeholders.

Non-motorized recreationists, environmental/conservation interests, and second-home owners all share a common objective four times, most often with one another. Motorized recreationists and skiing interests each share a common objective once.

Providing separation of uses and minimal crowding is the first common objective, perhaps the most difficult one to address simply. The recreation opportunity spectrum (ROS) provides one attribute or measure that may be useful in characterizing separation of uses. While ROS is not a perfect indicator, it does suggest a way in which stakeholders may benefit from each alternative. The ROS of greatest overlap, and potentially greatest conflicts, between motorized and non-motorized uses may be semi-primitive motorized (SPM). When the proportion of SPM lands decrease, separation of uses is more likely to occur. In the summer, Alternative B, no action, provides 28 percent of all lands to SPM. This proportion increases in Alternatives C, D, E, and F, and decreases in Alternatives I and K. Alternative K offers the lowest proportion of lands in SPM at 22 percent. Thus, Alternative K may offer the greatest potential separation of motorized and non-motorized uses.

In separating uses, however, the resulting opportunities for competing uses can change. For motorized recreationists, 13 percent of all lands are in the roaded modified (RM) and roaded natural (RN) categories in Alternative B. This proportion increases to 19 percent

in Alternative F, but decreases in all others. Alternatives D and I offer the lowest percentage of RM and RN lands at 5 percent; Alternative K is the nearest to Alternative B at 10 percent. Thus, motorized recreationists may benefit the most from Alternative F, as it may provide less crowding, but at the cost of less separation. For non-motorized recreationists, the percent of lands in semi-primitive non-motorized, primitive, and pristine are important indicators. Alternative B provides 54 percent of lands in these categories. This percentage drops for Alternatives D, E, and F, and increases for Alternatives C, I, and K. Alternative K offers best potential separation of uses and provides non-motorized recreationists a 9 percent increase in lands that offer non-motorized recreation.

ROS classes change in the winter. Alternatives B and E offer the largest areas of overlap (SPM), over 40 percent. Alternative I offers the least at 20 percent, suggesting greater separation of uses. The remaining alternatives provide 34 percent to 37 percent of lands in the SPM class. Crowding for motorized recreationists (snowmobiles) maybe the highest in Alternative K, as it offers a reduction from 10 percent of lands in the RM and RN classes for Alternative B. Crowding would be least in Alternative F, with a 5 percent increase in the RM and RN classes. Thus, Alternative F offers the least crowding for motorized recreationists, but is only moderate for separation of uses. For non-motorized recreationists, such as Nordic skiers, the semi-primitive non-motorized, primitive, and pristine classes increase for all alternatives except Alternative F. Alternative I offers the highest level of these classes at 74 percent of lands. Alternatives D and K are second with about 60 percent. Thus, Alternative I provides the highest level of potential separation and lack of crowding for non-motorized recreationists.

There is a great similarity to how the alternatives address the remaining commonly held objectives and their stakeholders. For all but one objective, Alternative I appears to benefit the non-motorized recreationists, skiing interests, environmental/conservation interests, and second-home owners more than any other. Lands in wildlife corridors is the objective that is somewhat different. Alternative K offers the most acres in wildlife corridors. Just as Alternative I offers the highest benefits to many commonly held objectives, Alternative B generally offers the least benefits to these same objectives. Again, there is one exception to this pattern—Alternative F offers fewer acres in naturally appearing landscapes than does Alternative B.

Table 180 displays a representative sample of 9 uniquely held objectives by specific stakeholder groups. All stakeholders are represented except motorized recreationists. This exception results from this group's objectives and attributes being better aligned with the transportation plan than with the revised forest plan.

For non-motorized recreationists, two objectives are listed. The first objective, low elevation ecosystems for non-motorized recreation, is best provided in Alternative I; none of these systems are available in Alternatives B and F. The second objective, setting limits on recreation use, cannot easily rely upon a single attribute. Neither more nor less use helps meet this objective; rather, it is the process of establishing carrying capacity and managing the land to that standard that best addresses this objective. The estimated carrying capacity is offered in **Table 179** as the first of many steps in that process.

For government and other interests, no single alternative best addresses their uniquely held objectives. Government interests offered the number of open allotments as an attribute. Alternative B appears to best meet this objective, yet many open allotments have gone ungrazed for years. Once current markets are considered, other measures and

alternatives may better address the objective of continuing historical uses on the national forest. With regard to employment effects, slower growth is preferred to unbridled growth. Under no alternatives would employment decrease. Consequently, Alternative I may best address this objective, while Alternative B would not address it at all. With regard to lands allocated to the intermix management area, Alternative F appears to offer the most benefits and Alternative B the least. From this small sample of objectives, it appears that Alternative B, no action, may be the least favorable alternative to government and other interests; it is difficult to say which alternative overall may be the most favorable.

For skiing interests, the one objective listed is connected with downhill skiing through one attribute and with Nordic skiing through a different one. Within ski area boundaries, skier density was suggested as an indicator of the objective. Alternative B best addresses this skier interest while Alternative D may address it the least. Outside of ski area boundaries, the size of backcountry areas was the suggested indicator. Alternative I appears to offer the most benefits in these terms while Alternative F offers the least.

For environmental/conservation interests, two objectives are listed. The objective of separating bighorn sheep from domestic sheep is addressed using management area distinctions. While number of acres may not be the best indicator, the probability of separation increases as lands allocated to each use is in balance with animal demand. All the alternatives increase acres allocated to bighorn sheep, providing from three to 17 times as many acres as Alternative B; Alternative I provides the most at 133,900 acres. Meanwhile, acres identified as suitable for domestic sheep grazing drop modestly from 1.1 million acres in Alternative B to a low of about 0.9 million in several alternatives. Special interest areas help address the objective of identifying and protecting unique ecological values. Alternative B addresses this objective in the weakest manner. The other alternatives offer from eight to nearly 100 times the acres in special interest areas compared to Alternative B.

In summary, as shown in **Tables 179** and **180**, Alternative B is most often the least desirable in addressing the various objectives. This observation seems to validate the need for revising the forest plan. Also, only once each do Alternatives C and K best address or least address stakeholder objectives. These alternatives appear to offer compromises or a middle ground among the representative objectives and attributes by stakeholders displayed in the tables.

CUMULATIVE EFFECTS

Objectives regarding the management of National Forest System lands are often not transferable to other public or private lands. However, as private lands are developed and become more crowded with visitors and residents, the objectives for National Forest System lands become increasingly intense. It is difficult to say whether the areas of agreement and disagreement among stakeholders will expand or contract. While it is not clear whether the observations made for the direct and indirect effects on stakeholders would change, it seems reasonable that increased effort on the part of all stakeholders will be necessary to find ways in which common ground can be discovered and differing objectives can be satisfied.

Financial and Economic Efficiency

Both financial and economic efficiency are analyzed in this section. Financial efficiency examines revenue and cost implications from the perspective of the Forest Service. It could also be said that this is the perspective of the taxpayer. Only those revenues and costs that are recorded in financial records are included in this analysis.

Economic efficiency examines a broader definition of benefits by including values for national forest uses that are not captured in the marketplace. Willingness-to-pay values for recreation use are the primary additions over a financial analysis. Estimated market value for meat gained by grazing livestock on public land is also included. Water values have been excluded from this analysis, but not because the values themselves are unavailable; rather, research has found that determining changes in water yields at the programmatic level is very difficult to accomplish. Annual variations in yield have not been well correlated with management-area allocations. This is not true at the project level. Consequently, there are no estimates of water yield changes to which values can be assigned. See Appendix B for a description of values used in the economic analysis.

Many non-market, non-use values are excluded from this economic efficiency analysis. Some outcomes or effects, such as biological diversity, visual amenities, and some social impacts have no monetary values or costs that have been established by USDA or the Forest Service. While some research studies have explored the development of such values, it is reasonable to handle these items in a non-monetary fashion. This is done other sections of this EIS. The agency cost of achieving these nonmonetary outputs is included in both the economic and financial analyses.

Net public benefit is an important concept in the current regulations for carrying out a forest plan revision. Net public benefit is defined as the overall value to the nation of all outputs and positive effects (benefits) minus all the associated Forest Service inputs and negative effects (costs) for producing those primary benefits, whether they can be quantitatively valued or not. Thus, net public benefits conceptually are the sum of this economic analysis *plus* the net value of nonpriced outputs and costs. It is not the result of an economic analysis alone. This concept is the basis upon which the Regional Forester selects an alternative for implementation. Net public benefits are discussed in the Record of Decision.

The main criterion used in assessing financial and economic efficiency is *present net value* (PNV), which is defined as the value of discounted benefits (or revenues) minus discounted costs. A PNV analysis includes all outputs, including timber, grazing, and recreation, to which monetary values are assigned. As noted above, the monetary values include both market and nonmarket values received by the public.

In addition, a financial efficiency analysis is completed to determine the net financial returns of each alternative. A financial efficiency analysis is the PNV of Forest Service revenues and costs. **Table 181** displays the economic and financial PNV for each alternative. All monetary values are expressed in constant dollars with no allowance for inflation. A 4 percent discount rate was used over a 50-year period (2000 to 2049). Revenues are not reduced for payments made to states and counties. The reduction of PNV in any alternative as compared to the most financially or economically efficient solution is the economic trade-off, or opportunity cost, of achieving that alternative.

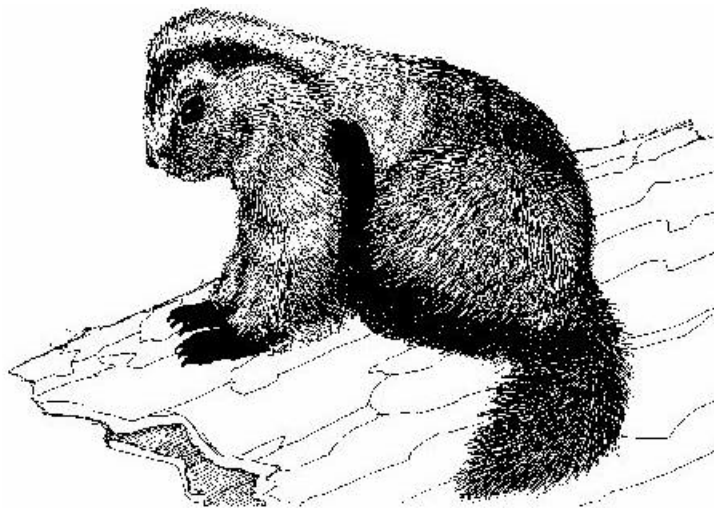
Table 181
Economic and financial efficiency (present net value over 50 years in millions of 2000 dollars)

<i>Experienced budget level</i>	ALTERNATIVE						
	B	C	D	E	F	I	K
Forest Service revenues	\$245	\$205	\$223	\$204	\$283	\$200	\$238
Public benefits	\$15,418	\$15,378	\$15,011	\$15,377	\$14,966	\$14,956	\$15,388
Costs	-\$283	-\$283	-\$283	-\$283	-\$283	-\$283	-\$283
Financial net revenues	-\$38	-\$78	-\$60	-\$79	\$0	-\$83	-\$45
Economic net benefits	\$15,135	\$15,095	\$14,728	\$15,094	\$14,683	\$14,673	\$15,105
<i>Full budget level</i>							
Forest Service revenues	\$272	\$218	\$247	\$216	\$328	\$207	\$265
Public benefits	\$15,445	\$15,391	\$15,035	\$15,389	\$15,011	\$14,963	\$15,416
Costs	-\$424	-\$424	-\$424	-\$424	-\$424	-\$424	-\$424
Financial net revenues	-\$152	-\$207	-\$177	-\$209	-\$96	-\$217	-\$159
Economic net benefits	\$15,021	\$14,966	\$14,611	\$14,964	\$14,587	\$14,538	\$14,991

Source: USDA Forest Service

As shown in **Table 181**, the financial PNV (Forest Service revenues minus costs) for experienced budget levels varies from a negative \$83 million for Alternative I to a break-even position for Alternative F. What appears to make Alternative F the highest PNV is high timber harvest levels. Alternatives with preservation emphases show the highest net cost to the taxpayer, because there are no agency revenues associated with these emphases while expenses remain the same. This same pattern is true for the full budget level, but the PNVs are lower. Higher expenses of this level do not generate additional revenues sufficient to offset the budget increase.

The economic PNV (public benefits minus costs) is positive for all alternatives at both budget levels. The net value ranges from a low \$14.5 billion for Alternative I to a high of \$15.1 billion for Alternative B. There is only a 3 percent difference between the lowest and highest PNV—a difference that may be indistinguishable given estimated accuracies for value and output estimates. The net economic benefits are orders of magnitude larger than the financial gross revenues. This suggests that even with the limited monetary values available for the analysis, society benefits greatly from implementing any alternative fully considered in this document.



TOPIC 8

AMERICAN INDIAN RIGHTS AND INTERESTS

Introduction

This section highlights the traditional and contemporary connection between American Indian tribes and the White River National Forest. It provides a general understanding of the American Indians who are affiliated with the White River National Forest and who regard the forest as an indigenous peoples' landscape.

There are three federally recognized Ute Indian tribes that have affiliation with the White River National Forest. These three tribes are the Ute Indian Tribe, the Southern Ute Indian Tribe, and the Ute Mountain Ute Indian Tribe. Together they comprise the Three Confederated Ute Indian Tribes. The White River National Forest is an important landscape to the Three Confederated Ute Indian Tribes and is considered part of their ancestral homeland. The individual bands that make up each tribe are listed below.

Table 182
Affiliated American Indian Tribes and Band Names

Name of Federally Recognized Tribe	Name of Bands Within Tribe	General Territories up to mid 1800s
Ute Indian Tribe	Uncompahgre, White River, Uintah	The Uncompahgre (also known as the Tabehuache) lived in the valleys of the Gunnison and Uncompahgre Rivers. The White River inhabited the Yampa River Valley and surrounding lands. The Uintah Utes inhabited the Uintah basin and surrounding lands.
Southern Ute Indian Tribe	Mouache, Capote	The Mouache lived in southern Colorado and New Mexico, almost as far south as Santa Fe. The Capote inhabited the San Luis Valley, near the headwaters of the Rio Grande, and the region around the towns of Chama and Tierra Amarilla, New Mexico.
Ute Mountain Ute Tribe	Weeminuche	The Weeminuche occupied the valley of the San Juan River and its northern tributaries in Colorado and northwestern New Mexico.

Legal and Administrative Framework

The United States government has a unique relationship and responsibility to federally recognized American Indian tribes. The Three Confederated Ute Tribes have federal recognition status. The Northern Ute Tribe currently resides on the Uintah and Ouray Reservation headquartered at Ft. Duchesne, Utah. The Southern Ute Tribe currently resides on the Southern Ute Reservation headquartered at Ignacio, Colorado. The Ute Mountain Ute Tribe currently resides on the Ute Mountain Reservation headquartered at Towaoc, Colorado.

A series of historical negotiations and agreements first existing between the Ute Nation and the Spanish government, then the Ute Nation and the Mexican government, and finally treaties between the Ute bands and the United States government recognize the status of the Ute Indians and their influence within aboriginal territories. The treaties entered into between the Ute Nations and the United States government reflect a renegotiation of land reserved for the Ute Indians and identify services to be provided by the United States government in exchange for acquired Ute territory. Universally understood as a central concept of Indian law, all *“treaties entered into with American Indians were not a grant of rights to tribes, but rather a grant of rights from tribes, with the Indian tribes retaining all of the powers and rights of sovereign nations granted by the tribe pursuant to the treaty or taken from the tribe by federal statute”* (USDA Forest Service 1997g).

The earliest and most useful legal interpretations of the federal trust relationship became defined and articulated by congressional legislations and Supreme Court decisions. Three opinions written by Chief Justice John Marshall are perhaps the most definitive and important. They are referred to as the Marshall Trilogy: *Johnson v. M’Intosh* (1823), *Cherokee Nation v. Georgia* (1831), and *Worcester v. Georgia* (1832). These cases and others provided a framework still used today to understand and interpret laws and treaties particular to American Indians.

Basic elements of federal Indian law are:

The Trust Relationship: Indian tribes are “distinct political” communities “that are domestic dependent nations” whose “relation to the United States resembles that of a ward to his guardian.” This statement has been wrongly interpreted to imply a child-parent relationship. Rather, the United States has an obligation to American Indians. The obligation is a federal trust responsibility.

The federal trust responsibility is the United States government’s permanent legal obligation to exercise statutory and other legal authorities to protect tribal lands, assets, resources, and treaty rights, and the duty to carry out the mandates of federal law with respect to American Indian and Alaska native tribes. Federal Indian policy and “trust responsibilities” have developed from court decisions, congressional laws, and policies articulated by the President of the United States.

For the Forest Service, trust responsibilities are essentially those duties that relate to the reserved rights and privileges of federally recognized Indian tribes found in treaties, executive orders, laws, and court decisions, that apply to the national forests and grasslands (USDA Forest Service 1997g).

Tribal Sovereignty: American Indian nations have the inherent authority and power of self-governance. These powers existed prior to the existence of the United States government. The following paragraph written by Chief Justice John Marshall in the *Worcester v. Georgia* (1832) opinion provided the foundation for sovereignty as a basic concept of Indian law.

“The Indian nations had always been considered as distinct, independent political communities retaining their original natural rights, as the undisputed possessors of the soil, from time immemorial, with the single exception of that imposed by irresistible power, which excluded them from intercourse with any other European potentate than the first discoverer of the coast of the particular region claimed: and this was a restriction which those European potentates imposed on themselves, as well as on the Indians. The very term ‘nation,’ so generally applied to them, means ‘people distinct from others.’ The Constitution, by declaring treaties already made, as well as those to be made, to be the supreme law of the land, has adopted and sanctioned the previous treaties with the Indian nations, and consequently admits their rank among those powers who are capable of making treaties. The words ‘treaty’ and ‘nation’ are words of our own language, selected in our diplomatic and legislative proceeding, by ourselves, having each a definite and well understood meaning. We have applied them to Indians, as we have applied them to the other nations of the earth. They are applied to all in the same sense.”

As distinct, independent political communities, tribal nations possess the right to 1) establish a form of government, 2) determine membership of the tribe, 3) make laws and enforce such laws, 4) provide membership with maintenance of law and order, 5) exclude persons from the reservation, 6) charter business organization for the purpose of managing tribal assets, and 7) waive sovereign immunity, or in other words, the tribe cannot be sued.

The Reserved Rights Doctrine: Another fundamental element of Indian law is the understanding that a treaty is “not a grant of rights to the Indians, but a grant of rights from them.” Additionally, those rights not expressly given up in the treaty or federal statute are reserved for the tribe. The principal is firmly established in *Winters v. United States*, a prominent water case in 1908. From the Supreme Court’s decision a concept of reserved rights, general known as the Winters Doctrine, became established. The Winters Doctrine established that a right to water existed for an Indian tribe without the right being specifically mentioned during negotiations or written into documents forming its reservation.

Tribal Consultation: Consultation is defined in the *Forest Service National Resource Book on American Indian and Alaska Native Relations*. All consultation must take place if a decision is to be made that will affect the Confederated Ute Indian Tribes. The American Rights and Interests Section can and will be amended through the consultation process.

Environmental Consequences: The direction located in the standards and guidelines, goals and objectives of the 2001 Forest Plan applies to all alternatives. There are no differences between alternatives.

APPLICABLE FEDERAL LAWS:

- American Indian Religious Freedom Act (AIRFA) of 1978
- Native American Graves Protection and Repatriation Act (NAGPRA) of 1990 (P.L. 101-601, 25 U.S.C. 3001-3013)
- Executive Order 12898, “Environmental Justice,” 1994
- Executive Order 13007, “Sacred Sites,” 1996
- Executive Order 13175, “Consultation and Coordination with Indian Tribal Governments,” 2000

FOREST SERVICE REGULATIONS:

- Forest Service National Resource Book on American Indian and Alaska Native Relations, April 1997
- FSM 63.01
- FSM 1563

TOPIC 9

OTHER CONSIDERATIONS

POTENTIAL CONFLICTS WITH GOALS AND OBJECTIVES OF OTHER AGENCIES

The White River National Forest has met with several other government agencies during the plan revision effort. Forest staff has met with and discussed the forest planning process and the revision topics with federal, state, county and local government agencies. The alternatives, associated effects and forest-wide and management area prescriptions generally are compatible with the goals and objectives of land management agencies adjacent to or near the forest.

With regard to water resources, federal requirements and authorities for maintenance and protection of these resources may conflict with the state's administration of water rights.

RESOURCE COMMITMENTS

Energy requirements for implementing the alternatives

Energy is consumed in the administration and use of natural resources from the forest. For the purpose of the revised plan, energy resources are gasoline, diesel fuel, liquefied petroleum, natural gas, electricity and wood. Although many activities consume energy, the following are those considered significant in the implementation of any alternative.

- Energy consumed in timber harvesting is the amount required for felling, bucking, skidding, loading, hauling, performing road maintenance, and industrial traffic associated with harvest activities.
- Energy consumed in utilizing range vegetation is the amount required for hauling stock to and from the range, permittee range improvements, watering and salting and herding.
- Energy consumption related to recreation is based on the estimated number of dispersed and developed recreation visitor days, estimated trips and facility construction.
- Energy consumed in road construction and reconstruction activities is that used by contractors or Forest Service crews in completing road development.
- Energy is consumed by Forest Service administrative activities including vehicle use, lighting, heating and cooling of buildings, and fuel used in such equipments as small engines and burners.

Unavoidable adverse impacts

The application of forest-wide standard and guidelines and resource protection measures would limit the extent and duration of any adverse environmental impacts. Nevertheless, some adverse effects are unavoidable. For a detailed discussion of all effects, see the preceding discussion for each resource area.

- Air quality** Road construction, road reconstruction, timber harvest, prescribed burning, and some recreational activities and other activities cause temporary and localized reductions in air quality due to dust, exhaust fumes, and/or smoke. Smoke from wildfires can temporarily reduce air quality and visibility. Firewood gathered on National Forest System lands and burned for heat contributes gases and particulate matter to the atmosphere.
- Recreation** Activities such as timber harvest and road construction temporarily displace visitors. Changes to the recreation opportunity spectrum may displace incompatible uses over the long term.
- Water quality** When vegetation cover is removed, or soils disturbed or compacted, there is a short-term increase in sedimentation (movement of soil particles in water). Natural precipitation and flood events can cause sedimentation. Natural occurrences of chemical compounds in surface water reduce water quality. Mining operations have the potential to contaminate surface and ground water. Many historical mining operations are leaking chemical compounds that reduce water quality.
- Wildlife** Activities such as timber harvest and road construction cause short-term disturbance and displacement of some wildlife species. Continual activity such as traffic on a highway or hiking on a trail may cause long-term displacement from localized areas. Individual animals are accidentally killed by human activities. Fish habitat can be degraded by low-pH water, sediment, or contaminants.

Hazardous materials

The use of motor vehicles and the transportation of hazardous materials such as gasoline, other fuels, and building materials on roads and highways carry the potential for accidental spills.

Relationship between short-term uses of the environment and long-term productivity

Short-term uses are those expected to occur over the next ten years. These uses include but are not limited to recreation use, grazing, mineral development, timber harvest, and prescribed burning. Long-term productivity refers to the capability of the land to provide resource outputs for a period of time longer than 10 years.

Minimum management requirements established by the regulations (36 CFR 219.27) provide for the maintenance of long-term productivity of the land. Minimum management requirements, as reflected in the standards and guidelines, will be met under all alternatives. They assure that long-term productivity of the land is not impaired by short-term uses.

Monitoring, as described in Chapter 4 of the forest plan, applies to all alternatives. One purpose of monitoring is to assure that the long-term productivity of the land is maintained or improved. If monitoring and subsequent evaluation indicates that forest-wide standards and guidelines are insufficient to protect long-term productivity, the revised plan will be amended.

Although the alternatives are designed to maintain long-term productivity, there are differences among alternatives in the long-term availability or condition of resources. There may also be differences between alternatives in long-term expenditures necessary to maintain desired conditions. These types of differences between alternatives are described in Chapters 2 and 3 of the FEIS.

Irreversible and irretrievable commitment of resources

Irreversible and irretrievable commitment of resources is defined in the Forest Service Handbook at 1909.15:

The irreversible commitment of resources means that nonrenewable resources are consumed or destroyed. Examples include mineral extraction, which consumes nonrenewable minerals, and potential destruction of such things as heritage resources by other management activities. These consumptions or destructions are only renewable over extremely long periods of time.

The irretrievable commitment of resources are opportunities foregone; they represent trade-offs in the use and management of forest resources. Irretrievable commitment of resources can include the expenditure of funds, loss of production or restriction on resource use.

Decisions made in a forest plan do not represent actual irreversible or irretrievable commitment of resources, with the exception of oil and gas leasing. Forest plans determine what kind and levels of activities are appropriate. It does not make site-specific or project decisions. The decision to irreversibly or irretrievably commit resources occurs:

1. When the Forest Service makes a project or site-specific decision;
2. At the time Congress acts on a recommendation to establish a new wilderness or to include a river in the National Wild and Scenic River System; or
3. At the time the Regional Forester designates a research natural area or special interest area.

Before formulation of the 2002 Forest Plan, the Oil and Gas Leasing EIS (1994) determined that certain areas would be made available for oil and gas leasing. This analysis is on file at Supervisor's Office in Glenwood Springs, and is incorporated by reference in the 2002 Forest Plan. Essentially, this analysis allows the Bureau of Land Management to conditionally authorize certain National Forest System lands for oil and gas exploration and production. Although surface disturbance cannot occur on leased lands without further analysis and a decision document, issuance of a lease confers certain rights on the lessee, and therefore represent a commitment of resources. The Oil and Gas FEIS for the White River National Forest may have to be amended to be in compliance with the 2002 Forest Plan.

The following irreversible resource commitments are associated with decisions made in the 2002 Forest Plan. They would occur to some degree as the result of any alternatives.

- Consumption of fossil fuels, such as oil and gas
- Extraction and use of minerals
- Potential destruction or damage to heritage resources
- Potential destruction or damage to private property from wildlife.

Examples of irretrievable resources commitments associated with revised Forest Plan decisions are as follows:

- Commodity outputs and uses would be curtailed or eliminated in areas recommended for and subsequently designation as Wilderness, Wild And Scenic Rivers, research natural areas, and some special interest areas;
- Opportunities for non-motorized recreation, solitude, and primitive or wilderness experiences would be foregone if portions of the forest are not allocated or recommended for subsequently designated for these purposes;
- Timber volume outputs would be foregone on lands determines as not suitable for harvest;
- Commodity outputs would be reduced or foregone on areas allocated to specific uses or purposes, such as developed recreation sites, old-growth habitat or botanical areas; and
- To the degree that an alternative preserves or encourages the development of mature and old-growth habitat, opportunities to develop early successional habitat are reduced.