Environmental Assessment
Finding of No Significant Impact

United States
Department of
Agriculture

Forest Service
February, 2017

Buford New Castle Project

Rifle and Blanco Ranger Districts
White River National Forest
Garfield and Rio Blanco Counties
Colorado

Portions of sections 29 and 32, Township 1S, Range 91W
Portions of sections 5, 8, 9, 15, 16, 17, 18, 22, 23, 26, 27, 34, 35; Township 2S, Range 91W
Portions of sections 2, 3, 7, 8, 9, 10, 11, 17, 18, 19, 30, 31; Township 3S, Range 91W
Portions of sections 24, 25, 36; Township 3S, Range 92W
Portions of sections 6 and 7; Township 4S, Range 91W

6th Principal Meridian, Garfield and Rio Blanco Counties, Colorado

For More Information Contact

Brett Crary, Silviculturist
Rifle Ranger District
White River National Forest Service
0094 CR244, Rifle, CO 81650
bcrary@fs.fed.us
970-328-5899

In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotape, American Sign Language, etc.) should contact the responsible Agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at http://www.ascr.usda.gov/complaint_filing_cust.html and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by: (1) mail: U.S. Department of Agriculture, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442; or (3) email: program.intake@usda.gov .

USDA is an equal opportunity provider, employer and lender.

Table of Contents

CHAPTER 1: INTRODUCTION 1
Background 1
Project Location..... 2
Purpose and Need for Action 3
Proposed Action 3
Treatment Area Selection..... 3
Forest Plan Direction 5
Decision to be Made 7
Public Involvement 7
Issues 7

CHAPTER 2: DESCRIPTION OF THE ALTERNATIVES 11
Alternative 1: No Action 11
Alternative 2: Proposed Action 11
Implementation Methods 12
Silviculture Prescriptions 21
Other Opportunities 22
Transportation 22
Project Design Features 23
Alternatives Considered but Eliminated from Detailed Study 31
Potential Sale Area Improvement Projects 31

CHAPTER 3: ENVIRONMENTAL CONSEQUENCES 32
Affected Environment and Environmental Consequences 32
Physical Elements 33
Soils 33
Hydrology 37
Biological 41
Forest Vegetation..... 41
Terrestrial Wildlife 49
Botany 59
Aquatics 61
Range and Invasive Species 69
Fire and Fuels 72
Social Elements 81
Scenery 81
Recreation 89
Heritage Resources 95
Engineering 99
Economics 114

CHAPTER 4: FINDING OF NO SIGNIFICANT IMPACT 119

CHAPTER 5: AGENCIES, ORGANIZATIONS AND INDIVIDUALS CONSULTED 124

APPENDIX A – LITERATURE CITED 127

List of Figures

Figure 1.1 – Vicinity Map 4
Figure 2.1 – Proposed Action Map 1 of 8 13
Figure 2.2 – Proposed Action Map 2 of 8 14
Figure 2.3 – Proposed Action Map 3 of 8 15
Figure 2.4 – Proposed Action Map 4 of 8 16
Figure 2.5 – Proposed Action Map 5 of 8 17
Figure 2.6 – Proposed Action Map 6 of 8 18
Figure 2.7 – Proposed Action Map 7 of 8 19
Figure 2.8 – Proposed Action Map 8 of 8 20

Figure 3.1 – Species Composition 43
Figure 3.2 – Spruce-Fir Example 45
Figure 3.3 – Aspen with Fir Encroachment 45
Figure 3.4 – Spruce-Fir Examples 51
Figure 3.5 – Elk Calving Areas 52
Figure 3.6 – Aspen Habitat Example 53
Figure 3.7 – Cutthroat Conservation Populations 65
Figure 3. 8 – Seral Aspen Stand Example 74
Figure 3.9 – Aspen 20-years Post Harvest 88
Figure 3.10 – Sight Distance Example 111
Figure 3.11 – Portion of NFST2290 Proposed for Haul Route 111

List of Tables

Table 2.1 – Proposed Treatment Summary 11
Table 2.2 – Proposed Haul Routes 22
Table 2.3 – Proposed Temporary Roads 22
Table 2.4 – Design Features 23
Table 2.5 – Sale Area Improvement (KV) Projects 31

Table 3.1 – Elements of the Human Environment 32
Table 3.2 – Past, Present, and Reasonably Foreseeable Projects 32
Table 3.3 – Soils Series and Classification 34
Table 3.4 – Watersheds in the Analysis Area 37
Table 3.5 – Cumulative Harvest by Sub-Watershed 38
Table 3.6 – Proposed Treatment Acres by Management Area 42
Table 3.7 – Structural Stages within Project Area 43
Table 3.8 – Cumulative Effects Projects for Forest Vegetation 48
Table 3.9 – Change in Structural Stage from Proposed Action 48
Table 3.10 – Comparison of Alternatives for Forest Vegetation 49
Table 3.11 – Structural Stages for Analysis Area 50
Table 3.12 – Proportion of Structural Stage by Cover Type 50

Table 3.13 – Sensitive Species Determinations 56
Table 3.14 – Cumulative Projects for Wildlife 57
Table 3.15 – Region 2 Sensitive Plant Species 60
Table 3.16 – Watersheds and Sub-Watersheds in Project Area 62
Table 3.17 – Fire Behavior Predictions 80
Table 3.18 – Potential Effects to Scenery from Proposed Action 85
Table 3.19 – Alternate Routes during Proposed Road Closures 93
Table 3.20 – Cultural Surveys Previously Completed..... 98
Table 3.21 – Estimated Road Maintenance Costs 108
Table 3.22 – Total Estimated Road Maintenance Costs 112
Table 3.23 – Economic Indicators 115
Table 3.24 – Economic Indicators for No Action Alternative 117
Table 3.25 – Economic Indicators for Proposed Action 118

CHAPTER 1: INTRODUCTION

This environmental assessment (EA) is prepared to determine whether effects of the proposed activities may be significant enough to prepare an environmental impact statement. By preparing this environmental assessment, we are fulfilling Agency policy and direction to comply with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations.

This environmental assessment discloses the direct, indirect, and cumulative environmental effects that would result from the proposed action and no action (baseline) alternatives. The document is organized into four chapters:

- *Chapter 1: Introduction:* This section includes information on the history of the project proposal, the purpose and need for action, the Agency's proposal for achieving that purpose and need, and applicable Forest Plan direction. This section also details how the Forest Service informed State, local, Tribal governments, non-governmental organizations and the general public of the proposal and how the public responded.
- *Chapter 2: Proposed Action and Alternatives:* This section provides a more detailed description of the proposed action and no action alternatives. Also, this section provides a summary table of the environmental consequences associated with selecting the action alternative versus the no-action alternative.
- *Chapter 3: Environmental Impacts of the Proposed Action and Alternatives:* This section describes the environmental effects of no action, as well as the trade-offs and effects of implementing the action alternative. This analysis is organized by resource area. Within each section the existing environment is described first, followed by the estimated effects of no action that provides a baseline for evaluation, and finally the estimated effects of the action alternatives.
- *Chapter 4: Finding of No Significant Impact.*
- *Chapter 5: Agencies and Persons Consulted:* This section lists agencies and others consulted during the development of the environmental assessment, and those who prepared the environmental assessment.

Additional documentation, including more detailed analyses of project area resources, may be found in the project planning record located at the Rifle Ranger District Office in Rifle, Colorado.

Background

Forests in the Buford New Castle Project (project, the project) consist of pure stands of aspen, aspen stands that have been overtaken by more shade tolerant conifer (seral aspen stands), and mixed conifer stands comprised of subalpine fir and Engelmann spruce. The spatial arrangement of these forest types varies, but in general they change with elevation, aspect and soil type; typically, pure aspen occurs lower in elevation with southern exposures, with forests transitioning to more mixed conifer types at higher elevations. Meadows punctuate the landscape, creating a mosaic pattern as a result of soils that are not suitable for forest development. Forest condition also varies by forest type, largely as a result of past and current management activities, with disruption of natural processes stemming from fire suppression being a major factor driving current and future species composition.

Forests throughout the western United States have been shaped by wildfire over evolutionary timeframes. The sizes, intensities and frequencies of these wildfires are based largely on local climates, with certain forest types having developed adaptations that create competitive advantages in certain places. In the Buford New Castle Project area, long winters, coupled with cool summers and short wildfire seasons create a situation where wildfires occur infrequently; often with fire return intervals greater than 100-years. Since wildfires occur infrequently, forests have an opportunity to grow dense and fuels are able to accumulate. This forest development and fuel accumulation ensures that when fires do burn, they burn large areas and typically burn under a 'stand replacing' or 'mixed' fire regime.

Over time, seral stands of aspen in the project area have largely converted to subalpine fir. Without fire suppression, many of these stands or landscapes would be expected to undergo stand replacing fire during periods of drought and would regenerate as aspen. Following stand replacing fire, aspen are capable of suckering from their roots, enabling them to quickly reestablish burned areas. However, as fires continue to be suppressed, the landscape containing the Buford New Castle project area is slowly converting to a subalpine fir dominated landscape, with aspen becoming a smaller component of overall species composition.

Unlike aspen, Engelmann spruce and subalpine fir are not fire adapted species. Rather than adapting to stand replacing fire, spruce and fir have adapted to have competitive advantages under shady forest conditions. Shade tolerance enables spruce and fir stands to develop relatively complex forest structure, including horizontal and vertical canopy layering, diversity of age classes, high levels of dead and down material, snags and other attributes often associated with older forests. Mixed conifer stands within the project area are relatively dissimilar, with some stands being relatively homogenous while other stands have higher degrees of structural, age class and species diversity. Silviculture activities can be designed to increase or maintain diversity, depending on existing conditions. Age class and species diversity can increase forest resistance and resilience to insects and disease. In addition, structural diversity can contain important habitat niches utilized by certain species of wildlife.

Along the Buford New Castle Road, there are opportunities for vegetation management activities that emulate these natural processes to meet forest health and fuels reduction objectives (Forest Plan Direction page 5) while managing a travel corridor. In some areas along the road, it could be beneficial to manage vegetation to increase sight distance, increase the amount of sunlight reaching the road surface to facilitate drying of the road, or creating scenic viewpoints. In addition, segments along the Buford New Castle Road have been identified where widening the road, or straightening curves, could create safer driving conditions. The travel corridor along the Buford New Castle Road has been evaluated and units have been selected where this type of management could be beneficial. In addition, treatment units have been designed to emulate natural processes described above.

Before implementing vegetation management plans, projects are carefully designed to meet management goals and objectives, taking into consideration scale over time and space, arrangement of proposed treatment areas, and impacts to a variety of natural resources.

Project Location

The Buford New Castle Project proposes vegetation management activities in the following areas:
Portions of sections 29 and 32, Township 1S, Range 91W
Portions of sections 5, 8, 9, 15, 16, 17, 18, 22, 23, 26, 27, 34, 35; Township 2S, Range 91W
Portions of sections 2, 3, 7, 8, 9, 10, 11, 17, 18, 19, 30, 31; Township 3S, Range 91W

Portions of sections 24, 25, 36; Township 3S, Range 92W
Portions of sections 6 and 7; Township 4S, Range 91W

6th Principal Meridian, Garfield and Rio Blanco Counties, Colorado

In general, proposed management activities would occur along the Buford New Castle Road (NFSR 245), where it passes through national forest system lands between the towns of New Castle and Buford, Colorado.

Purpose and Need for Action

The purpose of the Buford New Castle Project is to manage vegetation along the Buford New Castle Road for a variety of benefits and to enhance user safety along travel corridors.

There is a need to:

1. Increase aspen as an overall portion of stand composition in seral stands that are converting to subalpine fir
2. Increase forest resiliency by increasing species and age class diversity in aspen and mixed conifer stands
3. Daylight the road corridor to facilitate drying and improve sight distance
4. Provide a supply of forest products and/or biomass to local industries

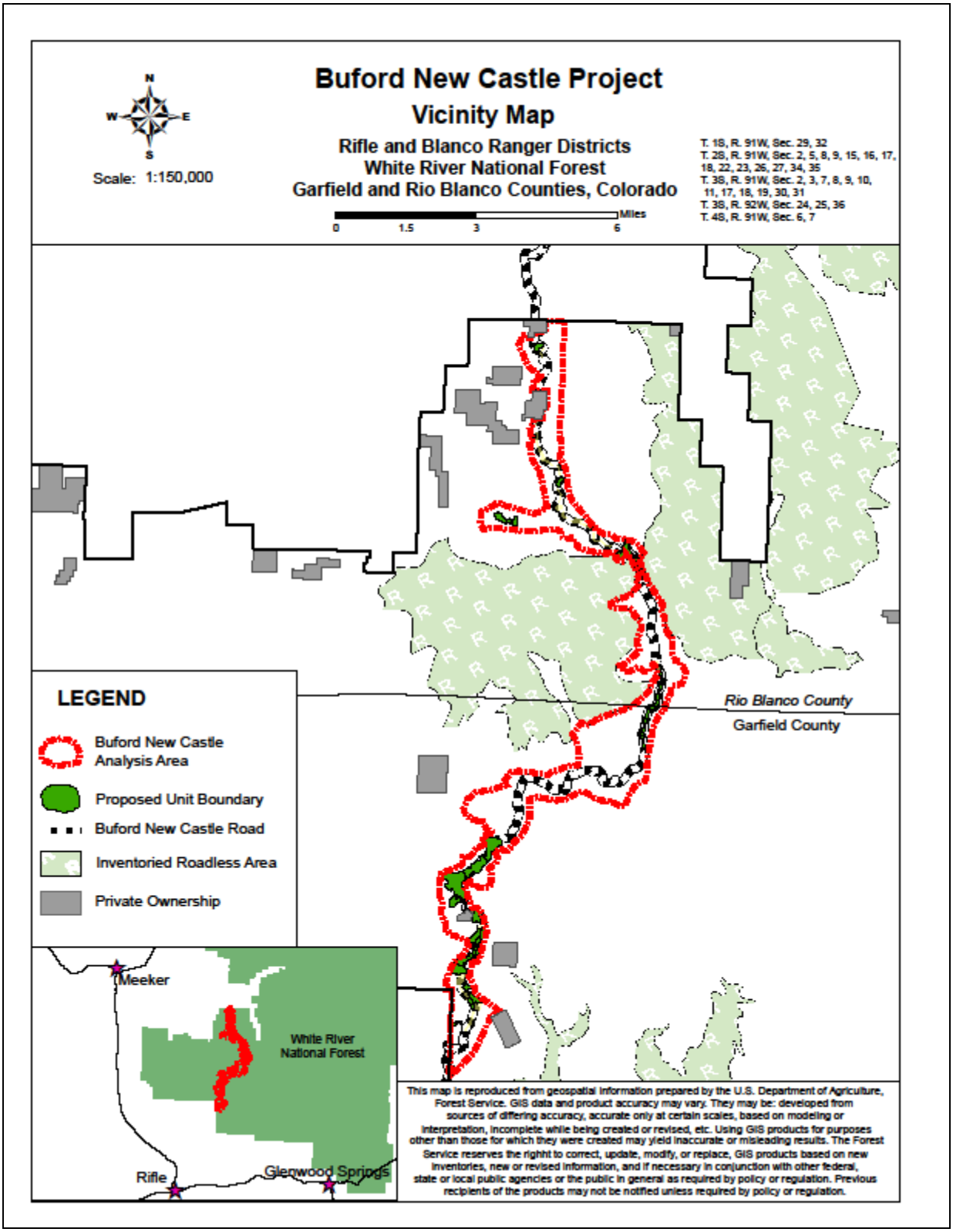
Proposed Action

The White River National Forest is proposing to implement approximately 660 acres of vegetation management activities on National Forest System lands located in Garfield and Rio Blanco Counties, Colorado. Potential treatment areas have been identified in the vicinity of the Buford New Castle Road (NFSR 245). Vegetation management activities include clearcuts, patch clearcuts, improvement harvests, commercial thinning, group selection and individual tree selection harvests.

Treatment Area Selection

Field surveys and geographic information systems (gis) were used to delineate treatment areas for the proposed project. Priority treatment areas were selected based on spatial arrangement of vegetation, proximity of forested areas to forest system roads and trails, and forest health and regeneration objectives.

Figure 1.1 Buford New Castle Project Vicinity Map



Forest Plan Direction

This proposal moves the project area toward desired conditions described in the goals and objectives outlined in the WRNF Land and Resource Management Plan 2002 Revision (LRMP). This Environmental Assessment is tiered to the LRMP Final Environmental Impact Statement (FEIS). The LRMP goals, objectives, and strategies applicable to this analysis include the following:

> **Goal 2:** Provide a variety of uses, products, and services for present and future generations by managing within the capability of sustainable ecosystems.
>
> > **Objective 2c:** Improve the capability of national forests and rangelands to sustain desired uses, values, products, and services.
> >
> > > **Strategy 2c.1:** By the end of the plan period, offer for sale the allowable sale quantity.
>
> **Goal 5:** Engage the American public, interested organizations, private landowners, state and local governments, federal agencies, and others in the stewardship of NFS lands.
>
> > **Objective 5a:** Work cooperatively with individuals and organizations, and local, state, tribal, and federal governments to promote ecological, economic, and social health and sustainability across landscapes.
> >
> > > **Strategy 5a.2:** Cooperatively work with local governments to address issues of common concern and to the extent possible maintain consistency with locally adopted master plans.

The project area is located within the following Forest Plan-designated management areas:

<u>4.3 Dispersed Recreation</u> – Dispersed recreation areas are managed to provide undeveloped recreation opportunities in natural or natural-appearing landscapes.

Applicable Desired Condition – "Biological communities are maintained or improved to provide an attractive setting for visitors, complement the recreational values, and provide varied plant communities, structural stages, and associated wildlife".

<u>5.12 General Forest and Rangelands, Range Vegetation Emphasis</u> – These areas are managed for the sustainability of the physical, biological, and scenic values of general forest and rangelands, while emphasizing forage production for livestock. Habitat and vegetation are managed to achieve and maintain the desired vegetation condition for livestock, wildlife, and recreational stock.

Applicable Desired Condition – "A variety of forested and non-forested plant communities and successional stages are maintained through a combination of human manipulations and natural processes. A diversity of desired plant and wildlife species is represented within the capability of the habitat".

5.13 Resource Production, Forest Products – These lands are managed to provide commercial wood products. In addition, they provide for forage production, other commercial products, scenic quality, diversity of wildlife, and a variety of other goods and services. Numerous open roads provide commercial access and roaded recreational opportunities, while closed roads provide non-motorized opportunities.

Applicable Desired Condition – "The desired condition of this management area prescription is to maintain suitable forested areas with commercially valuable species at ages, densities, and sizes that allow growth rates and stand health conducive to providing a sustained yield of forest products. To achieve this objective, a full array of silvicultural systems will be used that will produce a range of successional stages from seedlings to late-successional stands. Priority will be given to converting decadent and over-mature stands to young stands managed at stocking levels that maintain acceptable site occupancy and rates of growth. In areas in which timber harvest is planned, rotation periods are shorter and more frequent. Wildfires are suppressed and insect and disease populations are maintained at endemic levels to protect commercial forest products".

5.4 Forested Flora and Fauna Habitats – These areas are primarily forested ecosystems intermingled with grassland and shrub communities, and are managed to provide a mix of ecological and human needs. These needs include wildlife and aquatic habitats, livestock forage, and forest products. These areas also provide for recreational opportunities, scenic quality, and a variety of other miscellaneous goods and services.

Applicable Desired Condition – "These areas provide for a variety of forest and non-forest plant communities and successional stages, over the long term, through a combination of human manipulation and natural processes. Management activities are influenced by biological processes found in the area, and strive to replicate local natural vegetation patterns and patch size (HRV). Vegetation management is designed to simulate natural disturbances, thus silvicultural treatments may be larger than 40 acres in size. Vegetation composition and structure exist in a range of successional stages to meet wildlife and aquatic habitat, livestock forage, and forest product objectives….
A full range of silvicultural prescriptions may be employed that includes timber harvest and prescribed fire management, in which both focus on long-term desired conditions".

5.43 Elk Habitat – These areas are managed for elk. Low road densities and optimum forage and cover ratios characterize this management area prescription.

Applicable Desired Condition – "Vegetation is managed to provide healthy plant communities with a variety of species present for food and cover. Forested areas may appear managed without much evidence of damage by insects and disease. Natural and created openings or meadows of various sizes and shapes occur as well".

The project will be designed to conform to the Forest Plan and all other laws, regulations and policies. Forest Plan standards and guidelines will be applied as appropriate to meet Forest Plan goals and desired conditions.

Decision to be Made

The responsible official would decide whether to: 1) Implement the proposed activities as described, 2) Modify the proposed location or design of the project, 3) use some other combination of activities to meet the purpose and need, or 4) Not implement this project at this time.

Public Involvement

On November 19th, 2015, the Forest Service began a combined scoping and 30-day public comment period for the Buford New Castle Project. A legal notice for the project was published in the Rifle Citizen Telegram, which included a link to the Notice of Proposed Action (NOPA) and instructions on how to file comments. In addition, letters were mailed and emails sent to interested persons and groups. The official scoping period ended December 18th. In total 14 comments and letters were submitted in response to the NOPA.

Issues

The overriding purpose of public scoping is to identify key issues and how to address them, whether through project design features, analysis of the potential effects, or a new alternative to the proposed action. An issue is a point of concern with a proposed action, based on a potential effect that the proposed action would cause. The Council on Environmental Quality (CEQ) and the National Environmental Policy Act (NEPA) regulations require this delineation in Sec. 1501.7, "…identify, and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…"

The Forest Service separated the comments into three groups: non-issues, non-key issues, and key issues. Non-issues were comments that did not meet the definition of an issue as defined above. Non-key issues were identified as those that were: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) not supported by scientific or factual evidence. Key issues were defined as all remaining issues.

The issue statements listed below are followed by a brief description of how the Interdisciplinary Team (ID Team) responded. The issues identified by each commenter have been consolidated in order to allow for a singular answer. Prior to consolidation, however, each individual comment was fully considered and deliberated. A full listing of all commenters and consultees are provided in Chapter 5 of this document, and all letters and comments submitted are located in the project file as well. The consolidated issues as identified are as follows:

Recreation/Engineering

1. *Operations could lead to trail widening and impact the condition of the trail when harvesting operations are completed.*

<u>Response</u>

The Buford New Castle Project does not propose to widen Trail 2290. The trail would need to be crossed while skidding logs to a landing. This action could damage portions of the trail surface by causing small ruts traveling over the trail and flattening trail berms. Trail 2290 is not being planned as a haul route, with the exception of a short (~950-foot) segment running through Lake Park to access

proposed unit 201. Since this section of trail is running through a meadow, and has historically been used by full sized vehicles, additional widening is not anticipated. Several Design Features have been incorporated into the project to ensure the trail is maintained in its original condition when harvesting activities are complete. Contractors are required to return the trail to its original condition following harvesting activities. This requirement would be included as a contract provision with any timber sale or stewardship contract that may be awarded. In addition, other Design Features, such as leaving stump heights 12" high along trails and allowing logging slash next to the trail, could help maintain the proper trail width post logging. In some cases, buck-n-rail fence or downed logs could be built to restrict full-sized recreation traffic from using the ATV trail. This issue will be considered in further detail in the Recreation specialist report.

2. *Road closures would affect commuters and recreationists.*

Response
The Forest Service recognizes that road closures would be inconvenient to the public. Closures wo uld only be implemented during periods when harvesting occurs within 2-tree lengths from system roads and trails. Additionally, Design Features would not permit road closures during weekends (Friday at noon through Sunday at midnight), federal holidays, two days prior through the opening day of big game hunting seasons, and throughout the winter. Road closures are necessary to address concerns related to the safety of recreationists and commuters. To respond to concerns raised by the public, the design feature will be changed from allowing up to 6-hour road closures to allowing up to 4-hour road closures. This issue would be further discussed in the Recreation/Engineering reports.

3. *Harvesting activities could affect hunting and hunters. Operations could push game, affecting hunting. In addition, vegetation treatments could affect dispersed camping areas.*

Response
To accommodate hunters, the following design features have been incorporated into the project proposal:
1) Hauling and road closures will be restricted Friday at noon to Sunday at midnight to minimize conflicts with recreational traffic on NFSR 245.
2) Hauling, road maintenance, road closures and road reconstruction will be restricted on federal holidays along NFSR 245 from noon the day before the holiday to midnight the day of the holiday.
3) To minimize conflicts with recreational traffic on NFSR 245 road maintenance, road reconstruction, road closures and log hauling activities shall be restricted 2 days prior through the opening day of each big game season - including archery and muzzle loader seasons.

Changes in habitat, as well as effects to wildlife from logging operations, will be addressed in the Wildlife Specialist Report.

4. *Potential for vehicular accidents between logging traffic, recreationists and commuters.*

Response
The Buford New Castle Road is built to a standard adequate for hauling with log trucks. Safety signs will be placed along the road in designated locations to alert travelers of the presence of log trucks. Hauling would be restricted from Friday at noon to Sunday at midnight to minimize conflicts with recreationists and commuters. Hauling would be restricted during federal holidays to minimize conflicts with recreationists and commuters. Road reconstruction and log hauling would be restricted 2 days prior

through the opening day of each big game season - including archery and muzzle loader seasons. Road closures would be implemented while harvesting within 2-tree lengths from roads and trails to address potential safety issues. Log truck drivers are required to follow the same posted speed limits and follow the same traffic rules as other drivers. Safety will be addressed further in the Engineering report.

5. *Logging activities could cover existing dispersed campsites with slash, making them unusable following logging activities.*

Response
This issue will be analyzed in the Recreation Specialist Report.

6. *Commenter suggests allowing ATV traffic on Buford Road during periods when trail 2290 is closed to facilitate logging.*

Response
Opening the Buford Road to unlicensed vehicles is outside the scope of this project. The Forest Service recognizes there would be short term impacts to recreationists and would evaluate those impacts in the Recreation specialist report

7. *Repeated hauling by log trucks can result in road damage.*

Response
Logging contracts would require pre, during and post haul maintenance of the road, including blading and ditch cleaning. The project proposes to conduct additional road work including daylighting portions of the road to facilitate drying. If funding is available, road widening, straightening curves and other reconstruction activities could occur. This issue would be further addressed in the Engineering specialist report.

8. *Harvesting activities, and post-harvest forest conditions, can impact recreation opportunities at different spatial and temporal scales.*

Response
This issue will be analyzed in the Recreation Specialist Report.

9. *Stumps can pose hazards to snow machine users.*

Response
A design feature has been added that prohibits snow machine travel through harvested areas until forest regeneration is at a height and density that would once again restrict snow machine travel. In addition, if monitoring indicates damage is occurring, signage, physical closures including harvesting buffers, buck-n-rail fence, mesh safety fencing, or downed trees could be utilized to restrict snow machine traffic.

10. *Commenter requests ending all logging activity by at least November 23rd.*

Response
The Forest Service recognizes that hauling, and associated plowing, between November 23 and December 20 could affect snow machine grooming. However, this project already restricts logging

activities throughout most of the winter to accommodate winter recreation activities. Furthermore, timing restrictions on logging contractors could extend the total project duration.

11. Logging on snow and frozen ground has less impact on the land than at other times of the year.

Response
Due to the popularity of this area for snowmobiling, restrictions on winter operations is being incorporated into the project proposal. The project does allow harvesting beyond the winter travel management date of November 23rd to December 20th.

Scenery

1. *Vegetation management, including clearcuts, can change scenery.*

Response
Silviculture activities would affect scenery. Activities would have both short term and long term alterations to scenery and would differ at local and landscape scales. Unit layout and design features would minimize affects to scenery. This issue will be addressed in the Scenery specialist report.

Wildlife

1. *Silviculture activities that alter vegetation composition and structure would alter wildlife habitat, which would have an effect on the species that utilize those habitats.*

Response
Silviculture activities could have both positive and negative effects on wildlife habitat, over different spatial and temporal scales. Design features are included in the proposed action to protect key wildlife habitat. The Wildlife Specialist Report will evaluate those effects.

CHAPTER 2: DESCRIPTION OF THE ALTERNATIVES

Alternative 1: No Action

The EA may document consideration of a no-action alternative through the effects analysis by contrasting the impacts of the proposed action and any alternative(s) with the current condition and expected future condition if the proposed action were not implemented (36 CFR 220.7(b)(2(ii)). Under the No Action Alternative, vegetation management activities and road improvements associated with the proposed action would not occur. The area would continue to be used for summer and winter recreation, hunting, firewood gathering, grazing and routine maintenance of roads would continue.

Alternative 2: Proposed Action

Implementation of the proposed action would involve mechanical removal of trees within 22-treatment units encompassing approximately 660-Acres (+/- 10%). Silviculture methods would include Clearcut, Patch Clearcut, Improvement Cut, Commercial Thinning, Group Selection, and Individual Tree Selection Harvests. In general, trees would be felled, yarded to a landing area, decked, de-limbed or ground for biomass, and removed from the site using log trucks or chip vans. Landings would be placed adjacent to Forest System Roads or temporary roads, would be of sufficient size to provide space for log decks and logging equipment, and could be placed anywhere within units unless expressly prohibited in a project design feature. Limbs and slash resulting from proposed treatments would be piled and burned, lopped and scattered, or removed as biomass. Road maintenance, including clearing of brush along roads, grading and replacing gravel would occur along haul routes. In addition, road widening and curve straightening could occur in areas identified on the proposed action maps (Figures 2.1 – 2.8). Approximately 0.8 miles of temporary road construction, with subsequent obliteration following harvesting activities, would be completed to facilitate harvesting activities. Mechanical site preparation could be used to expose bare mineral soil to enhance regeneration establishment and fill-in planting could be conducted to ensure regeneration harvests meet Forest Plan standards within 5-years post-harvest.

Table 2.1 Proposed Treatment Summary

Unit Number	Prescription	Method	Acres	* P & N
101	Clearcut	Ground Based Mechanical	13.0	1, 2, 3, 4
102	Clearcut	Ground Based Mechanical	20.5	1, 2, 3, 4
103	Clearcut	Ground Based Mechanical	34.8	1, 2, 3, 4
104	Clearcut	Ground Based Mechanical	8.6	1, 2, 3, 4
105	Clearcut	Ground Based Mechanical	24.7	1, 2, 3, 4
106	Clearcut	Ground Based Mechanical	11.7	1, 2, 3, 4
107	Clearcut	Ground Based Mechanical	23.6	1, 2, 3, 4
108	Clearcut	Ground Based Mechanical	23.3	1, 2, 3, 4
109	Clearcut	Ground Based Mechanical	39.1	1, 2, 3, 4
		Total Acres Clearcut:	**199.3**	

Unit Number	Prescription	Method	Acres	* P & N
201	Patch Clearcut	Ground Based Mechanical	114.1	1, 2, 3, 4
202	Patch Clearcut	Ground Based Mechanical	59.5	1, 2, 3, 4
		Total Acres Patch Clearcut:	**173.6**	
301	Improvement Cut	Ground Based Mechanical	7.4	1, 3, 4
303	Improvement Cut	Ground Based Mechanical	29.8	1, 3, 4
304	Improvement Cut	Ground Based Mechanical	8.8	1, 3, 4
305	Improvement Cut	Ground Based Mechanical	64.9	1, 3, 4
		Total Acres Improvement Cut:	**110.9**	
401	Commercial Thinning	Ground Based Mechanical	8.8	3, 4
402	Commercial Thinning	Ground Based Mechanical	8.1	3, 4
403	Commercial Thinning	Ground Based Mechanical	62.0	3, 4
404	Commercial Thinning	Ground Based Mechanical	56.2	3, 4
405	Commercial Thinning	Ground Based Mechanical	11.6	3, 4
406	Commercial Thinning	Ground Based Mechanical	16.8	3, 4
		Total Acres Commercial Thinning:	**163.5**	
501	Group Selection	Ground Based Mechanical	11.8	2, 4
		Total Acres Group Selection:	**11.8**	
------	** Individual Tree Selection	Hand Felling – Hauling on Existing Templates	------	3, 4
		Total Acres Implementation:	**659.1**	

P & N References with Need the Activity is designed to accomplish (pg. 3).
** See section below for details regarding Individual Tree Selection Harvesting.

Implementation Methods

Mechanical Felling

All units would use conventional ground-based machinery to harvest trees and remove them from the stand. Conventional logging equipment typically includes harvesters, rubber tired and tracked skidders, stroke de-limbers, grinders, front end loaders, chip vans and log trucks. Trees could be processed (limbed and cut to length) in the forest or at a landing, provided all design features for fuel loading and coarse woody retention are adhered to. However, the Forest Service will encourage the utilization of slash for biomass.

Figure 2.1 Buford New Castle Project Proposed Action Map 1 of 8

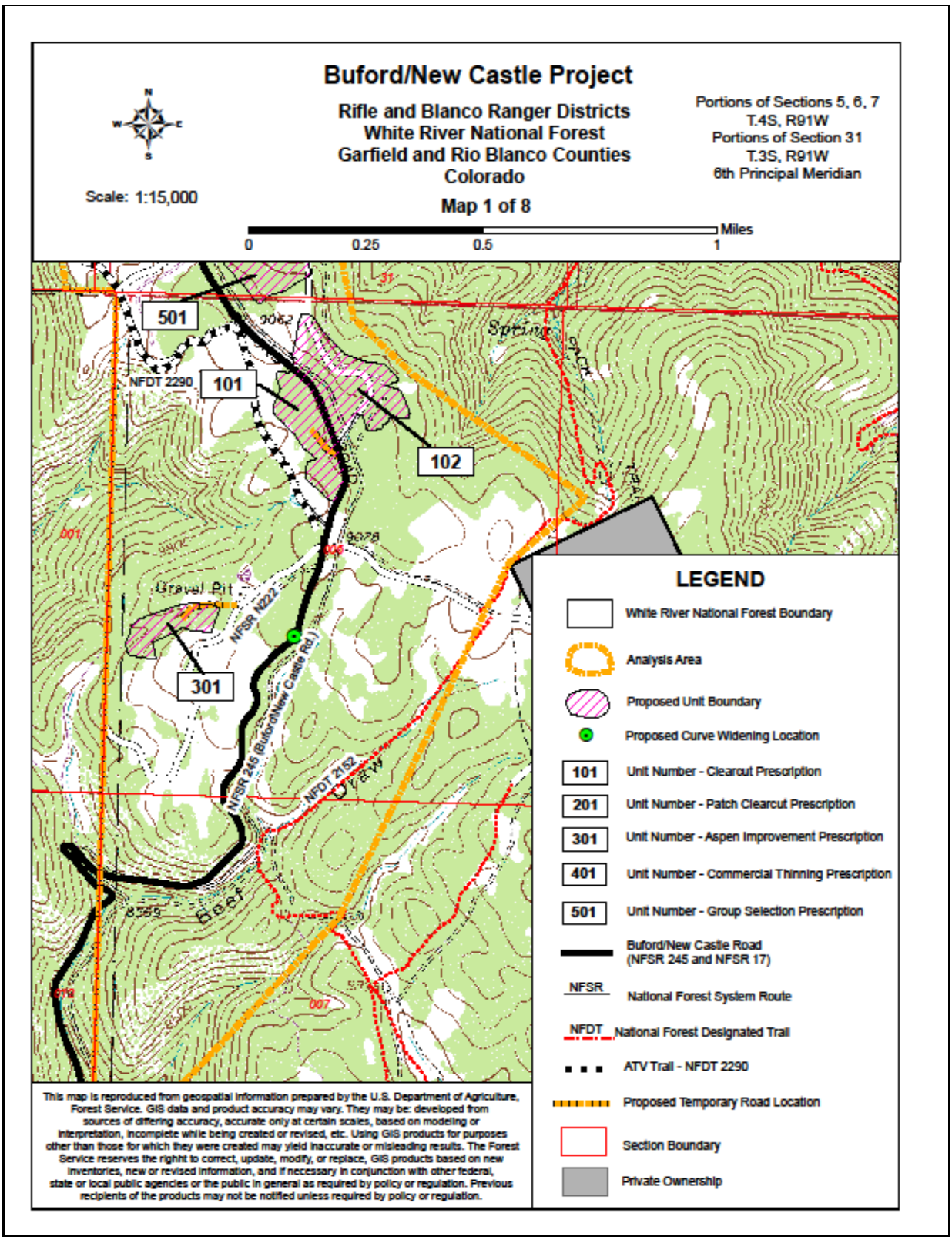


Figure 2.2 Buford New Castle Project Proposed Action Map 2 of 8

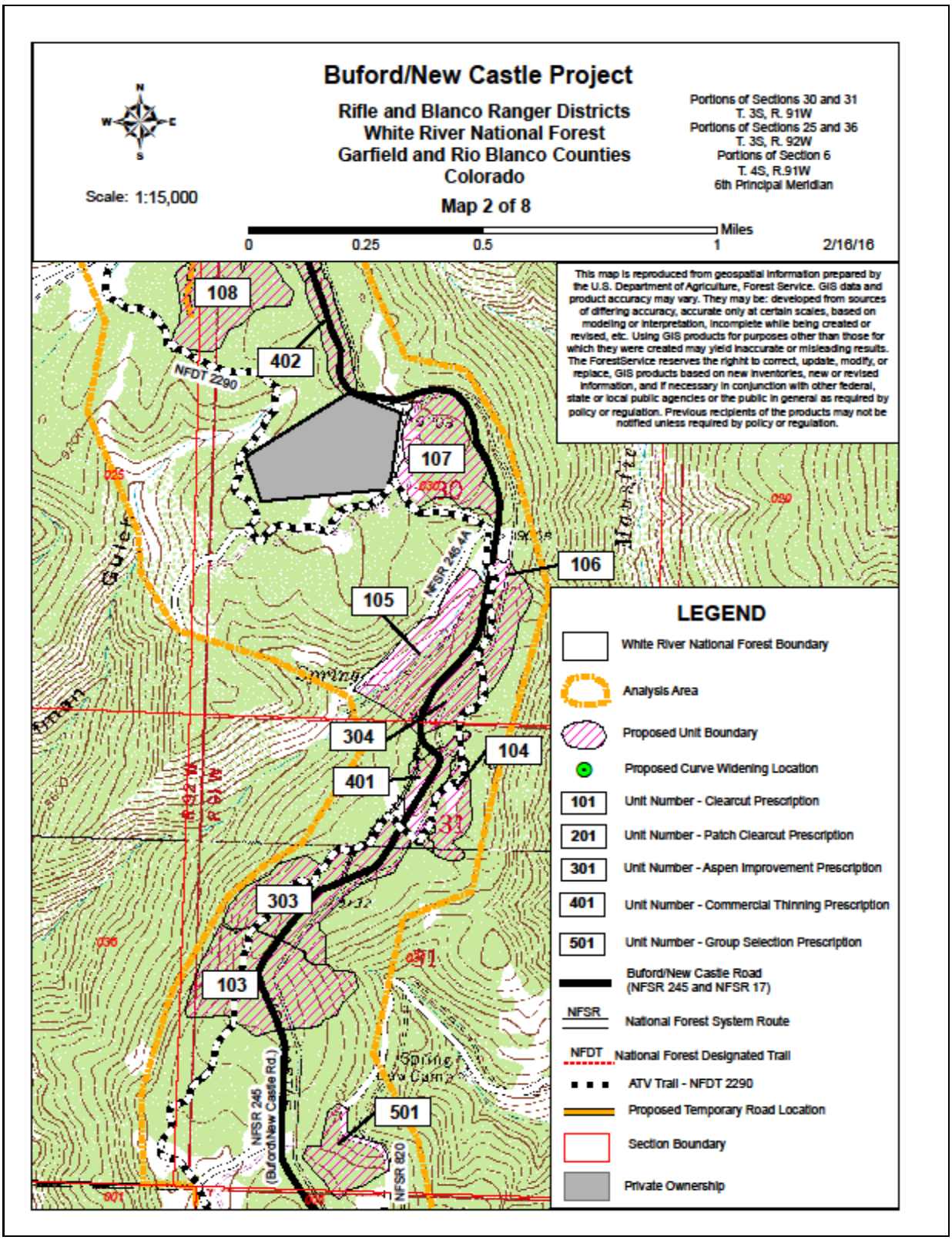


Figure 2.3 Buford New Castle Project Proposed Action Map 3 of 8

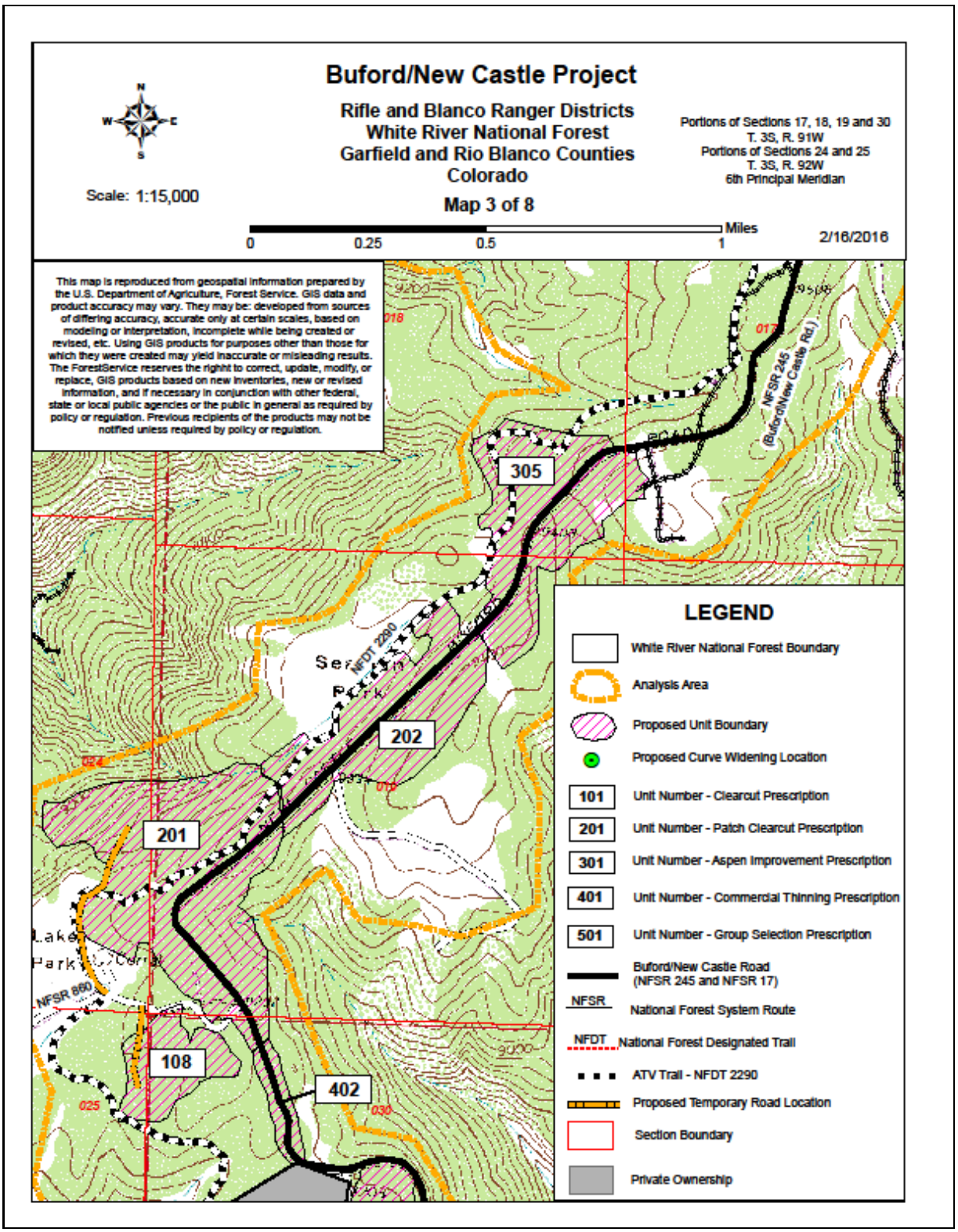


Figure 2.4 Buford New Castle Project Proposed Action Map 4 of 8.

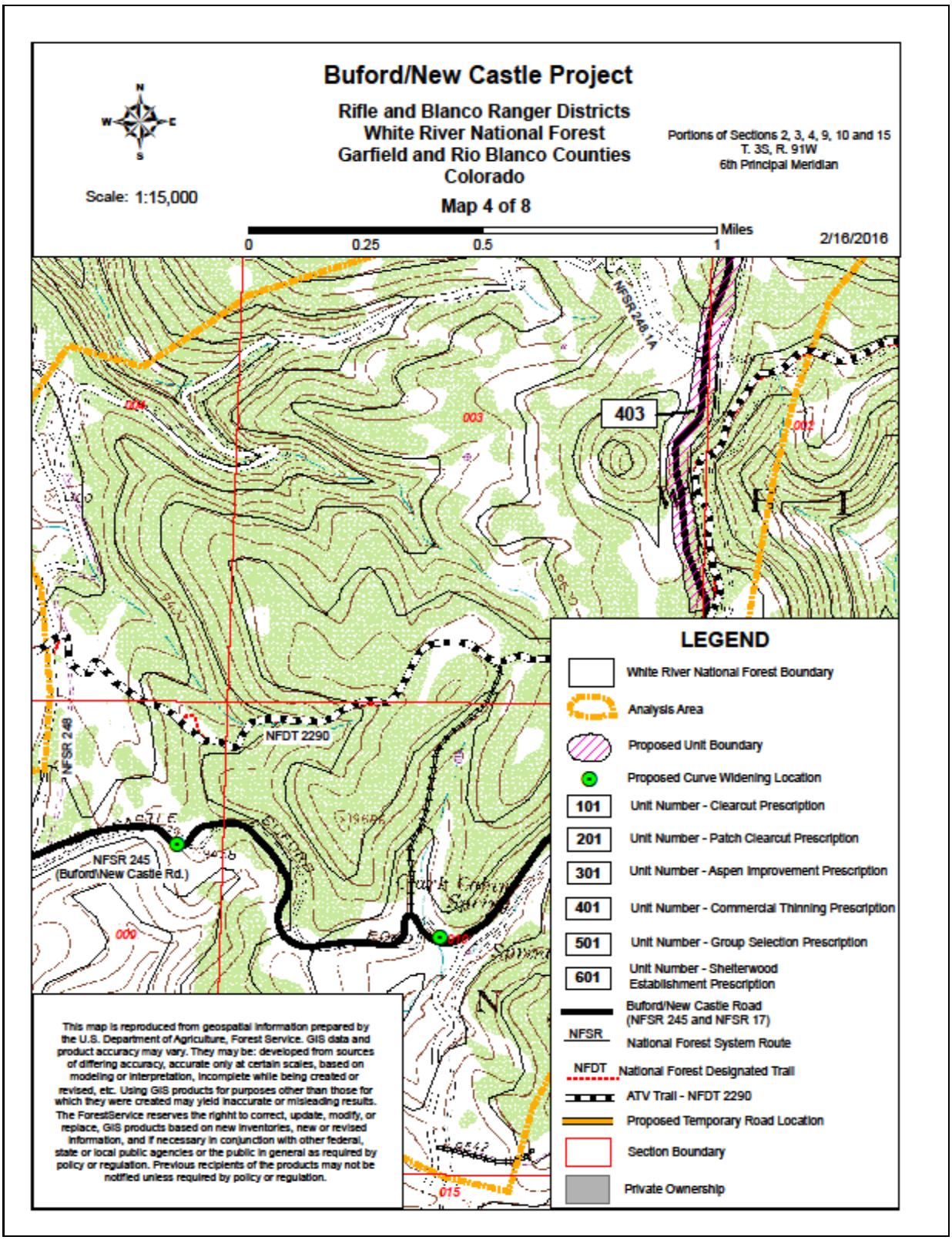


Figure 2.5 Buford New Castle Project Proposed Action Map 5 of 8

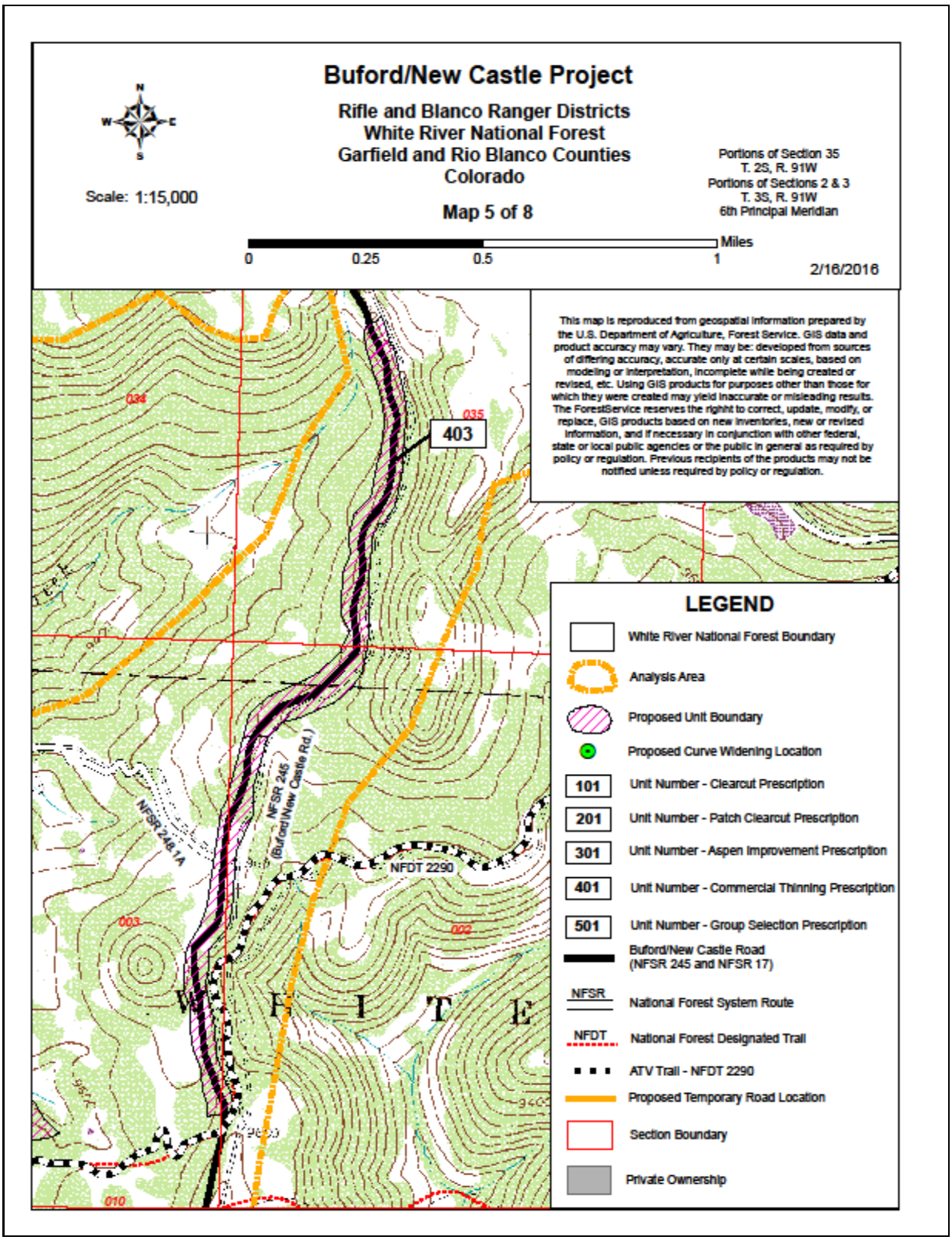


Figure 2.6 Buford New Castle Project Proposed Action Map 6 of 8

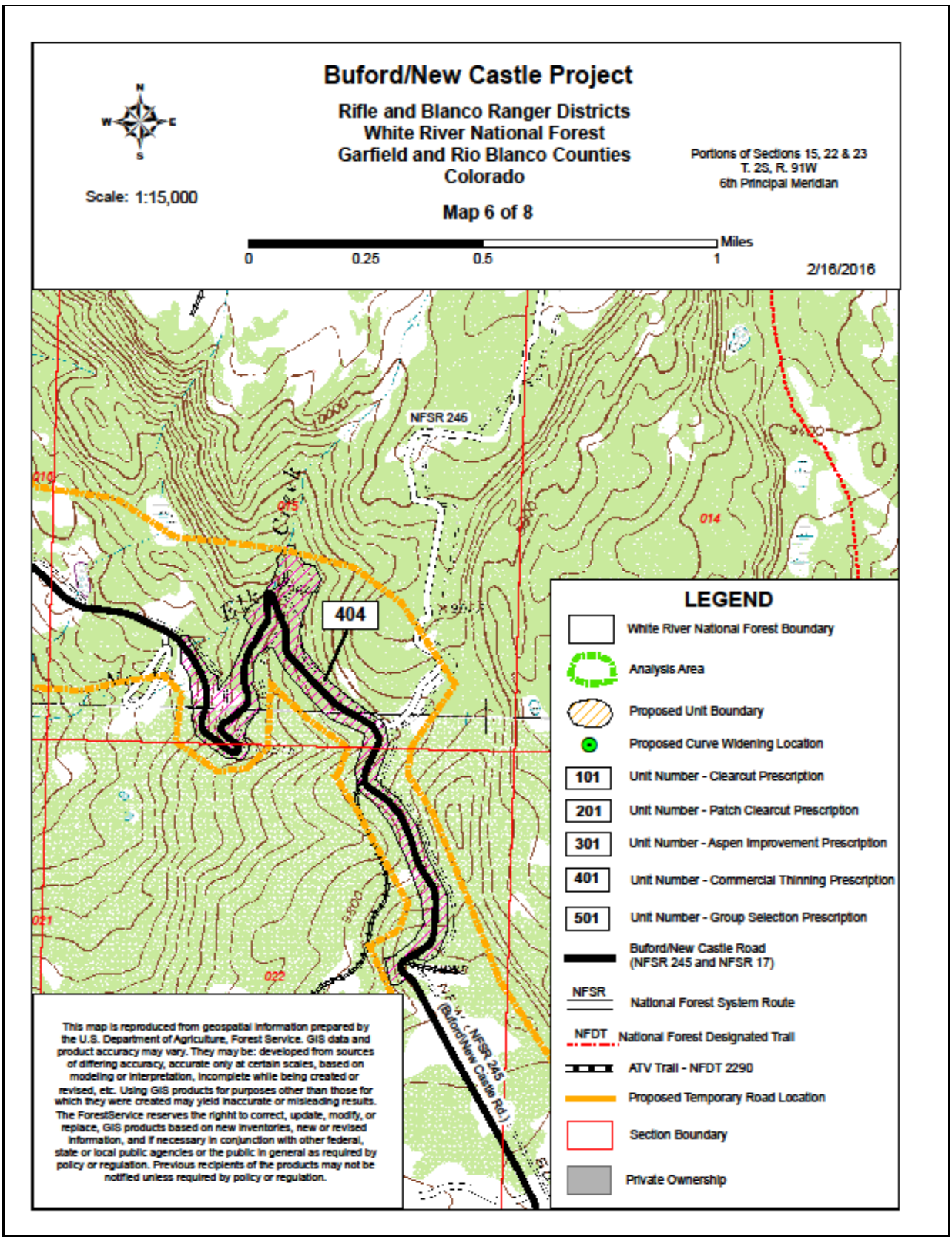


Figure 2.7 Buford New Castle Project Proposed Action Map 7 of 8

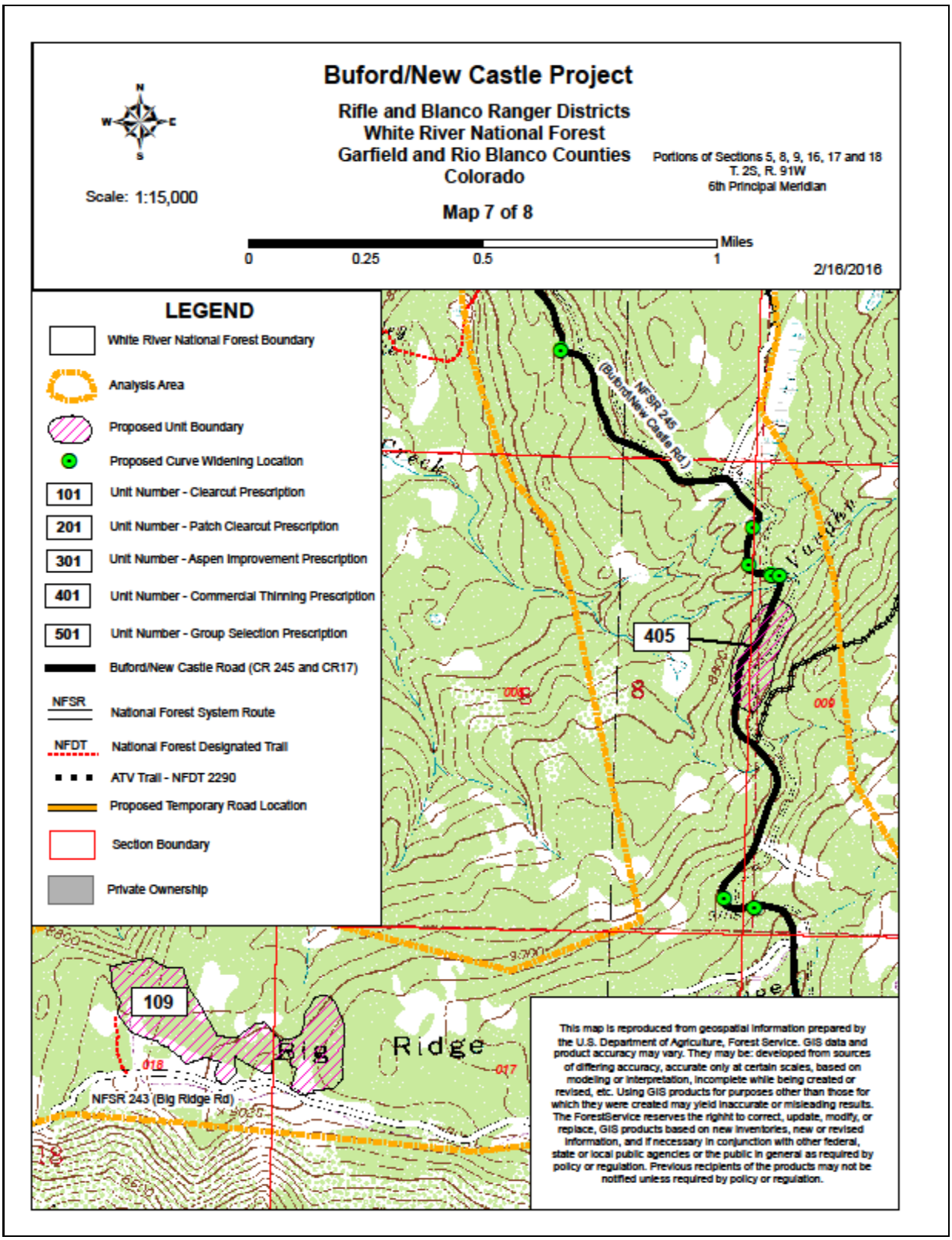
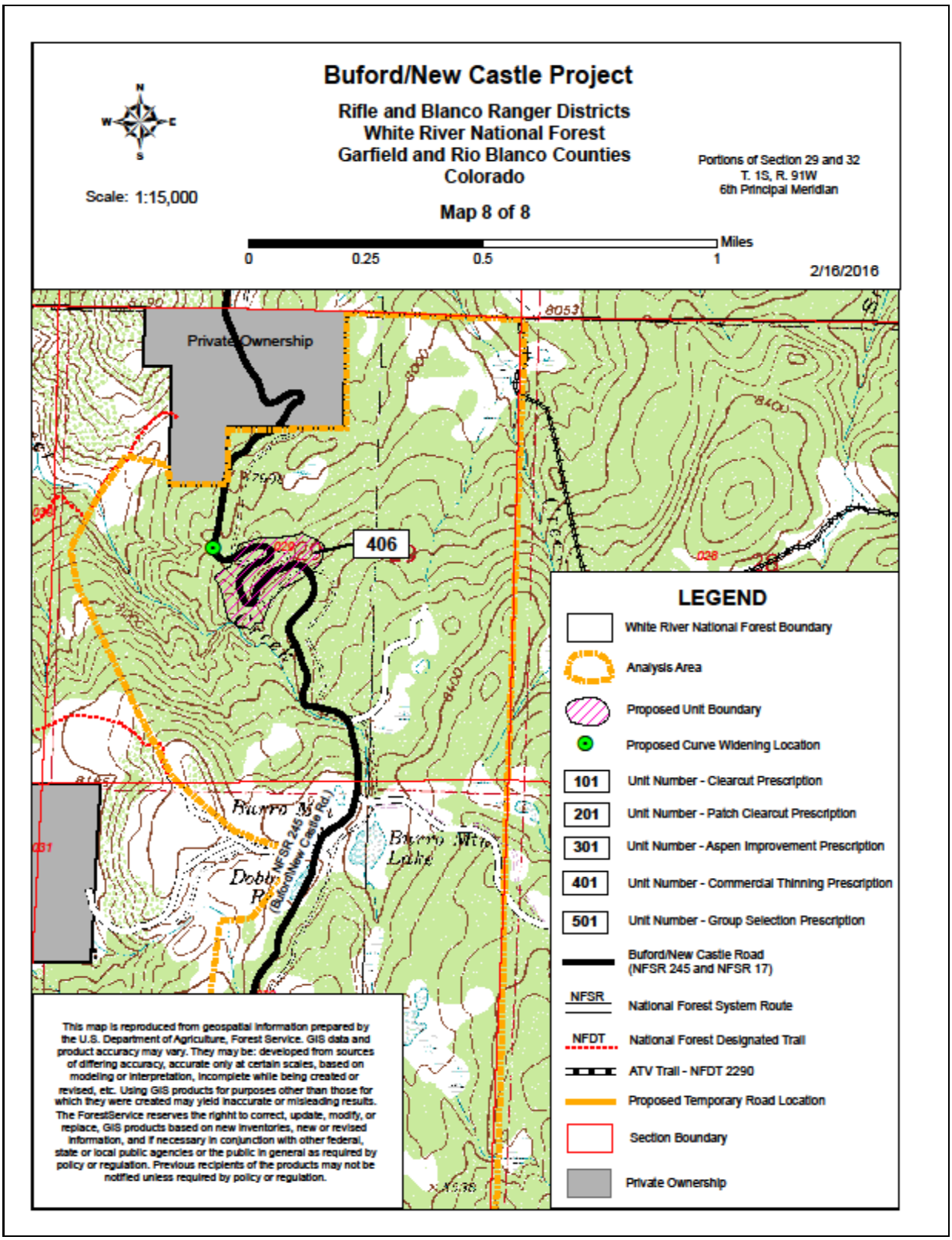


Figure 2.8 Buford New Castle Project Proposed Action Map 8 of 8



Silviculture Prescriptions

Clearcut (199.3 Acres)
In units with a clearcut prescription, all trees within a unit would be harvested. Following commercial harvest of merchantable timber, conifer seedlings and saplings would be felled by chainsaw crews, or broadcast burning would be conducted to remove conifer seedlings and stimulate aspen suckering. This activity would create a new age class comprised of young aspen.

Patch Clearcut (173.6)
Patch Clearcutting would create small (~10-20 acre) clearcuts within larger units. Cumulatively, patch clearcuts within a unit would not exceed 35% of a unit's size. In other words, of the 174 acres having a patch clearcut prescription, no more than 61 acres could be harvested. Patch clearcuts would focus on regenerating aspen where it occurs, while generally leaving areas that contain spruce, edges of units along meadows, areas near stock tanks, or in pinch points between trails and roads, in the unharvested portion of the unit. Patch clearcut openings would be dispersed throughout a given unit. Incidental harvesting could occur in areas outside of patch openings to facilitate yarding, decking or other harvesting operations. This activity would create a new age class comprised of young aspen and conifer.

Improvement Cut (110.9)
Improvement Cuts are being proposed in seral aspen stands that have enough of a mature aspen component to allow conifer removal without compromising the integrity of the residual aspen. In these units, subalpine fir and spruce would be harvested where they occur within aspen clones, or within two tree lengths of aspen clones. Incidental amounts of aspen would be harvested when these trees occur within groups primarily composed of fir. Careful skid trail design and approval would be required to minimize damage to the remaining aspen that is not harvested. This activity would maintain a mature aspen overstory, but in some cases could create a two aged aspen stand.

Commercial Thinning (163.5)
Commercial Thinning would reduce stand densities in mixed conifer stands. Commercial Thinning would reduce stand densities by 25%-35%, measured in basal area. Spacing would be relatively even throughout the stand, with subalpine fir being prioritized for harvesting over Engelmann spruce. Trees from all diameter sizes would be harvested. This activity would maintain mature spruce and fir stands, but would reduce their density for improved daylighting.

Group Selection (11.8)
Group Selection prescriptions are being proposed in mixed conifer units that are currently single storied. This prescription would create small openings, one to one and a half tree lengths in diameter, to create an environment suitable for conifer regeneration. Placement of openings would be dispersed throughout the unit, with any given opening being more than two tree lengths from another opening. Openings would be placed adjacent to mature cone bearing spruce, to favor spruce regeneration over subalpine fir. Cumulatively, group openings would not exceed 25% - 30% of a unit's total size. This activity would lead to the development of multi-aged conifer stands.

Individual Tree Selection
Individual tree harvesting could occur within 100-feet of either side of the Buford New Castle Road within the National Forest System boundary to improve sight distance and facilitate road drying. This treatment would allow harvesting trees as individuals or in small clumps of trees, but is not expected to

contribute to significant volume removal. Harvesting would likely be accomplished by firewood gatherers. Ground based machinery would not be allowed off the Buford New Castle Road template to harvest or yard trees in areas with this prescription. The amount of trees felled under this prescription is expected to be 'incidental' and not contribute to substantial amounts of biomass volume removed from the forest, therefore acreage was not chosen as an appropriate measurement for evaluating this activity.

Slash

For all prescriptions, all felled merchantable timber would be removed from the forest, all non-merchantable material including tree tops, branches and cull material would be lopped and scattered, machine piled and burned, or removed as biomass. Design features to leave minimum coarse woody debris for soils and wildlife will be met through site specific detailed prescriptions and contract provisions. Existing dead and down can also be left on-site to protect the harvested area from grazing and off-road vehicle encroachment.

Other Opportunities

Additional activities associated with the proposed action include installing interpretive signs along the road corridor, widening the Buford New Castle Road to provide a more uniform width, widen and lay back "taper" cut slopes through curves to improve sight distance and create safer driving conditions, provide road maintenance (blading, drainage, surfacing), and continue to work cooperatively with Rio Blanco County and Garfield County to provide safe and enjoyable user experience along the Buford New Castle Road.

Transportation

The Proposed Action would use National Forest System Roads, county roads and temporary roads to provide access to proposed treatment areas.

Table 2.2 Proposed Haul Routes

Route Number	Route Name	Length (Miles)	Units Accessed	Acres	Loads*
NFSR 462	----------	0.17	301	7	14 – 21
NFSR N222	----------	0.04	301	7	14 – 21
NFSR 820	Ogden Place	0.5	501, 102	33	54 – 86
NFSR 860	Lake Park	0.35	108, 201	137	189 - 252
NFSR 245.4A	Road Camp	0.45	105	25	75 – 100
NFSR 243	Big Ridge	1.6	109	39	117 – 156
NFSR 245	Buford New Castle	34.5	All	660	1,221 – 1,721

* Load Counts are estimates for chip vans, based on similar projects.

Table 2.3 Proposed Temporary Roads

Temporary Road #	Units Accessed	Length (Miles)	Existing Template
T1	301	0.12	No

Temporary Road #	Units Accessed	Length (Miles)	Existing Template
T4	101	0.09	No
T5	108	0.19	No
T6	201	0.4	No
----------	Total	0.8	----------

* A timber sale or stewardship contract would require obliterating all temporary roads after harvested trees are removed from the treatment unit. Actual temporary road locations are subject to change, to ensure certain natural resources (such as wetlands found during implementation) are avoided and to ensure the roads alignment provides for safe operations.

Project Design Features

The proposed project was developed with site-specific directions for implementation, called design features, to lessen or avoid potential negative effects associated with implementation. The following are some of the design features developed for this proposal. In addition to design features, the proposal would follow forest-wide standards and guidelines from the White River National Forest Land and Resource Management Plan, 2002.

Table 2.4 Design Features

Reference Number	Buford New Castle Project Design Features	Source
	Botany	

#1	**Sensitive plant Species**
	
	Where federally-listed Threatened (T), Endangered (E) or USFS Sensitive (S) plant species and plant species of Local Concern (LC) are found in the project area the following will apply:
	
	• Buffering
	  ○ The protection buffers would be a minimum of 50 feet in radius from the identified population boundaries.
	  ○ Exclude mechanized equipment from identified buffered sites.
	  ○ Exclude tree felling from within identified buffered sites.
	  ○ Fell trees away from identified buffered populations.
	  ○ Do not place or burn slash piles or broadcast burn slash in buffered areas.
	  ○ It is not required to move existing roads if they occur within the 50 feet buffer of the LC species.
	  ○ Monitor and aggressively treat non-native plant populations in the area so that habitat for rare native plants is not taken over by non-natives.
	  ○ Do not burn slash piles or broadcast burn in areas identified as supporting rare botanical resources
	• Over the snow
	  ○ Over-snow operations, using the BMP will provide adequate protection for these occurrences.
		Forest Plan Species of viability concern, Standard #1, pg. 2-24,
		IDT

	Safety/Recreation	
#1	National Forest System roads and trails shall be posted with warning signs and traffic control devices shall be employed in accordance with the "Manual on Uniform Traffic Control Devices" (MUTCD) as needed.	Contract Provision

Reference Number	Buford New Castle Project Design Features	Source
#2	Trails traveling through or directly adjacent to units would be closed to public access during logging operations when cutting within two tree lengths from the trail, or skidding or yarding across trails. Special orders will be prepared by the timber, recreation or engineering staff and signed by the Forest Supervisor. Trails may be closed in segments (Monday through Friday) during logging operations along the route. News releases regarding the closures will be issued and signs (meeting USFS standards) will be posted on the ground at major access points.	IDT
#3	Protect improvements along trail system(cattle guard restrictors –drainage structures, signs etc.)	Contract Provision
#4	Flaggers, closure devices or special orders are required when harvesting operations occur within two tree lengths from an open Forest System or County Road. During the week (M-F), roads may be closed for up to 4 hours in active units. Special orders will be prepared by the timber, recreation or engineering staff and signed by the Forest Supervisor. News releases regarding the closures will be issued and signs (meeting USFS standards) will be posted on the ground at major access points.	IDT
#5	System trails (WRNF MVUM) will be protected and returned to their original condition following all harvesting activities. Intersections with skid trails or temporary roads along system trails will be blocked with natural materials to avoid off trail use.	IDT
#6	Logging activities, including hauling, skidding, decking, felling, road maintenance and chipping will be restricted Friday at noon to Sunday at midnight to minimize conflicts with recreationists. Specific operations may be allowed to occur within this time period upon approval by the USFS.	IDT
#7	Logging activities, including hauling, skidding, decking, felling, chipping, road maintenance and road construction will be restricted on federal holidays along NFSR 245 from noon the day before the holiday to midnight the day of the holiday to minimize conflicts with recreationists. Specific operations may be allowed to occur within this time period upon approval by the USFS.	IDT
#8	To minimize conflicts with recreational traffic on NFSR 245 road maintenance, road reconstruction and log hauling activities shall be restricted 2 days prior through the opening day of each big game season – including archery and muzzle loader seasons. Specific operations may be allowed to occur within this time period upon approval by the USFS.	IDT
#9	To minimize conflict with winter recreation activities and routes, restrict winter operations and plowing of roads from December 20th through May 23rd annually. Specific operations may be allowed to occur within this time period upon approval by the USFS.	IDT
#10	Retain natural pinch points in transitions along trails in meadows and timber to restrict full sized access.	
#11	USFS staff will coordinate treatment activities and recreational special use events to provide for public safety.	IDT
#12	Avoid using identified dispersed campsites for landings and staging areas. Allow a buffer around campsites in all prescriptions other than clear-cuts.	IDT
	Engineering	
#1	Ground based operations, including felling, skidding and hauling will be suspended during periods of precipitation that result in excessive soil and/or road damage and may contribute to possible sediment discharges into stream channels. Hauling shall be suspended until the road sub-grade can adequately carry loaded log trucks and road damage will not occur.	Contract Provision
#2	Road maintenance, improvements and reconstruction shall include adequate surface drainage and rolling dips (reinforced with geotextile and aggregate, if needed). Rolling dips shall not be installed on grades less than 2 percent or greater than 10 percent as determined by site conditions (Management Level 1 or 2 Roads).	IDT

Reference Number	Buford New Castle Project Design Features	Source
#3	Temporary or decommissioned roads to be rehabilitated shall use a combination of the following techniques including: • Placing stumps, rocks, slash and logs on the ripped (12" to 18" depth) road density and depth to mimic the surrounding forest floor areas. • Push, pull or deposit excavated soils and rock to fill in road cut. • Every 10 to 200 feet along the roadway beginning at junctions, fell or place live and/or dead trees across the roadway and suspend off cutbanks where feasible. • Install waterbars, outsloping and cross drains as needed to stabilize the rehabilitated surface. • Seed compacted sites following ripping, using locally appropriate native seed mix approved by WRNF Ecologist/Botanist.	IDT
#4	System roads will be protected. Logging slash or debris will be removed from road corridor or leadout ditches. Culvert inlets and outlets will be protected using contract provisions. Any damage as a result of harvesting activities will be repaired prior to contract closure.	IDT
#6	Work cooperatively with State, County and local government to inform and post road closure information.	IDT
#7	Work cooperatively with counties to provide additional dust abatement that may be required during log haul on NFSR 245.	IDT
Fuels		
#1	Total fuel loading should remain between 5 and 20 tons per acre.	Brown et al. 2003 IDT
#2	Lop and scatter slash to within 18 inches of the ground. Where total fuel load is greater than 20 tons per acre, and the excess slash would be burned, restrict hand piles to 300 cubic feet (10'x10'x7' and conical in shape) and machine piles to 7068 cubic feet (smoke permit limits efficient burning to a maximum pile size of 45'x20'x15' and conical in shape). Burn piles with $\geq$2" of permanent snow pack to reduce residual damage to soils.	Colorado APCD Standard pile worksheet
#3	Broadcast burning could occur within any unit with a clearcut prescription, within 1-year of harvesting activities, if this activity is included in a detailed prescription approved by a certified Silviculturist, and not otherwise prohibited by design features (such as buffering TES species, archaeological sites, etc.).	IDT
Vegetation/Silviculture		
#1	Logging Operations, including felling, bucking, skidding, decking hauling, road maintenance and snow plowing may occur at any time during the calendar year except when explicitly restricted.	IDT
#2	The USFS will monitor for wind throw and noxious weeds while conducting 1st, 3rd, and 5th year stocking surveys. If wind throw or noxious weeds are observed, treatments will be developed based on the extent and species present.	IDT
#3	Following harvesting activities, treatment units would be closed to snowmobile use until regeneration reaches a height sufficient to avoid being physically damaged from topping by snowmobiles (~5' above high snow depth). Special orders will be prepared by the timber, recreation or engineering staff and signed by the Forest Supervisor. News releases regarding the closures will be issued and signs (meeting USFS standards) will be posted on the ground at major access points.	IDT
#4	To limit browsing of regeneration, particularly aspen suckers, work with rangeland permittees to move livestock through treatment units quickly. Prohibit the placement of salt within or adjacent to treatment units until regeneration reaches a height and width sufficient to avoid excessive browse by livestock (~5-10 years).	IDT
Wildlife		
#1	Initial surveys for raptor nesting sites and sensitive species colony sites will be completed by the wildlife biologist between May 1 and July 31, 2016.	IDT

Reference Number	Buford New Castle Project Design Features	Source
	Thereafter, surveys at active raptor nests and sensitive species colonies will be completed by the wildlife biologist annually (May 1-June 30) in units proposed for implementation in the same year over the life of the sale.	
#2	If raptor nests are identified, then units will be adjusted to accommodate buffers around active and inactive nests, and logging operations (falling, chipping, decking, skidding, loading, hauling and road construction/ reconstruction) will be discontinued between March 1 and August 15 (or earlier with clearance by biologist) at active locations up to 1/2 mile around the nests (depending on species).	Forest Plan Wildlife Standard #5 pg 2-17
#3	In Unit 109, logging operations will be restricted from May 15th through June 20th, to reduced disturbance to elk calving.	IDT
Scenery		
#1	Openings in the canopy should have a natural appearance with uneven edges rather than straight lines where possible. When it is possible, coordinate with adjacent property owners, to soften the edges of cutting units. The shape should be an irregular pattern like the existing natural openings and should avoid straight-line edges. The edges of the treatment units should be varied and random to soften and blend with the native vegetative mosaic. Favor existing healthy dominant trees such as Aspen and woody shrubs to shape the edges of areas where materials are to be removed. Blend with natural landscape features such as natural meadows or openings and rock outcrops when possible. This will create free form vegetative shapes that mimic natural patterns. Make clearing edges irregular and freeform, feathering and undulating edges where possible.	CP – Forest Plan & Scenery Management Handbook
#2	Unit boundary paint shall face away from open system roads or be removed or 'blacked out' after treatment activities are completed.	DC – Forest Plan & Scenery Management Handbook
#3	Root-wads created by the harvest activities that are visible in the foreground of an open system road shall be removed from sight, unless used to close temporary roads or landings.	CP – Forest Plan & Scenery Management Handbook
#4	All stumps should be 12 inches high or less.	DC – Forest Plan & Scenery Management Handbook
#5	Scattered slash and logging debris should be limbed and scattered over disturbed areas to a maximum depth of 18 inches of the ground surface within 100 feet of NFSR 245 (Buford-New Castle Road) and trails. After completion of pile burning, blackened logs and stumps should be scattered back into harvest units or removed to create visual diversity. Leave some logs on the ground to provide wildlife habitat and visual diversity. Forest Plan guidance regarding coarse woody debris will be met.	DC– Forest Plan & Scenery Management Handbook
#6	Where possible place landings in existing openings, unless doing so would adversely affect other resources. If an existing opening cannot be used, clearing size and form of the landings should mimic that of surrounding vegetative mosaic as seen from middle ground and background views (distances greater than ½ mile). The shape of landings should be an irregular pattern like the existing natural openings and should avoid straight-line edges.	DC – Forest Plan & Scenery Management Handbook
#7	When constructing temporary roads or any grading, excessive cut/fill slopes shall be avoided. Vary cut/fills to blend with the adjacent terrain, and leave in a roughened condition to facilitate revegetation. Stabilize fills and re-establish natural drainage configuration to the degree possible.	DC – Forest Plan & Scenery Management Handbook
#8	All equipment and construction debris (man-made debris and trash, including old culverts) caused by timber operations shall be removed from the site at sale completion.	CP – Forest Plan & Scenery

Reference Number	Buford New Castle Project Design Features	Source
		Management Handbook
#9	Where feasible, construction of skid trails should avoid creating straight line corridors when the skid trails connect with open system roads and trails. Any skid trails should be rehabilitated to reduce the color contrast of the exposed soil by randomly scattering and spreading slash or replacing scraped material. Cover exposed bare soil with adjacent organic material.	CP – Forest Plan & Scenery Management Handbook
#10	Do not leave unnatural appearing rings of trees adjacent to openings. Any painted trees, which leave a strip along meadow edges, should be removed along with the other timber in the clearcut prior to the end of the sale.	CP – Forest Plan & Scenery Management Handbook
Weeds/Range		
#1	Off-road equipment shall not be moved into project area without having first taken reasonable measures to make sure it is free of soil, seeds, vegetative matter, or other debris that could contain noxious weed seeds. USFS Representative shall be notified at least 24 hours in advance of off-road equipment arriving on the Forest, to provide the option of inspecting the equipment to ensure it has been cleaned as required. Equipment may also require inspection prior to moving it from areas infested with invasive species of concern to areas free of such invasive species. Reasonable measures include pressure-washing or steam cleaning in an offsite location so oil, grease, soil and plant debris can be contained and provide optimal protection of project areas. All equipment surfaces should be cleaned especially drive systems, tracks and "pinch points" to ensure removal of potentially invasive debris.	Forest Plan Disturbance Process Standard #1-2, Guideline #4, pg 2-30, IDT
#2	Pre-treat existing infestations within, near, or along travel routes prior to implementing the proposed project. This will help to eradicate existing weeds and/or suppress seed production.	Forest Plan Disturbance Process Standard #1-2, Guideline #4, pg 2-30, IDT
#3	Monitor the harvest units for a minimum of four years after project completion and treat any new infestations in a timely manner.	Forest Plan Disturbance Process Standard #1-2, Guideline #4, pg 2-30, IDT
#4	Pond implementation would be determined based on monitoring and resource conditions (Wildlife, Botany, and Archaeology). Establish alternate water sources to reduce concentrated livestock trampling and browsing around existing water sources within the analysis area. Up to 10 alternate locations are proposed to ameliorate potential effects to regeneration from livestock.	IDT
Watershed/Fisheries		
#1	Minimize Connected Disturbed Area by ensuring that roads, road ditches, and other disturbed areas drain to undisturbed soils rather than directly to streams. Manipulate drainage from disturbed areas as necessary using natural topography, rolling dips, waterbars, ditch-relief culverts, etc., to disconnect disturbed areas from streams.	WCPH Management Measure 1

<table>
<tr><th>Reference Number</th><th>Buford New Castle Project Design Features</th><th>Source</th></tr>
<tr><td>#2</td><td>Retain the average per-acre levels of coarse woody debris (CWD) summarized in the table below
<table>
<tr><th>Forest Type</th><th>Minimum Retention for Small Diameter Component (tons per acre)</th><th>Minimum Retention for Large Diameter Component (tons per acre)</th><th>Total Down CWD Retention (tons per acre)</th></tr>
<tr><td>Lodgepole pine</td><td>4.25</td><td>0.75</td><td>5</td></tr>
<tr><td>Aspen</td><td>2.5</td><td>0.5</td><td>3</td></tr>
<tr><td>Spruce-Fir</td><td>8.5</td><td>1.5</td><td>10</td></tr>
</table></td><td>WCPH Management Measure 2, FP Soils Standard 7</td></tr>
<tr><td>#3</td><td>Retain live and dead trees within 100 feet of perennial and intermittent streams, except within designated stream crossings.</td><td>IDT, WCPH Management Measure 3</td></tr>
<tr><td>#4</td><td>Locate all landings and skid trails at least 100 feet away from perennial and intermittent streams.</td><td>WCPH Management Measure 3</td></tr>
<tr><td>#5</td><td>Keep heavy equipment out of streams, swales, and lakes, except to cross at designated points, build crossings, or do restoration work, or if protected by at least 1 foot of packed snow or 2 inches of frozen soil.</td><td>WCPH Management Measure 3</td></tr>
<tr><td>#6</td><td>Design stream crossings to withstand floods as follows:
Design Life (years): 1 2 5 10 20 50
Design Flood (years):10 10 25 50 100 200</td><td>WCPH Management Measure 4</td></tr>
<tr><td>#7</td><td>Size culverts to easily pass sediment and debris transported by the stream to be crossed. Do not use culverts less than 18” in diameter to cross any stream channel.</td><td>WCPH Management Measure 4</td></tr>
<tr><td>#8</td><td>Designate the locations of stream crossings on temporary roads. Install stream crossings on straight and resilient stream reaches, as perpendicular to flow as practicable.</td><td>WCPH Management Measure 4</td></tr>
<tr><td>#9</td><td>Add or remove rocks, wood, or other material in streams or lakes only if such actions maintain or improve stream health. Avoid altering the stream bed and banks and maintain the natural character of the stream.</td><td>WCPH Management Measure 5</td></tr>
<tr><td>#10</td><td>Keep ground vehicles out of wetlands unless protected by at least 1 foot of packed snow or 2 inches of frozen soil. Do not disrupt water supply or drainage patterns into wetlands.</td><td>WCPH Management Measure 6</td></tr>
<tr><td>#11</td><td>Do not skid logs on sustained slopes steeper than 40%.</td><td>WCPH Management Measure 9</td></tr>
<tr><td>#12</td><td>Out-slope temporary roads to shed water rather than concentrating water on the road surface or in ditches. Install cross drains [in roads] to disperse runoff into filter strips and minimize connected disturbed areas. Make cuts, fills, and road surfaces strongly resistant to erosion between each stream crossing and at least the nearest cross drain. Revegetate using certified local native plants as practicable; avoid persistent or invasive exotic plants.</td><td>WCPH Management Measure 9</td></tr>
<tr><td>#13</td><td>Do not install culverts during spring runoff, or during periods of heavy precipitation.</td><td>WCP Management Measure 9</td></tr>
</table>

Reference Number	Buford New Castle Project Design Features	Source
#14	Do not locate roads, landings, or skid trails on slopes that show signs of instability, such as slope failure, mass movement, or slumps.	WCPH Management Measure 9
#15	Locate and construct log landings in such a way as to minimize the amount of excavation needed and to reduce the potential for soil erosion. Design landings to drain water to undisturbed soils rather than retaining water, or draining to streams. After use, treat landings to disperse runoff, prevent surface erosion, and encourage revegetation.	WCPH Management Measures 9 and 13
#16	Minimize sediment delivery to streams from temporary roads. Wherever stream crossings are required, use out-sloping, rolling dips, water-bars, or ditch-relief pipes to drain water and sediment to undisturbed soils outside the WIZ rather than directly to streams.	WCPH Management Measure 10
#17	For re-construction of Forest System Roads, apply road surfacing near stream crossings as needed to minimize sediment delivery to streams.	WCPH Management Measures 10 and 11
#18	For temporary roads that will be operated for more than one season, install additional water-bars near stream crossings at the end of the operating season to prevent sediment delivery to streams during the off-season.	WCPH Management Measure 11
#19	Keep logging slash and debris out of ditches and drainage channels.	IDT
#20	Reclaim disturbed areas promptly when use ends to prevent resource damage and invasion of noxious weeds. Rehabilitate temporary roads when project is complete by: • Removing all culverts; • Removing all fill in stream channels, and re-contouring stream banks to the original geometry; • Installing additional cross drains and/ or out-sloping to reestablish natural drainage patterns; • Ripping and seeding of road segments located within 100 feet of streams; • Placing additional water-bars as needed.	WCPH Management Measure 12
#21	Obliterate skid trails after operations are complete by pulling slash on skid trails; building water-bars where needed; placing barriers within skid trails to prohibit mechanized and motorized use; and seeding skid trails with approved seed mix, where necessary, to establish vegetation.	WCPH Management Measure 12
#22	Manage land treatments to limit the sum of severely burned and detrimentally compacted, eroded, displaced land to no more than 15% of any activity area. Specifically: • Designate the location and size of landings and major skid trails; • Minimize the length of temporary road approved to meet objectives; • Limit the width of skid trails to 12 feet and ensure the spacing between skid trails is no closer than 120 feet on average; • Rip all landings and main skid trails to a depth of 8-12 inches and seed with Forest Service approved seed mix immediately upon closure.	WCPH Management Measure 13
#23	Operate heavy equipment for land treatments only when soil moisture is below the plastic limit, or protected by at least 1 foot of packed snow or 2 inches of frozen soil.	WCPH Management Measure 13
#24	If machine piling of slash is done, conduct piling to leave topsoil in place and to avoid displacing soil into piles or windrows.	WCPH Management Measure 14
#25	Locate vehicle service and fuel areas on gentle upland sites at least 100 feet away from streams to prevent pollutants from contaminating water.	WCPH Management Measure 15

Reference Number	Buford New Castle Project Design Features	Source
#26	There is a spring located at the end of the Road Camp Rd. (NFSR 245.4A). To minimize potential impacts to this spring, the following design feature would be applied. 1. A truck turn-around/landing should be developed that is at least 100 feet away from the spring/perennial water that would not deliver sediment to the spring/stream, if feasible, 2. The impacted area within 100 feet of the spring/perennial water should be hardened with rock or wood chips to minimize the likelihood and extent of fine sediment generation and delivery to surface water, 3. Opportunities to improve drainage to prevent or minimize sediment delivery to the spring/stream should be sought and developed, as available, 4. The Road Camp road should only be used by project-related vehicle traffic under dry conditions.	Specialist Report
Soils		
#1	Avoid soil-disturbing actions during periods of heavy rain or wet soils. Operate heavy equipment within unit boundaries only when soil moisture is below the plastic limit, or protected by at least 1 foot of packed snow or 2 inches of frozen soil. - Soil moisture exceeds the plastic limit if the soil can be rolled into 3mm threads without breaking or crumbling.	Management Measures #9, #13
#2	Prior to implementation, the Forest Service must approve temporary roads, landings, skid trails and concentrated use-site locations to minimize potential damage to soils.	IDT
#3	Areas that are determined to have "highly" or "severely" unstable soils will be excluded from unit boundaries during layout.	IDT
Heritage		
#1	Sites that may have traditional cultural and religious significance to Indian Tribes or other interested parties located during field inventory will require additional consultation with SHPO and the affected Indian Tribes or interested parties. Consultation may include determination of eligibility and potential effects to sites, and/or mitigation to minimize or avoid effects.	WR Agreement No. 07-MU-11021500-043 (SHPO PA)
#2	Cultural resource inventories will be conducted before implementation in all areas identified as "areas of high potential for historic properties" within Areas of Potential Effect (APE). The APE includes all areas within a proposed treatment unit and extends a minimum of 300 feet beyond the perimeter of the unit's exterior edge.	WR Agreement No. 07-MU-11021500-043 (SHPO PA)
#3	A 50-foot buffer around all known eligible and field-eligible historic property locations will be established. Within these buffers, no ground based mechanical activities would be allowed. Hand treatments to address hazard trees along the travel corridor may occur within these buffers, in accordance with Stipulation C of the 2007 Programmatic Agreement with SHPO. For these circumstances, consultation with a Forest Service Archaeologist would be required to determine the best method for accomplishing proposed activities.	Amendment Four WR Agreement No. 07-MU-11021500-043 (SHPO PA)
Lands		
#1	Survey corners, Forest Service boundary signs, and survey monuments will be avoided during harvesting activities. Trees containing survey signs or monuments will be left unharvested.	IDT

Alternatives Considered but Eliminated from Detailed Study

No additional alternatives were suggested by the public during scoping.

Prior to scoping, the Forest Service considered an alternative that included clearcutting and patch clearcutting conifer forests that contain aspen as a component of species composition, within Management area 2.1. These activities were considered in the Sterry Lake SIA (Special Interest Area). Management Area 2.1 allows vegetation management practices necessary to meet specific resource objectives of maintaining the values for which the individual area was proposed or established. In the case of Sterry Lake, those values include northern leopard frog habitat and waterfowl nesting habitat. While conducting silviculture activities in these forests could have environmental benefits, these activities were not being driven by the need to improve habitat for northern leopard frog or waterfowl. Therefore, silviculture activities within the Sterry Lake SIA were eliminated from detailed study.

Potential Sale Area Improvement Projects

As authorized in the Knutson-Vandenberg Act of 1930 (KV), a portion of the timber receipts from the proposed commercial timber harvests would be deposited in a cooperative account for future use in improving existing structures and renewable natural resources within sale boundaries. Projects proposed by the ID team are listed in Table 2.5 in order of funding priority. These projects would be included in the Sale Area Improvement Plan, which is required to receive and disperse KV funds that are a part of the proposed action.

Table 2.5 – Sale Area Improvements (KV) Projects Listed in Priority Order.

1.	Regeneration Surveys that would be performed during the 1st, 3rd, and 5th years following treatment
2.	Site preparation for natural regeneration following the implementation of proposed treatments
3.	Artificial reforestation (replanting) of proposed treatment units
4.	Noxious weed spraying in areas where noxious weed occurrences are identified

CHAPTER 3: ENVIRONMENTAL CONSEQUENCES

Affected Environment and Environmental Consequences

This section summarizes the physical, biological, and social environments of the project area and the estimated effects associated with the implementation of the proposed action. Table 3.1 indicates the areas that are present and would be affected by the proposed project. The existing environmental condition serves as the baseline condition for each resource. The alternatives are analyzed to provide a comparison of the effects to the baseline condition.

Table 3.1 Elements of the Human Environment

Element	*Present*		*Affected*		*Element*	*Present*		*Affected*	
	Yes	No	Yes	No		Yes	No	Yes	No
Soil Productivity	X		X		Inventoried roadless area†*		X		X
Water Quality	X			X	Research natural area†*		X		X
Wastes, hazardous or solids		X		X	Other unique characteristics* (list)		X		X
Flood plains†		X		X	Cultural and Historic Resources†*	X		X	
Wetlands†*	X		X		Native American Religious Concerns†	X		X	
Municipal watersheds†		X		X	TEP species or critical habitat†*	X		X	
Wilderness/ study area†*		X		X	FS Sensitive species†	X		X	
Wild and Scenic River†*		X		X	Management indicator species	X		X	
National Recreation Area†*		X		X	Environmental Justice		X		X

Table 3.2 contains a list of projects that should be included in the Cumulative Effects Analyses for the respective resource. Only portions of some projects may be considered depending on the resource in question and the spatial scope of the activity.

Table 3.2 Past, Present and Reasonably Foreseeable Projects in the vicinity of the Buford New Castle Project.

Activity	Acres	Eng.	Veg.	Fuels	Wildlife	Rec.	Scenery	Soil *	Heritage *	Fish/ Hydro	Botany *
Seaman Park Salvage Conifer Salvage Year - 2005	42		X	X	X		X			X	
Fourmile Shelterwood & Coppice Year – 2005	159		X	X	X		X			X	
Middle Mountain Coppice Harvest Year - 2010	151		X	X	X		X			X	
Wells Ridge Shelterwood & Coppice Year – 2010	283		X	X	X		X			X	

Activity	Acres	Eng.	Veg.	Fuels	Wildlife	Rec.	Scenery	Soil *	Heritage *	Fish/ Hydro	Botany *
Meadow Creek Coppice & Shelterwood Year – 2017/18	496	X	X	X	X	X	X			X	
Sheep Salvage Conifer Salvage Year – 2017/18	21	X	X	X	X	X	X			X	
Middle Elk Fire Low-Mixed Severity Fire Year – 2012	257		X	X	X		X			X	
Buford ATV Trail Year 2012					X						

Grazing Allotments – Transport of Livestock September – October (3 days annually) will be analyzed as an "Existing Condition".

Recreation – Special Events, such as the annual archery tournament held at Triangle Park, will be analyzed as an "Existing Condition".

* Some effect may not be cumulative with some resources if there is no spatial overlap. Individual resource specialists determine if portions of these activities contain overlap and analyze accordingly.

Timber sales that occurred prior to 2005 are not included in the Cumulative Effect table because forest development following these sales would now be considered part of the Existing Condition.

Physical Elements

Soils

Resource Description

Background soil data for the spatial bounds of the Buford New Castle Project was garnered from the Flat Tops Area Soil Survey (USDA Forest Service, unpublished data) and is depicted in Table 3.3. Soil properties relevant to the mechanized removal of timber products and subsequent revegetation include soil organic matter content, erosion risk ratings, texture, depth, and drainage class. Deep, well-drained soils with higher organic matter content and relatively low clay percentages are more resilient to the potential impacts of timber harvest. As shown in Table 3.3, many of the soils mapped for the project area are Mollisols that possess the favorable soil properties such as high organic matter and nutrient levels. Skeletal soils (those with at least 35% rock fragment content by volume) inventoried in Table 3.3 are more resistant to erosion, as demonstrated by the lower Kw values. For the purposes of this analysis, K-factor values are used as a proxy for erodibility. K factors are values used to predict the susceptibility of soil to displacement by water and are used in erosion models and equations that predict soil loss across landscapes (USDA Natural Resources Conservation Service 2010). The K factor scale ranges from 0.02 to 0.64; lower K factor values indicate more erosion-resistant qualities to a soil due to favorable textures and rock fragment content. All K factor ratings used were based on the whole-earth volume of the soil (the "Kw" as opposed to "Kf" factor). Kw values take rock fragment content into account when calculating erodibility as higher rock fragment percentages in the soil volume make the ground less erodible due to the "armoring" effect of the rocks. K factor values for the rated soil components within this project area greater than 0.26 (those highlighted in yellow on Table 3.3 below) were considered "erodible"; the confidence of this rating can be increased by examining the taxonomic classification and geologic parent materials. The reported K factors are only for the surface mineral soil

horizons; removal of organic-rich surface horizons often exposes much more erodible, clayey subsoils. Maintenance of soil organic matter and surface O and A-horizon integrity is paramount in avoiding erosion, compaction, and hydrology problems potentially associated with the proposed biomass removal.

Table 3.3 - Soils Series and Components of the Buford New Castle Project

Component	Kw (Surface)	Classification	Soil Order
Adel	0.20	Fine-loamy, mixed, superactive Pachic Haplocryolls	Mollisol
Angostura	0.15	Loamy-skeletal, mixed, superactive Typic Glossocryalfs	Alfisol
Anvick,warm	0.28	Fine-loamy, mixed, superactive Alfic Argicryolls	Mollisol
Callings	0.20	Clayey-skeletal, smectitic Alfic Argicryolls	Mollisol
Clayburn	0.15	Loamy-skeletal, mixed, superactive Lithic Haplocryolls	Mollisol
Cheadle	0.24	Fine-loamy, mixed, superactive Pachic Argicryolls	Mollisol
Cochetopa	0.37	Loamy, mixed, superactive Lithic Haplocryepts	Inceptisol
Coutis	0.20	Fine, smectitic Pachic Argicryolls	Mollisol
Cowdrey	0.20	Coarse-loamy, mixed, superactive Pachic Haplocryolls	Mollisol
Gateview	0.24	Loamy-skeletal, mixed, superactive Pachic Haplocryolls	Mollisol
Kamack	0.28	Loamy-skeletal, mixed, superactive Typic Haplocryolls	Mollisol
Lake Creek	0.15	Loamy-skeletal, mixed, superactive Ustic Haplocryalfs	Alfisol
Lamphier	0.24	Fine-loamy, mixed, superactive Pachic Haplocryolls	Mollisol
Lespate	0.20	Fine-loamy, mixed, superactive Pachic Haplocryolls	Mollisol
Mayoworth	0.24	Fine, smectitic Ustic Argicryolls	Mollisol
McIntyre	0.15	Coarse-loamy, mixed, superactive Lamellic Haplocryalfs	Alfisol
Mulgon	0.15	Loamy-skeletal, mixed, superactive Mollic Glossocryalfs	Alfisol
Namela	0.15	Loamy-skeletal, mixed, superactive Pachic Haplocryolls	Mollisol
Northwater	0.20	Loamy-skeletal, mixed, superactive Pachic Palecryolls	Mollisol
Pagosa,cool	0.28	Fine, smectitic Ustollic Glossocryalfs	Alfisol
Peeler	0.20	Fine-loamy, mixed, superactive Ustic Glossocryalfs	Alfisol
Pineisle	0.24	Fine-loamy, mixed, superactive Ustic Haplocryepts	Inceptisol
Rhone	0.20	Fine-loamy, mixed, superactive Pachic Haplocryolls	Mollisol
Scout	0.15	Loamy-skeletal, mixed, superactive Ustic Haplocryepts	Inceptisol
Starley	0.15	Loamy-skeletal, mixed, superactive Lithic Haplocryolls	Mollisol

Geology and Landscape Stability

Bedrock geology information is derived from the digitized version of the USGS *Geology of Colorado* (Tweto, 1983). The geology of the project area is dominated by 2 lithologies: the Minturn formation and the Tertiary-aged basalt flows of the bimodal volcanic suite. The Minturn Formation is a mixed sedimentary bedrock type with intebedded layers of limestone within a matrix of sandstone, mudstone, and gypsum clastic deposits (Schenck, 1992). It is mapped as underlying over 80% of the project area; given the heterogeneous nature of this strata, soils that have it as a parent material manifest similarly diverse properties with regard to texture (sand/silt/clay content), mineralogy (shrink/swell clays), and chemistry (pH).

Given the combination of gentle relief, stable bedrock geology, and soils with moderate K-factor values for most of the project area, the generally low risk rating for site stability issues from management

activities such as vegetation removal on this setting is logical. Adherence to Best Management Practices (BMP's) and Project Design Criteria (PDC) detailed in subsequent portions of this report should ensure minimal damages to soil resources from logging activities on this project.

Effects of Alternative 1: No Action

Under the no-action alternative, timber harvesting and associated road construction would not occur, precluding any potential impacts to soil and geologic resources from these activities. Analyzing the potential effects from fuel buildups and subsequent fire from not actively managing vegetation on this area is beyond the scope of this analysis.

Effects of Alternative 2: Proposed Action

Soil Compaction and Productivity

Soil compaction from the Proposed Action of harvesting timber on approximately 660 acres within the boundary of the Buford New Castle Project is expected to be minimal; this owes to the favorable soil properties characterized in Table 3.3 and adherence to Forest Plan standards, guidelines, and design criteria. High levels of soil organic matter and rock fragments offset compaction risk in the finer-textured (clay and silt-rich) soils found in the limestone and basalt-derived soils of the project area. Design features incorporated into this project will further mitigate against potential soil compaction. The ability of the soil to function as a substrate for future forest growth (soil productivity) is unlikely to be hindered under the Proposed Action. Management and policy directives that provide for retention of specific levels of coarse and fine woody debris following timber harvest should help provide for adequate supplies of nutrient and organic matter pools on the forest floor. A comprehensive list of these features is found in the *Forest Plan Consistency* portion of this report.

Soil Erosion and Surface Water Runoff

Gentle slopes and predicted low risk to site stability on this given landscape deem the Buford New Castle project area ideal for logging operations from a geologic hazards perspective. Four soil types mapped within the bounds of the proposed timber sale have Kw values that exceed 0.26, the lower threshold for what are considered erodible soils. Given the fine-textured nature of some of the geology found in the Buford New Castle project area (mudstones, siltsones, basalt), erosion potential increases in subsoil horizons underneath the more resilient topsoil (A and/or O) soil horizons. Reclamation of temporary roads and improvements to the permanent road system should offset some of the increases in soil erosion, sedimentaion, and runoff that accompany transporation corridors through the project area.

Cumulative Effects

Within the temporal and spatial bounds of the Buford New Castle project area, a host of land use and management activities have had variable impacts to soil resources of the area. Past timber harvests, transportation and utility construction, grazing by wildlife and livestock, and recreation have all contributed to minor amounts of localized soil disturbance. Existing soil conditions are likely to remain

relatively stable from the cumulative effects of the aforementioned activities. The additive impacts of selective vegetation removal in the Buford New Castle project area are not anticipated to contribute significantly to cumulative effects on soil and geologic resources if design criteria and management directives are followed. In some cases, regeneration of aspen may serve to improve soil health through the increase in organic leaf litter (i.e. deciduous leaves that fall to the ground), which in turn breaks down to produce soil organic matter.

Irreversible and Irretrievable Commitment of Resources

Soil is a very slowly renewable resource as estimates for rates of soil formation range from .0056 cm to .00078 cm a year (Alexander, 1998). Globally, rates of soil formation are not keeping pace with erosion, leading to widespread soil loss that is due in part to logging operations on public lands. In this sense, logging-induced erosion is an irreversible and irretrievable commitment of resources. The loss of soil organic and mineral matter and earth materials through timber harvesting would potentially be offset by soil organic matter accumulation that accompanies regenerative growth of the trees, shrubs, grasses, and forbs on forest land. The scale of soil loss is not expected to be such that the Proposed Action cannot proceed; adherence to design criteria and best management practices should keep soil erosion to minimal levels that fall well within tolerances for acceptable loss.

Forest Plan Consistency

Forest-wide soil *standards* contained in the White River LRMP (USDA Forest Service, 2002) state that activities on the Forest should:

- Manage land treatments to maintain or improve soil quality, limiting the sum of detrimental soil impacts to no more than 15% of an activity area (Soils Standard # 5).
- Design vegetation and fuels management treatments to retain the average per-acre levels of coarse wood debris (CWD) displayed in Table 2-1. (Soils Standard # 7; see Appendix for Table 2-1)

National strategic goals from Appendix AA of the LRMP are derived from Forest Service Manual (FSM) objectives statements. Those pertinent to the soil resource are found in section 2553.02 and include:

1. Improve soil quality to selected levels for specific purposes by mechanical treatment, chemical or other soil additive, irrigation, or vegetative manipulation.

2. Rehabilitate soils that are in unsatisfactory condition.

Additional soils protection measures are found in Chapter 10 of FSH 2509.25, "Management measures and design criteria". The Proposed Action is consistent with LRMP direction related to soils.

HYDROLOGY

Resource Description

This report summarizes how the Buford New Castle Project would affect watershed resources; specifically streams, riparian areas, and wetlands. Please refer to the Aquatics Specialist Report for further discussion of impacts to streams.

ISSUE STATEMENT

Potential consequences associated with proposed timber harvest and road improvements include changes to: water yield, peak stream flow, water quality (sediment loading), stream health, riparian area conditions, and wetland ecological function, all of which are considered here.

INDICATORS

Indicators used in assessing the effects of the proposed project include: percent of watershed harvested, disturbance to the Water Influence Zone (acres), increase in Connected Disturbed Area (acres), stream health, and acres of wetland disturbance.

TEMPORAL SCOPE

The watershed resources analysis considered all past and planned timber harvest treatments in the analysis area between 1991 and 2016. This allowed for an accounting of all known vegetation treatments that cumulatively could impact the streams and watersheds that would be affected by the proposed activities.

GEOGRAPHIC SCOPE

The geographic scope of this analysis included the same 6th field sub-watersheds listed in the Aquatics Specialist Report associated with the Buford New Castle Project, reproduced here in Table 3.4

Table 3.4. Watersheds and sub-watersheds included in the watershed resources analysis area.

6th field HUC	5th field HUC	4th Field HUC
Deep Creek	Elk Creek	Colorado Headwaters-Plateau
East Rifle Creek	Rifle Creek	Colorado Headwaters-Plateau
Hill Creek-South Fork White River	South Fork White River	Upper White
North Elk Creek	Coal Creek-White River	Upper White
Outlet North Fork White River	North Fork White River	Upper White
South Fork Canyon	South Fork White River	Upper White
Veatch Gulch-White River	Coal Creek-White River	Upper White
West Elk Creek	Elk Creek	Colorado Headwaters-Plateau

DIRECT AND INDIRECT EFFECTS

Alternative 1 – No Action

Under the no-action alternative, the proposed vegetation treatment and road improvements would not occur. Selection of this alternative would not affect water yield, stream health, water quality, riparian area conditions, or wetland ecological function.

Alternative 2 – Proposed Action

Water yield

The proposed project would harvest timber from approximately 660 acres. Water yield and peak flow increases have been demonstrated in small watersheds where as little as 25% of vegetation has been removed in a single entry (Jones and Grant, 1996), however, increases are generally undetectable or insignificant when harvest levels are below 25% (Jones and Grant, 1996; Beschta *et al.*, 2000; Troendle and King, 1987). The proposed action would not increase cumulative harvest, as a percentage of each 6th field HUC harvested, above 25% in any of the project area watersheds and would therefore not be expected to increase water yield in these watersheds.

Table 3.5: Previous harvest, proposed, and cumulative harvest levels in project area sub-watersheds. Estimates are known to be high as all acres harvested were assumed to be clearcut, while many were/are proposed as thinnings only, which would leave more trees in each stand than if they had been clearcut, and thereby have less effect on water yield.

6th Field HUC	Previous harvest (acres)	Proposed harvest (acres)	Cumulative harvest (acres)	6th Field HUC acres	Cumulative harvest (%)
Deep Creek	304	141	445	18,782	2%
East Rifle Creek	657	326	983	33,438	3%
North Elk Creek	267	169	436	28,376	2%
Veatch Gulch-White River	0	17	17	28,361	0%
West Elk Creek	0	7	7	17,117	0%
Total		660			

Stream Health

Road curve widening is proposed at one road/stream crossing, high in the Vaughn Creek drainage. Curve widening will disturb ground near the stream crossing though no work in the stream channel is proposed. Only about 33 feet of the road segment to be widened drains toward the stream and thus the risk of delivery of a substantial volume of sediment to the stream is low. Erosion from the site would be managed with BMPs to minimize erosion and delivery of sediment to the stream (see Engineering section). No changes to the stream health class of Vaughn Creek would thus be anticipated.

Water Influence Zone (WIZ) disturbance and Connected Disturbed Area

About 420 feet of an unnamed tributary to the East Fork of North Elk Creek runs through unit 404. A 100 foot no disturbance buffer would preclude disturbance to the WIZ associated with that stream segment. No other streams are known within proposed harvest units. If any

streams, ponds or wetlands were to be identified within harvest units, they would have no disturbance buffers of at least 100 feet which would preclude impacts to surface water resources.

No temporary or other new roads are proposed within 100 feet of any stream and therefore CDA would not expand under the proposed action.

Road curve widening in the WIZ of three stream reaches would total about 0.2 acres spread out over several thousand acres of multiple sub-watersheds and would therefore not affect watershed resources.

Timber haul is proposed from unit 105 on the existing Road Camp road (NFSR 245.4A; an estimated 75-100 loads). This 0.45 mile spur off the Buford New Castle Road ends at a developed spring, which flows down an unnamed tributary to Huffman Gulch and eventually East Rifle Creek. Log truck traffic within the WIZ of the spring (within 100 feet) could increase sediment generation and delivery to the spring area and the stream channel downstream of it. The existing conditions of the stream channel in that segment are not known.

While Connected Disturbed Areas (CDA) would not increase under the project, increasing the intensity of the existing ground disturbance near the spring on the Road Camp road without compensatory road/landing design criteria could potentially reduce the stream health of the stream segment below the spring, contrary to management direction. Therefore, the following design features specific to the spring area are proposed:

1. A truck turn-around/landing should be developed that is at least 100 feet away from the spring/perennial water that would not deliver sediment to the spring/stream, if feasible,

2. The impacted area within 100 feet of the spring/perennial water should be hardened with rock or wood chips to minimize the likelihood and extent of fine sediment generation and delivery to surface water,

3. Opportunities to improve drainage to prevent or minimize sediment delivery to the spring/stream should be sought and developed, as available,

4. The Road Camp road should only be used by project-related vehicle traffic under dry conditions.

Implementing as many of the above design features as feasible should maintain watershed resources in the vicinity of the spring and the stream health of the stream reach downstream.

Conversely, increasing the intensity of disturbance within 100 feet of the spring without hardening the turn-around area, or otherwise increasing sediment transport to the stream would likely decrease stream health at that site, contrary to management direction (FSH 2509.25 Watershed Conservation Practices Handbook).

Water quality

Protecting the WIZ protects water quality by preserving soil infiltration capacity, preventing overland flow from disturbed areas from entering directly into streams, trapping sediment within natural ground cover, and providing shade which keeps water cold. These measures are expected to protect water quality such that beneficial uses will not be affected in or downstream from project area watersheds.

Wetlands

For this project wetlands maps were generated from the National Wetlands Inventory (NWI), which is produced by the US Fish and Wildlife Service using aerial photography, topographic maps, soil survey reports, and field observations. Additional field observations were conducted during the initial mapping of proposed harvest units. Only two small ponds have been identified in or near a proposed harvest unit (unit 305) that may have some small area of wetland habitat associated with them. Harvest buffers will preclude any impacts to wetland areas around the small ponds.

The following management direction applies to wetlands within the project area:

(FSH 2509.25 Management Measure 6): Maintain long-term ground cover, soil structure, water budgets, and flow patterns of wetlands to sustain their ecological function.

a) *Keep ground vehicles out of wetlands unless protected by at least 1 foot of packed snow or 2 inches of frozen soil. Do not disrupt water supply or drainage patterns into wetlands (Hydrology/Fisheries Design Feature #10, Soils Design Feature #1. Pg. 23).*
b) *Keep roads and trails out of wetlands unless there is no other practicable alternative.*

Project design features included as part of the proposed action specify that harvest unit boundaries would be refined before implementation, that the boundaries would be marked on the ground to exclude wetlands and that that wheeled or tracked vehicles would not be operated in wetlands. These design features would ensure that wetland ecological function would be maintained. The proposed action is thus not expected to affect wetlands.

CUMULATIVE EFFECTS

Past, present and foreseeable management activities within the project area watersheds include timber harvest, livestock grazing, water withdrawals from the spring at the end of Road Camp road, and dispersed- motorized and non-motorized recreation.

The effects analysis presented above considers all reasonably foreseeable timber harvest and road building within the affected watersheds. All foreseeable timber harvest projects were analyzed as existing conditions in the accounting for cumulative harvest levels. All clearcut harvest that has occurred since 1991 was accounted for when calculating cumulative harvest levels. As described above, this project would cause only limited ground disturbance within the WIZ, would not increase CDA in any watershed, and cumulative harvest levels within all project area watersheds would remain well below 25%, below which increases in water yield are

generally undetectable or insignificant (Jones and Grant, 1996; Beschta *et al*., 2000; Troendle and King, 1987).

Although direct effects to water resources from individual land uses can be additive, this project is not expected to have measurable effects to stream health, water quality or wetlands function. Therefore the project is not expected to contribute to adverse cumulative effects.

FOREST PLAN CONSISTENCY

Forest Plan Direction

Forest-wide standards for the management of water resources were published in the Land and Resources Management Plan for the White River National Forest (USDA Forest Service, 2002). An amendment published in 2005 (USDA Forest Service, 2005) removed standards that were already covered under the Watershed Conservation Practices Handbook (FSH 2509.25). After incorporating the proposed project design features specific to Road Camp road, both the no action and proposed action alternatives would be consistent with Forest Plan direction.

BIOLOGICAL ELEMENTS

FOREST VEGETATION

This analysis includes descriptions of the current vegetation condition and the desired vegetation condition. Direct and indirect effects of the No Action Alternative and the Proposed Action Alternative will be discussed, as well as the cumulative effects of implementing the Proposed Action. Indicators used to differentiate between alternatives include:

- Percent increase in aspen as an overall portion of stand composition in seral stands that are converting to subalpine fir.
- Percent increase in young (Structural Stage 2T) aspen and mixed conifer stands.

Desired Condition

The proposed treatment area falls into four main Forest Plan designated Management Areas. The majority of the area, approximately 88%, consists of Management Area 4.3 – Dispersed Recreation. The remaining 12% is composed of Management Areas 5.12 – General Forest and Rangelands (Range Vegetation Emphasis), 5.4-Forested Flora and Fauna Habitats, and 5.4-Elk Habitat. Applicable desired conditions are listed below.

4.3-"Biological communities are maintained or improved to provide an attractive setting for visitors, complement the recreational values, and provide varied plant communities, structural stages, and associated wildlife."

5.12 – "A variety of forested and non-forested plant communities and successional stages are maintained through a combination of human manipulations and natural processes. A diversity of desired plant and wildlife species is represented within the capability of the habitat."

5.4– "These areas provide for a variety of forest and non-forest plant communities and successional stages, over the long term, through a combination of human manipulation and natural processes.

Management activities are influenced by biological processes found in the area, and strive to replicate local natural vegetation patterns and patch size. Vegetation management is designed to simulate natural disturbances, thus silvicultural treatments may be larger than 40 acres in size. Vegetation composition and structure exist in a range of successional stages to meet wildlife and aquatic habitat, livestock forage, and forest product objectives….A full range of silvicultural prescriptions may be employed that includes timber harvest and prescribed fire management, in which both focus on long-term desired conditions".

5.43– "Vegetation is managed to provide healthy plant communities with a variety of species present for food and cover. Forested areas may appear managed without much evidence of damage by insects and disease. Natural and created openings or meadows of various sizes and shapes occur as well."

Table 3.6. The proposed treatment area and associated Forest Plan-designated management areas

Forest Plan Management Area	Proposed Treatment Area (Acres)	Percent of Treatment Area
4.3 Dispersed Recreation	579	88
5.12 General Forest and Rangelands – Range Vegetation Emphasis	29	4
5.4 Forested Flora and Fauna Habitats	42	6
5.43 Elk Habitat	10	2

Issues, Resource Indicators and Measures

No specific key issues were identified during the scoping and comment period. An effects driven analysis will be used to discuss and disclose anticipated effects associated with implementing the proposed action or the no action alternatives of the Buford Newcastle project.

Indicators used to differentiate between the alternatives are:

- Percent increase in aspen as an overall portion of stand composition in seral stands that are converting to subalpine fir.
- Percent increase in young (Structural Stage 2T) aspen and mixed conifer stands.

Forest condition data used to develop this report includes: FSVeg Spatial Data, project area field visits (2015), and common stand exam data (2015). Other resources used to discuss possible effects to the vegetation resource from implementing the Proposed Action include Forest Activity Tracking System (FACTS) database, aspen management literature, and Common Stand Exam (CSE) data.

Affected Environment

The dominant forest cover types in the 8,743 acre Buford New Castle analysis area are aspen, spruce-fir and grass-forbs.

Cover types were determined by dominant life form species within the overstory of the stand. The FSVeg Spatial Database was used to determine cover types within the analysis area.

Figure 3.1: Species Composition by Cover type for Buford New Castle analysis area

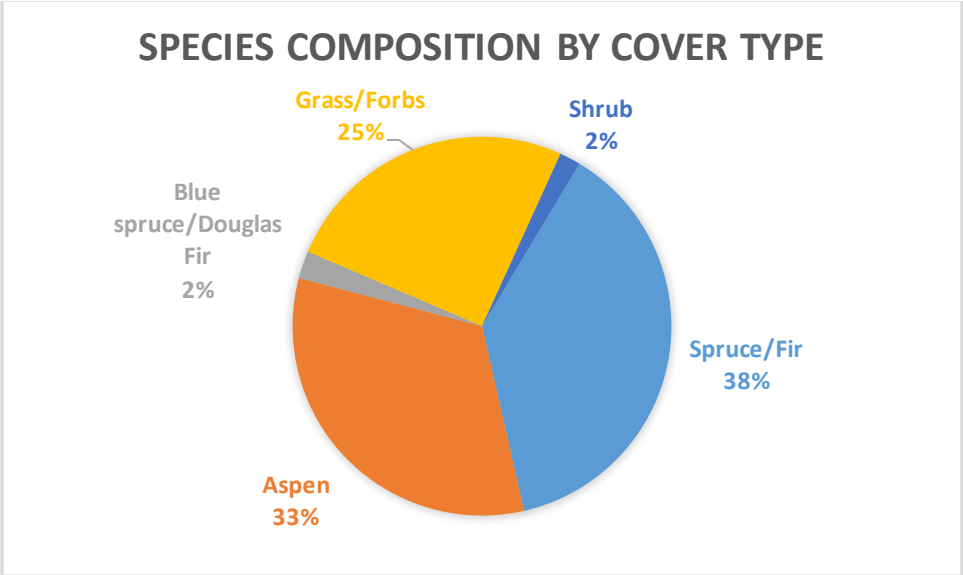


Table 3.7. Buford New Castle Analysis Area by Structural Stage

Cover type	1	2S	2T	3A	3B	3C	4A	4B	4C	Total	Percent of Total (8,743 acres)
Barren / Rock/ Water										7	<1
Non-forest (shrubs and grasses)	2,216	158								2,374	27
Blue Spruce				88			20	74		182	2
Spruce and fir				41	590	139	53	1,693	788	3,304	38
Aspen				47	795	194	8	1,427	383	2,854	33
Douglas Fir								22		22	<1
Forest Cover by Structural Condition (acres)	2,216	158	0	176	1,385	333	81	3,216	1,171	8,743	
Forest Cover Percent by Structural Condition	25	2	0	2	16	4	1	37	13		

Definitions of Structural Stages:

1 – Meadow
2S – Seedling/Sapling Stage (Shrub)
2T – Seedling/Sapling Stage (Tree)
3A – Sapling/Pole, canopy closure < 40%
3B – Sapling/Pole, canopy closure 40-70%
3C – Sapling/Pole, canopy closure > 70%
4A – Mature, canopy closure < 40%
4B – Mature, canopy closure 40-70%
4C – Mature, canopy closure > 70%

Spruce-fir Cover type

The spruce-fir cover type is the most extensive cover type within the Buford New Castle analysis area. This cover type consists primarily of Engelmann spruce (*Picea Engelmannii*) and subalpine fir (*Abies lasicarpa*), with aspen (*Populus tremuloidies*) being a minor component of the stand (Figure 3.7). Approximately 77% of this cover type consists of large to very large trees (Structural Stage 4A, 4B, 4C)). Based on stand exam data, stand ages range from 110 to 165.

Both spruce and fir are shade tolerant and form climax or near climax vegetation associations. They differ from most climax forest in that many stands are not truly all-aged (Alexander/Shepperd, 1990). Stands within the analysis area vary, with most stands being single-storied or two-storied.

Disturbances are a natural and ongoing process of stand development. The scale of disturbance range from small (an individual tree or group of trees) to large (stand replacement). Common small disturbances include mortality from wind, insects, and disease. These disturbances aid in the formation of multi-storied stands. Large disturbances; fire, catastrophic windthrow and insect/disease epidemics occur infrequently. After these large scale, drastic environmental changes, spruce and fir are usually replaced by lodgepole pine, aspen, or shrub and grass communities. (Alexander/Shepperd, 1990)

Within the analysis area, common insects include endemic populations of spruce bark beetle (*Dendroctonus rufipennis*) and fir engraver (*Scolytus ventralis*). The most common disease is Armillaria root rot (*Armillaria mellea).* Armillaria root rot has been found on both Engelmann spruce and subalpine fir root systems within the analysis area. Much of the mortality of subalpine fir along the Buford New Castle road corridor can be attributed to Armillaria root rot.

A recent large natural disturbance occurred on June 19, 2000. A wind event between Triangle Park and Clark Cabin Springs damaged approximately 1550 acres of spruce-fir and aspen stands. This wind event, caused by a thunderstorm, caused trees to be blown over, uprooted, and broken at various heights. Damage varied depending on location. Damage within timber stands occurred as individual trees and small ½-3 acre groups. Some forested areas along ridgetops and meadow edges were completely blown over creating openings between 5 and 15 acres. The stands that were completely blown over have since regenerated into aspen stands with a small component of advanced regeneration of spruce and fir. The spruce-fir component consist of existing regeneration that were released at the time of the wind event.

Another more recent large natural disturbance was the 2012 Middle Elk Creek fire. This fire burned approximately 257 acres of spruce-fir and aspen stands. This fire burned in a mosaic pattern, some areas burned intensely, killing the overstory while in other areas, it burned the understory or not at all. It is expected that intensely burned areas will regenerate with aspen.

Figure 3.2 – Typical Mixed Stand of Spruce-Fir

Aspen Cover type

Aspen stands cover approximately 33% of the analysis area. These stands can be found in pure stands and stands that have been overtaken by more shade tolerant conifer. Approximately 64% of this cover type consists of large to very large trees (Structural Stage 4A, 4B, 4C). Based on stand exam data, stand ages range from 80 to 125.

Aspen are a fast-growing, short lived species that are quick to occupy disturbed sites. Seral aspen stands are usually replaced by more shade-tolerant conifers, which can take only a single aspen generation or as long as 1,000 years of fire exclusion (Perala, 1990). Replacement of aspen by conifer is apparent throughout the analysis area. Figure 3.3 illustrates how remnant aspen are a component of many of the spruce-fir stands and fir seedlings can be found in the understory of many of the aspen stands.

Figure 3.3 – Aspen with Fir Encroachment

Within the analysis area, common diseases to aspen stands include, cankers (Encoelia pruinosa, Cytospora chrysosperma, Ceratocystis fimbriata, Cryptosphaeria populina) and stem rot (Phellinus tremulae). Leaf Blight (Marssoniana populi) is present and generally appears in some aspen stands following warm, moist periods in early spring/summer. Leaf blight was apparent last summer, many stands showed characteristic leaf discoloration and premature leaf shedding.

Regeneration surveys are conducted the first, third and fifth years after harvest. Aspen stands are considered fully stocked when at least 75% of the area clearcut contains at least 300 trees per acre or more. Regeneration of aspen stands after clearcutting has had mixed results within the analysis area and west of the analysis area. Surveys have shown most stands contain 1000-15000 aspen stems per acre within the 1ST year and 1000-5000 stems per acre after 5 years. Of the 593 clearcut acres of aspen included in the cumulative effects analysis, 102 acres have not regenerated naturally. Areas that have failed to regenerate have been attributed to over grazing by domestic sheep and to a lesser extent elk. Fencing of clearcut units has been used in the past to reduce the impacts of domestic sheep grazing. Monitoring of sheep movements through treatment areas has also limited the impacts of grazing.

Environmental Consequences

Alternative 1 – No Action

Under the no action alternative, natural processes would be expected to continue. Seral aspen stands within the analysis area are expected to continue to be encroached by surrounding conifer species. These stands of aspen will continue to convert to mixed conifer stands of subalpine fir and Engelmann spruce. These spruce-fir stands are then expected to develop into climax forests until drastic environmental changes occur (complete removal of the stand). As a result of these stand replacement events, aspen or shrub and grass communities are anticipated to occupy the site (Alexander/Shepperd, 1990).

There are no cumulative effects of the no action alternative. The proposed treatment areas would not be treated and natural processes would continue.

Alternative 2 – Proposed Action
Direct and Indirect Effects

Clearcut (199.3 Acres)

This activity would create a new age class comprised of young aspen (Structural Stage 1/2T). The removal of all trees within the clearcut units would provide favorable conditions for the establishment of a young aspen stand. "The number of suckers that appear is directly proportional to the number of stems removed the greatest number arise after clearcutting" (Jones 1985). Once the overstory is removed, cytokinins accumulate in the roots and the supply of inhibitory auxins is eliminated, and suckers are initiated (Perala, 1990). Based on other similar projects conducted around the analysis area it is expected the units would regenerate to required Forest Plan standards of 300 trees per acre. Domestic sheep grazing would need to be monitored and the use of enclosure fencing utilized if overgrazing is observed.

This treatment would meet the proposed purpose and need of the project by increasing forest resiliency by creating a new age class of young aspen, as well as provide a supply of forest products and/or biomass to local industries.

Patch Clearcut (173.6 Acres)

These subunit clearcuts would act like the clearcuts described above. This activity would create a new age class comprised of young aspen and conifer. The focused removal of aspen and associated subalpine fir and spruce would provide favorable conditions for the establishment of a young aspen stand within the clearing limits. By leaving the surrounding stand intact, conifer regeneration can be expected to mix with aspen regeneration along the perimeter of the patch clearcuts.

This treatment would meet the proposed purpose and need of the project by increasing age class and species diversity, by creating a new age class of young aspen. It would also increase aspen as an overall portion of stand composition in seral stands, as well as provide a supply of forest products and/or biomass to local industries.

Improvement Cut (110.9)

By removing subalpine fir and spruce, the existing aspen overstory would remain creating a stand with a mature aspen overstory. A two storied aspen stand may develop within some of these stands. Past small disturbed areas, approximately 1/10th to 1 acre in size, within the analysis area have shown the ability to regenerate with aspen. Existing subalpine fir seedlings may be released through this activity and would be expected to form a portion of the second story.

This treatment would meet the proposed purpose and need of the project by increasing the overall proportion of aspen in seral stands that are converting to subalpine fir. In addition, the proposed treatment would provide a supply of forest products to local industries.

Commercial Thinning (163.5)

This activity would maintain mature spruce and fir stands, but would reduce their density for improved daylighting. The residual stand should show improved vigor by reduction of completion and develop wind firmness over time.

This treatment would meet the proposed purpose and need of the project by daylighting the road corridor to facilitate drying and improve sight distance as well as, provide a supply of forest products to local industries.

Group Selection (11.8)

The group selection prescription would create small openings in the forest canopy, where all trees would be removed. Newly created openings would lead to development of multi-aged conifer stand. In order to ensure natural regeneration, cutting units will be designed, shape and size, so that seed from the surrounding timber margin reaches all part of the opening. (Alexander 1987)

This treatment would meet the proposed purpose and need of the project by providing a supply of forest products to local industries as well as increasing age class and species diversity by creating a new age class conifer.

Individual Tree Selection

This activity would be expected to have little effect. Currently firewood gathering occurs throughout the analysis area. There is potential for small openings to be created through this option which may allow for new aspen regeneration or the release of conifer regeneration.

Cumulative Effects

Vegetation management treatments that have occurred between the mid 2000's and present, as well as any reasonably foreseeable vegetation management activities.

Table 3.8 - List of Past, Present and Reasonably Foreseeable Activities by Activity Type

Activity	Acres	Year	Activity Description
Seaman Park Salvage	42	2005	Conifer Salvage
Fourmile	159	2005	Shelterwood & Coppice
Middle Mountain	151	2010	Coppice Harvest
Wells Ridge	283	2010	Coppice Harvest
Middle Elk Fire	257	2012	Low-Mixed Severity Fire
Meadow Creek	496	2017/2018	Coppice & Shelterwood
Sheep Salvage	21	2017/2018	Conifer Salvage

Table 3.9 – Forest area changes associated with the Buford New Castle Project.

Cover type	1	2S	2T	3A	3B	3C	4A	4B	4C	Total	Percent of Total (8,743 acres)
Barren / Rock/ Water										7	<1
Non-forest (shrubs and grasses)	2216	158								2,374	27
Blue Spruce				88			20	74		182	2
Spruce and fir			***4***	41	590	***97***	53	***1642***	***673***	***3,099***	***35***
Aspen			***260***	47	795	***201***	8	***1398***	***349***	***3,059***	***35***
Douglas Fir								22		22	<1
Forest Cover by Structural Condition (acres)	2,216	158	***264***	176	1,385	***298***	81	***3,136***	***1,022***	8,743	
Proposed Change in Forest Cover by Structural Condition (acres)	0	0	***264***	0	0	***-35***	0	***-80***	***-149***		
Forest Cover Percent by Structural Condition	25	2	***3***	2	16	***3***	1	***36***	***12***		

*Changes from existing condition are italicized and cells are light gray.

The proposed action covers approximately 7.5% of the total analysis acres and 10% of the total forested acres within the analysis area. Following implementation of the proposed action, all structural stages would be represented. Aspen and spruce-fir would cover an equal percentage of coverage area. The largest structural stage increase would be within the seedling (2T) structural stage. This stage would now represent 3% of the analysis area. Structural stages 3C, 4B, and 4C will each lose a percent.

The proposed action increases the total number of acres effected by recent vegetation management activities and natural disturbances from 299 to 959. Since 2005, vegetation management activities and natural disturbances have effected approximately 3.4% of the analysis area. Implementation of the proposed action would increase the percent of managed acres to 11% of the analysis area.

A loss in the number of forested acres may occur if stocking standards are not met in the clearcut, patch clearcut and group selection openings. If this occurs, artificial regeneration (planting) would be conducted to meet stocking requirements.

Summary of Environmental Effects

Implementing the proposed action would meet all objectives of the purpose and need. The 371 acres of clearcut, patch clearcut, and improvement cut treatments would increase aspen as an overall portion of stand composition in seral stands and increase age class diversity. Without treatment, a downward trend in the number of acres of aspen can be expected unless a major natural disturbance occurs. Forest resiliency can also be expected to increase throughout all treatments. All treatments give the potential for new regeneration which would increase species and age class diversity. Without treatment, little to no change is expected without natural disturbance. Thinning treatments would daylight the road and removal of timber from each treatment would provide a supply of forest products and/or biomass to local industries.

Table 3.10 – Comparison of No Action and Proposed Action

Indicator	No Action (acres)	Proposed Action (Acres)
Increase aspen as an overall portion of stand composition in seral stands that are converting to subalpine fir.	0	371
Increase in forest resiliency by increasing species and age class diversity in aspen and mixed conifer stands.	0	660

Forest Plan Compliance

The Buford New Castle Project complies with all Forest Plan Standards and Guidelines related to Silviculture. Project Design Features would protect regenerating aspen from browse and potential damage from snow machines. Stocking surveys would be met within 5-years post-harvest through natural regeneration. All proposed openings are under 40-acres in size.

TERRESTRIAL WILDLIFE

This report analyzes the effects on terrestrial wildlife species, including Threatened and Sensitive species, from the two alternatives in the Buford New Castle Environmental Assessment. Wildlife species and their habitat will be addressed on three different geographic scales: the Buford New Castle Harvest Units (653 acres- includes dropping unit 301), the Buford New Castle Analysis Area (8,743 acres), and the Buford New Castle Wildlife Cumulative Effects Area (68,610 acres).

Issues and Resource Indicators

Issue 1: Effects to Migratory and Non-Migratory birds and raptors - Tree clearing may have direct impacts on nesting birds in the short term and indirect effects on nesting habitat in the long term.

Indicator: Number of acres harvested and time of year harvested

Issue 2: Effects to Elk and Elk Habitat - Tree clearing within elk calving habitat may have direct impacts on elk in the short term and indirect effects on elk calving habitat in the long term.

Indicator: Number of acres harvested in calving habitat and time of year harvested

Affected Environment

The Buford New Castle Analysis Area totals 8,743 acres. This analysis area encompasses harvest units, temporary road locations, haul routes within the Forest boundary, and surrounding areas. Elevation ranges 8,000-10,600 feet. Table 3.11 displays the vegetation and associated structural stages occurring in the Buford New Castle Analysis Area. The structural stages are defined below the table.

Table 3.11. Structural Stage Distribution of the Vegetation in the Buford New Castle Wildlife Analysis Area (8,743 acres)

Species	1	2T	3A	3B	3C	4A	4B	4C	Total Acres & % of Total
Aspen	0	0	47	795	194	8	1427	383	2854 (33%)
Spruce-fir	0	0	41	590	139	53	1693	788	3304 (38%)
Douglas fir	0	0	0	0	0	0	22	0	22 (<1%)
Blue spruce	0	0	88	0	0	20	74	0	182 (2%)
Grass/forb and Shrub	2216								5753 (23%)
Barren, Rock, Water								7	7 (<1%)
Grand Total									**8,743 acres**

Definitions of Structural Stages:

1 – Meadow
2T – Seedling/Sapling Stage
3A – Sapling/Pole, canopy closure < 40%
3B – Sapling/Pole, canopy closure 40-70%
3C – Sapling/Pole, canopy closure > 70%
4A – Mature, canopy closure < 40%
4B – Mature, canopy closure 40-70%
4C – Mature, canopy closure > 70%

The structural stage distribution for the forested cover types in the Buford New Castle Wildlife Analysis Area is displayed in Table 3.12.

Table 3.12: Structural Stages of the Forested Cover Types in the Buford New Castle Wildlife Analysis Area (8,743 acres)

Covertype	Early Stage	Mid Stage	Late Stage
Spruce-fir and spruce-fir mixed	0%	23%	77%
Aspen and aspen-conifer mix	0%	36%	64%
Douglas fir*	0%	48%	52%
Blue spruce*	12%	14%	74%

*These cover types are not proposed for any treatments in this project, and will not be discussed in detail in this report.

Spruce-fir and spruce-fir mixed: There are 3,304 acres of spruce-fir and mixed spruce-fir habitat in the Buford New Castle Wildlife Analysis Area, representing 38% of the analysis area.

Some of the wildlife species commonly associated with the spruce-fir and mixed spruce-fir cover type include:

- Pine marten, pine grosbeak, boreal owl, southern red-back vole, elk and deer (foraging habitat and hiding cover), red squirrel, boreal owl, Canada lynx and snowshoe hare.

Figure 3.4 Examples of spruce fir habitat in two of the harvest units

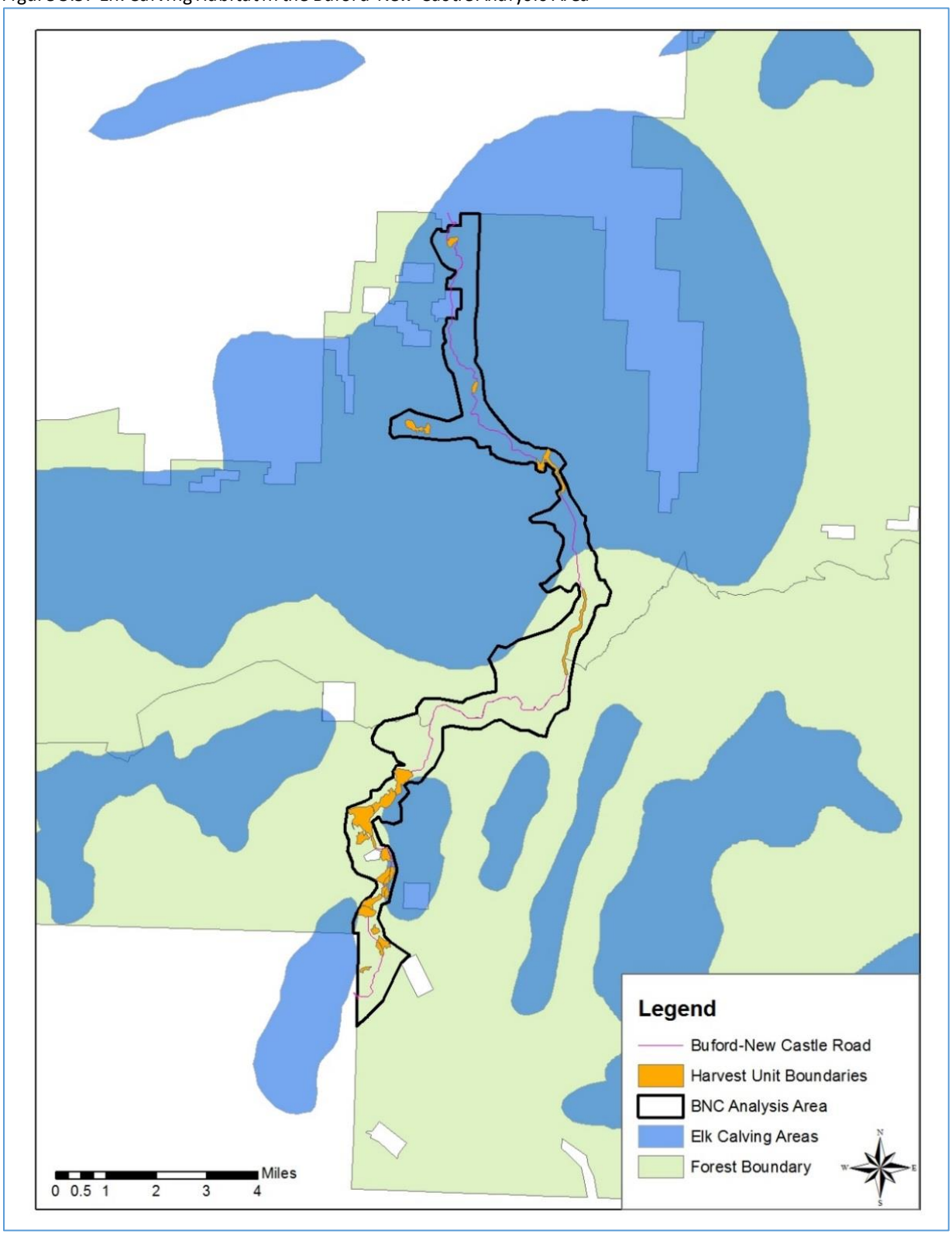
Aspen and Mixed Aspen: There are 2,854 acres of aspen and mixed aspen/conifer habitat in the Buford New Castle Wildlife Analysis Area, totaling 33% of the Wildlife Analysis Area. The mixed stands primarily consist of aspen and sub-alpine fir, with lesser amounts of Engelmann spruce.

Some of the wildlife species associated with the aspen and mixed aspen cover types include:

- Warbling vireo, American robin, northern goshawk, common flicker, red-naped sapsucker, purple martin, elk, mule deer, western wood peewee, and flammulated owl.

In the Buford New Castle Project Area, the aspen habitat provides important elk calving habitat. Mature aspen habitat also provides high quality habitat for cavity nesting birds and raptors. Figure 3.5 below shows that elk calving habitat, mapped by Colorado Parks and Wildlife, in relation to the harvest units.

Figure 3.5: Elk Calving Habitat in the Buford-New Castle Analysis Area



The two pictures below show examples of the aspen habitat in the project area. Most of the habitat is a comprised of mixed aspen and spruce-fir, in a more advanced seral condition.

Figures 3.6: Examples of Aspen Habitat in two of the harvest units

Mountain Shrub: This habitat primarily consists of Gambel oak, snowberry and small amounts of sagebrush. This type of habitat will not be affected by the any of the alternatives associated with this project, and will not be discussed further in the wildlife section.

Mountain Grasslands: Approximately 20% percent of the analysis areas is comprised of grasslands. These open parks are scattered throughout the project area and range from a few acres, up to several hundred acres in size. There are temporary roads and landing areas that will be located in this type of habitat type.

Some of the wildlife species associated with the mountain grassland cover type include:

- white-crowned sparrow, northern pocket gopher, mountain bluebird, elk and deer (foraging habitat).

Wetlands and Riparian Areas: There is very little riparian or wetland habitat in or adjacent to any of the cutting units associated with this project. There is one road curve widening that is proposed high in the Vaughn Creek drainage. There is also about 420 feet of an unnamed tributary to the East Fork of North Elk Creek runs through unit 404.

Environmental Consequences

Alternative 1: No Action

This alternative would not harvest any timber in spruce-fir, spruce-fir mixed, or aspen stands in the Buford New Castle Project Area. There would be no mortality to wildlife species resulting from timber harvesting activities. Wildlife species that are directly affected by harvesting activities are those species that are less mobile, including young birds that have not fledged from the nest, young mammals, and some adult and young small mammals. Under this alternative, there would be no disturbance or displacement of wildlife species resulting from commercial timber harvesting. Other activities that disturb and displace wildlife would continue under this alternative, such activities include recreational activity, motorized traffic, firewood gathering and livestock grazing.

Under the no action alternative, natural processes would be expected to continue. Seral aspen stands within the analysis area are expected to continue to be encroached by surrounding conifer species. These stands of aspen will continue to convert to mixed conifer stands of subalpine fir and Engelmann spruce. These spruce-fir stands are then expected to develop into climax forests until a disturbance event occurs.

Alternative 2: Proposed Action

General Direct Effects on Wildlife: Timber harvesting activities in aspen and spruce-fir habitat would result in direct mortality of some animals. These activities particularly affect less mobile species such as small mammals or young birds that have not fledged from the nest. In addition to direct mortality, harvesting operations, road construction and log hauling can displace some animals, and reduce the habitat effectiveness of an area.

Direct Effects on Nesting Birds: Depending on the time of year that harvesting activities occur, there is the potential to affect nesting birds within the cutting units. Raptor surveys were conducted throughout the cutting units, including broadcast calling for the northern goshawk. A coopers hawk nest and a red tail hawk nest were found on the edge of unit 301 on the south end of the project area. This unit was removed from the proposed action. In Unit 109, a red-tailed hawk adult was observed and a juvenile red-tailed hawk was heard calling, however a nest was not found. This unit will continue to be monitored throughout the life of this project.

If harvesting activities occur before the end of July there would be a greater level of impact to nesting birds. Although adult birds would be displaced and avoid direct mortality, nestlings and young fledglings would do not have the mobility to avoid direct impacts. The majority of songbird species at this elevation have fledged from the nest by the end of July, so harvest activities that occur in August or later would have less of an impact on nesting birds.

Direct Effects on Elk, Deer and Moose: There are four harvest units that are within mapped elk calving habitat, and several more units that are on the edge of an elk calving areas. Biologists have observed cows and calves throughout this area. The majority of these units are along the Buford New Castle Road (FSR 245), which opens up to motor vehicle traffic depending on snow levels sometime in late May or early June. It is likely that the existing activity on this road pushes elk back off of the road corridor. There is the potential to displace and disturb some elk during calving season from harvesting, however, given the level existing activity on the Buford-New Castle Road, this effect would be minimal.

Unit 109 is well off of the Buford New Castle Road, therefore harvest activities will be restricted until after June 20 in this unit, to reduced disturbance to elk calving.

Deer and moose utilize the project area primarily as general summer range, and there is the potential for some fawning and calving activity to occur. Although there could be some displacement of individuals, there is no critical habitat identified for these species.

Indirect Effects: There is a total of 653 acres of harvesting that would affect wildlife species in the analysis area. The type of habitat that is treated, as well as the silvicultural prescription influences indirect effects on different groups of species. In general, the proposed action would benefit those wildlife species that utilize earlier successional habitat, and result in less habitat for species that utilize more advanced successional stands with higher amounts of standing dead, and down wood.

Clearcut and Patch Clearcut: A total of 199 acres is proposed for clearcutting, and 174 acres is proposed for small patch clearcuts (resulting in 61 acres harvest). These areas should result in the establishment of a pure aspen stand, or pure aspen patches. These cuts represents 9% of the aspen and mixed aspen habitat in the analysis area. Some of the wildlife species that benefit from an increase in pure aspen habitat across the landscape include the purple martin, red-naped sapsucker, western wood peewee, warbling vireo, flammulated owl, and cavity nesting species in general.

There have been some studies analyzing the effects on bird species from commercial clear cutting of aspen in Colorado. Two of these studies determined that the effects of clear cutting on bird abundance and composition in aspen appear to be temporary if regeneration is prompt (Scott and Crouch 1987, Scott and Crouch 1988). In the 1988 study, broad-tailed hummingbirds, solitary vireos, song sparrows, and white-crowned sparrows were more numerous on the clear cuts, as compared to the control areas. Tree swallows, violet-green swallows, house wrens, yellow-rumped warblers and warbling vireos were less numerous in the clear cuts compared to the control areas (Scott and Crouch 1988). This study stated that clear cutting of aspen in relatively small blocks over a span of years in the same area should provide a mosaic of age classes, and could result in increased local bird diversity. This same study also stated that raptors and other birds that require extensive stands of mature forests could have been adversely affected by the clear cuts, for instance hairy woodpeckers were only seen in control areas.

Both deer and elk utilize young aspen stands for forage. When regeneration reaches sufficient heights, clear cut areas can also provide good hiding cover. Several of the mature aspen stands in the Buford New Castle Project Area have been documented as important elk calving habitat. Elk have been shown to return year after year to the same areas for calving. Because many of the harvesting units are adjacent to the Buford Newcastle Road, this habitat is likely less desirable for elk based on the motor vehicle noise, as well as dispersed camping that occurs along the road.

Improvement Cuts: There are a total of 111 acres of Improvement Cuts that are being proposed in seral aspen stands that have enough of a mature aspen component to allow conifer removal without compromising the integrity of the residual aspen. This harvest activity would maintain a mature aspen overstory, but in some cases could create a two aged aspen stand. These type of treatments would have a more beneficial effect on aspen dependent wildlife species as compared to the aspen clear cuts. This is because there would still be a mature component of aspen trees that provide valuable cavity nesting habitat as well as potential nest trees for raptors. This type of treatment would have a greater impact on conifer associated species, examples include snowshoe hare, pine marten and red squirrel.

Commercial Thinning: There is a total of 164 acres of commercial thinning that would reduce stand densities in mixed conifer stands. Stand densities would be reduced by 25%-35%, measured in basal area. This activity would maintain mature spruce and fir stands, but would reduce their density for improved daylighting. There would be minor impacts to wildlife species associated with spruce-fir habitat, however this only affects a small percentage of habitat across the landscape. This treatment occurs along a relatively busy road that already has reduced habitat effectiveness.

Group Selection: There is a total of 12 acres of group selection that are being proposed in mixed conifer units that are currently single storied. This prescription would create small openings, one to one and a half tree lengths in diameter, to create an environment suitable for conifer regeneration. Placement of openings would be dispersed throughout the unit, with any given opening being more than two tree lengths from another opening. Openings would be placed adjacent to mature cone bearing spruce, to

favor spruce regeneration over subalpine fir. Cumulatively, group openings would not exceed 25% - 30% of a unit's total size. This activity would lead to the development of multi-aged conifer stands. Although this is a very small area of treatment, it would increase structural diversity in this spruce-fir stand, including snowshoe hare habitat.

Individual Tree Harvesting: This treatment could occur within 100-feet of either side of the Buford New Castle Road within the National Forest System boundary to improve sight distance and facilitate road drying. Harvesting would likely be accomplished by firewood gatherers. Ground based machinery would not be allowed off the Buford New Castle Road template to harvest or yard trees in areas with this prescription. The amount of trees felled under this prescription is expected to be 'incidental' and not contribute to substantial amounts of biomass volume removed from the forest, therefore acreage was not chosen as an appropriate measurement for evaluating this activity. For these same reasons, the indirect effects on wildlife habitat across the landscape would be minimal.

Riparian and Wetland Habitat: There is very little riparian and wetland habitat within or adjacent to any of the harvest units. A 100 foot no disturbance buffer placed along the one riparian area in Unit 404 would preclude disturbance to the water influence zone. No other streams are known within proposed harvest units. If any streams, ponds or wetlands were to be identified within harvest units, they would have no disturbance buffers of at least 100 feet which would preclude impacts to surface water resources. Based on this information, there would be no impact to riparian dependent wildlife species.

Effects on Threatened, Endangered and Sensitive Species

The Canada lynx is the only Threatened terrestrial wildlife species that has the potential to occur in the Analysis Area, there are no endangered species that could occur in the Analysis Area.

For the Canada lynx, the No Action Alternative was a "no effect" determination. For Alternative 2, a "may affect, not likely to adversely affect" determination was made. This determination was based on the fact there would be approximately 499 acres of lynx habitat affected, but out of those 499 acres, approximately 164 acres would still remain as suitable habitat. This represents less than 1% of the lynx habitat within the Bar HL Lynx Analysis Unit and less than 1% of the lynx habitat in the Clinetop Lynx Analysis Unit. High quality, multi-storied spruce-fir was not be affected. For a detailed description of the effects on lynx habitat, see the Biological Assessment in the project file.

Table 3.13. Summary of all the determination statements for the sensitive species analyzed for this project. For rationale, description of effects, and species eliminated from detailed analysis, see the Biological Evaluation in the project file.

Table 3.13: Summary of Effects Determinations for Terrestrial Sensitive Species by Alternative

Species	Alt 1	Alt 2
Hoary Bat	NI	MAII
North American wolverine	NI	MAII
American marten	NI	MAII
Pygmy shrew	NI	MAII
Northern goshawk	NI	MAII
Flammulated owl	NI	MAII

Boreal owl	NI	MAII
Olive-sided flycatcher	NI	MAII
Purple martin	NI	MAII
Western bumblebee	NI	MAII

NI - No impact.
MAII - May adversely impact individuals, but not likely to result in a loss of viability on the Planning Area, nor cause a trend to a federal listing or a loss of species viability range-wide.

Cumulative Effects

Cumulative effects for terrestrial wildlife were analyzed across a 68,610 acre area, and include activities that have occurred since 1990. This large area was used because several of the wildlife species included in this analysis have large ranges, and this area includes the majority of the vegetation management activities.

Timber Sales

Of the timber sales listed in Table 3.14, the Meadow Creek and Sheep Salvage Timber Sales may be active concurrently with the Buford New Castle Project. The combination of these activities would add cumulatively to affect habitat effectiveness for deer, elk and other wildlife species by increasing the amount of activity across the landscape, and increasing the amount of traffic on the roads. A total of 3,198 acres has been harvested in the Buford New Castle Wildlife Cumulative Effects Area (68,610 acres) over the last 26 years. Out of this total, 1658 acres are within conifer habitat, which is 12% of all the spruce-fir in the Cumulative Effects Area. There has been 1540 acres harvested in the aspen cover type which is 7% of all of the aspen in the Cumulative Effects Area. The greatest concern with the harvesting that has occurred in the past is the amount of unsuccessful regeneration within several of the aspen clear cuts. There are partial units and at least 1 complete unit that are now open grass/forb meadow. This may be the result of livestock grazing, elk browsing, site conditions, time of harvest, or some other unknown factor.

Table 3.14. Timber Harvesting in the Buford-New Castle Wildlife Cumulative Effects Area (68,610 acres)

Sale Name	Year Terminated	Cover Type	Harvest Method	Acres
PAST TIMBER SALES				
Finely Springs	2004	Aspen	Clearcut	549
Fourmile	2002	Aspen/conifer	Shelter/Clearcut	159
Bear Gulch	2001	Conifer	Sherlterwood	151
Buckskin Lake	2000	Aspen	Clear Cut	156
Triangle Park	1999	Conifer	Salvage.	10
Caroline	1999	Conifer	Shelt/thin/salvg.	63
Hiner Springs Pit	1998	Conifer	Clear Cut	4
Irish Springs #1	1997	Aspen	Clear Cut	112
Small Sales	1996-2000	Conifer	Salvage	50
Elk Creek	1996	Conifer	Shelterwood	32
GV Springs #1	1996	Aspen	Clear Cut	115
Irish Springs #2	1996	Aspen	Clear Cut	196
Big Ridge Aspen	1993	Aspen	Clear Cut	27

Unknown	1972	Aspen	Clear Cut	52
Bar HL #1	1988	Conifer	ITMShelterwood	255
Bar HL #2	1994	Conifer	ITMShelterwood	65
Middle Clark North	1994	Conifer	Shelterwood	56
Middle Clark South	1994	Conifer	Shelterwood	44
Bar HL North	1999	Conifer	ITMShelterwood	41
Middle Clark 2	1992	Conifer	ITMShelterwood	162
Middle Clark Aspen	1991	Aspen	Clear cut	10
Muddy Elk 1	1991	Conifer	ITMShelterwood	102
Muddy Elk 2	1994	Conifer	ITMShelterwood	227
In Between	1990	Conifer	Shelterwood	46
ON-GOING TIMBER SALES				
Meadow Creek		Conifer/Aspen	Shelter/clearcut	514
Sheep Salvage		Conifer	Salvage	21

Grazing

Livestock only lightly use coniferous stands of timber for forage or cover, and usually it is just the edge of the stand. Domestic livestock do however use the aspen cover type frequently. New aspen clearcuts provide attractive forage for wildlife species and domestic livestock. It is important that livestock managers be made aware of the location of these new cuts so that they are not over-grazed. Past experience has shown that over-grazing in aspen clear-cuts (whether it is caused by wildlife or domestic livestock) can affect the success of regeneration. It is important to continually monitor aspen clearcuts until they are tall enough to avoid browsing and trampling by domestic livestock. The following allotments are involved with the Buford-New Castle Project.

Meadow Creek Cow & Horse: 465 cow/calf pairs & 308 yearlings per season; June 28 to October 15,
Corral Point Sheep & Goat: 1,200 sheep per season; July 1 to September 15,
Burro Mountain Sheep & Goat: 900 sheep per season; July 1 to September 15, and
Clark Ridge/Deep Creek Sheep & Goat: 1,000 sheep per season; July 1 to September 10.

Recreation

The Buford-New Castle Wildlife Cumulative Effects Analysis Area is a popular area for summer and winter recreationists. The Buford/New Castle Road (FSR 245), which connects 1-70 to the North Fork of the White River Road (County Road 8), is located within the Cumulative Effects Analysis Area. Another major road is the Bar HL Road (FSR 211), and the Meadow Creek Road (FSR 601). There is also a relatively new ATV route that parallels the Buford New Castle Road that does not permit full size passenger vehicle traffic. These roads provide recreational opportunities for summer-motorized recreation, hunters, campers, automobile touring, ATV riders, and snowmobilers. Over the last 10 years there has been a considerable increase in the amount of ATV/UTV popularity and use in this area. The project area also contains four-wheel drive roads that are used for dispersed camping and hunting access. Winter recreationists on the north and south end of the project area boundary use snowmobile parking lots located on FSR 245 for access into the project area from December

through April. These activities may not totally exclude animals from areas near high use, but they may make some areas less suitable or reduce habitat effectiveness.

Fire

There has been only one fire within the wildlife cumulative effects area in the last 26 years, the Middle Elk fire of 2012, which was located in the Middle Elk drainage. This fire had no significant effect on the forest structure and tree species composition. This fire was a late season, human caused fire and was 257 acres in size. It was a low intensity fire that primarily consumed the dry grasses and dead and down materials on the forest floor. There was very little crown fire activity, mostly isolated torching of spruce and fir trees with minimal associated mortality. Within the areas of the fire that was dominated by Aspen stands there is a slight increase in sprouting due to this disturbance. Overall this fire had a slight beneficial effect on wildlife habitat.

Forest Plan Compliance

This project is meets all of the Forest Plan direction related to the terrestrial wildlife resource, including objectives, standards, guidelines and management direction.

BOTANY

This section analyzes the effects on rare plant species, including Threatened, Endangered and Sensitive plant species that are known to occur on the White River National Forest.

Affected Environment

The Buford New Castle Analysis Area totals 8,743 acres, and botany resources were analyzed within this area. This analysis area encompasses harvest units, temporary road locations, haul routes within the Forest boundary, and surrounding areas. Elevation ranges from 8,000-10,600 feet.

A Geographic Information System (GIS) exercise was conducted in and near the boundaries of the Analysis Area to prepare a pre-field review and this analysis. The pre-field review considered the elevation range, ecoregion types, vegetation cover types and riparian features present within the analysis area as well as existing habitat models and any management status plants that were known to occur in the vicinity to determine which management status plant species to evaluate for this analysis.

Field surveys were conducted during the summers of 2015 and 2016 within cutting units, as well as other areas that have the potential to be affected by the proposed action, including landings and temporary roads.

There is very little riparian or wetland habitat in or adjacent to any of the cutting units associated with this project. There is one road curve widening that is proposed high in the Vaughn Creek drainage. There is also about 420 feet of an unnamed tributary to the East Fork of North Elk Creek that runs through unit 404. There are no fens located in or near any of the areas that could be impacted by this project.

Environmental Consequences

Alternative 1 – No Action

Under Alternative 1, activities associated with harvesting timber and road maintenance would not occur. Current activities such as domestic livestock grazing and recreation would continue in the project area. These activities can result in the occasional trampling of plants, and spread of non-native species which compete with native plants. However, these effects have been occurring in the area for decades. Therefore there would be no change from the current baseline to botanical resources.

Alternative 2 – Proposed Action

Threatened and Endangered Plant Species: There is no habitat present for any Threatened or Endangered plant species within the Buford Newcastle Analysis Area, therefore there would be no effect to any Federally listed plant species.

Region 2 Sensitive Plant Species: There are a total of 20 sensitive plant species that are known to occur, or have a high likelihood of occurring on the White River National Forest. Out of those 20 species, the following species have potential habitat, and occur within the elevational range of the Buford New Castle Analysis Area.

Table 3.15. Region 2 Sensitive Plants (updated 10/23/2015) that have Potential Habitat within the Buford New Castle Analysis Area.

Scientific Name **Common Name**	**Habitat**	**Habitat present**	**Habitat Group**	**Documented in Analysis Area**
Astragalus leptaleus Park milkvetch	Moist, sedge-grass meadows, swales, turfy hummocks on edge of meandering brooks, and typically on level to gently sloping ground. 6,500 to 9,500 feet. Only known population on the forest is below Green Mt. Reservoir, Summit Co. Species has never been documented from floristic surveys in the Flat Tops area.	Yes	General Riparian	No
Botrychium ascendens Trianglelobe moonwort	Road sides, trails, earthen dams, and old ski runs. Montane short and tall riparian willow communities with high moss, gravel and cobble ground cover, on volcanic or granitic alluvium - 8,000 to 10,845 feet.	Yes	Upland/Range	No
Cypripedium parviflorum Yellow lady's slipper	Riparian/wetlands or transitional to cottonwood, aspen and conifers, 7,400 to 8,500 feet.	Yes	General Riparian	No

Table 3.15. Region 2 Sensitive Plants (updated 10/23/2015) that have Potential Habitat within the Buford New Castle Analysis Area.				
Scientific Name **Common Name**	**Habitat**	**Habitat present**	**Habitat Group**	**Documented in Analysis Area**
Machaeranthera coloradoensis Colorado tansyaster	Mountain parks to dry alpine tundra, little competing vegetation. Open exposure, 7,675 to 12,940 feet.	Yes	Upland/Range	No
Parnassia kotzebuei Kotzbue's grass of Parnassus	Riparian subalpine and alpine wet, rocky ledges, in mossy streamlets. 10,000 to 12,000 feet.	Yes	General Riparian	No

The 5 sensitive plant species listed in Table 3.15 above were surveyed for within the Buford New Castle Analysis Area, during the appropriate survey window needed for accurate identification. These species were not documented during project level surveys, and for this reason there would be no impact to the park milkvetch, trianglelobe moonwort, yellow lady's slipper, Colorado tansyaster or Kotzbue's grass of Parnassus as a result of activities associated with the Buford New Castle Project.

Forest Plan Consistency

The proposed action follows standards and guidelines to protect botanical resources from the White River National Forest Plan. Forest Plan objectives, standards, and guidelines direct activities to reduce the spread of non-native plant species and maintain viable native plant populations. Maintaining native plants and excluding exotic invasive plants are essential to maintaining ecosystem health (goal 1). Applicable objectives, strategies, standards, and guidelines are listed on page 25 (Objective 1d, Strategy 1d 1-4; Objective 1e, Strategy 1e 1-2), page 44 (Standard 1); page 55 (Standards 1-3), page 64 (Standard 1), and page 70 (Standards 1-4, Guidelines 1-4).

AQUATICS

INTRODUCTION

The purpose of this report is to assess the effects of the proposed Buford New Castle Project and road improvements on aquatic resources including Threatened, Endangered and Sensitive fish and amphibian species and Management Indicator Species, and to determine if the proposed action is consistent with the White River National Forest Land Management Plan (2002) and the Conservation Agreement for Colorado River Cutthroat Trout (*Oncorhynchus clarkii pleuriticus*) in the States of Colorado, Utah, and Wyoming (CRCT Conservation Team, 2006; Conservation Agreement), of which the US Forest Service Region 2 is a signatory.

FOREST PLAN DIRECTION AND SENSITIVE- AND INDICATOR SPECIES CONSERVATION COMMITMENTS

The White River National Forest Land and Resource Management Plan (2002; Forest Plan) includes direction to "ensure that projects maintain sufficient habitat …for all life history stages of native and desired non-native aquatic species…in each stream currently supporting a self-sustaining fish population" (Chapter 2, Forest-wide Standards and Guidelines, Water and Riparian Resources, p. 2-6).

Aquatic resources are among the beneficiaries of the management measures included in the Water Conservation Practices handbook (Forest Service Handbook 2509.25) and discussed in the Watershed Resources section and Watershed Specialist Report associated with this EA.

Among the goals of the Conservation Agreement (2006) is "to assure the long-term viability of Colorado River Cutthroat Trout (CRCT) throughout their historic range [and maintain] areas that currently support CRCT" (p. 3).

Forest Service policy towards Sensitive species generally is to "ensure that …actions do not contribute to loss of viability of threated, endangered, proposed, or sensitive plant and animal species, or contribute towards Federal listing under the Endangered Species Act of any species" (USDA Forest Service, 2013).

Monitoring population trends of Management Indicator Species (MIS) and establishing relationships between habitat changes and those populations is a requirement under the National Forest Management Act (36 CFR 219.19 (a) (6), 1976; LRMP, 2002).

EXISTING CONDITIONS

The analysis area for aquatic resources including Forest Service Region 2 Sensitive species, MIS species, aquatic macroinvertebrates, and amphibians included stream reaches and wetland areas within the 6th field HUCs listed in Table 3.16. The analysis area included all proposed timber harvest units and the natural surface or rocked portions of the haul route. Effects to Threatened and Endangered fish species (Endangered Species Act, 1973, as amended; ESA) were considered at the 4th field HUC scale. Effects to frogs and toads were considered at the site scale and throughout their range.

The northern half of the analysis area is within the Blanco Ranger District, the southern half in the Rifle Ranger District. The center of the analysis area along the Buford-New Castle road ranged from about 5,900 to 10,100 feet in elevation.

Table 3.16. Watersheds and sub-watersheds crossed by the aquatics analysis area.

6th field HUC	5th field HUC	4th Field HUC
Deep Creek	Elk Creek	Colorado Headwaters-Plateau
East Rifle Creek	Rifle Creek	Colorado Headwaters-Plateau
Hill Creek-South Fork White River	South Fork White River	Upper White
North Elk Creek	Coal Creek-White River	Upper White
Outlet North Fork White River	North Fork White River	Upper White
South Fork Canyon	South Fork White River	Upper White

Veatch Gulch-White River	Coal Creek-White River	Upper White
West Elk Creek	Elk Creek	Colorado Headwaters-Plateau

Aquatic Species Including Threatened, Endangered, Sensitive, and Management Indicator Species

In the Blanco Ranger District, Critical Habitat for federally Endangered (Endangered Species Act, 1973, as amended) Colorado Pikeminnow (*Ptychocheilus lucius*) reaches into the Upper White 4th field HUC, though its upstream end is at least 50 river miles downstream of where NFSR 245 crosses the White River east of Meeker, Colorado. Critical Habitat for Razorback Sucker (*Xyrauchen texanus*) includes lower, Utah portions of the White River, at least 100 river miles downstream of the project area. Critical Habitat for Endangered Humpback Chub (*Gila cypha*) and Bonytail Chub (*Gila elegans*) are downstream further yet, in the Green River, in Utah.

In the Rifle Ranger District, Critical Habitat for Colorado Pikeminnow and Razorback Sucker reach into the Colorado Headwaters-Plateau watershed. The upstream extent of that Critical Habitat is in the Colorado River, more or less at the outlet of Rifle Creek, which is approximately 17 miles downstream of the closest analysis area 6th field. Critical Habitat for Endangered Humpback Chub (*Gila cypha*) and Bonytail Chub (*Gila elegans*) also extend into the Colorado Headwaters-Plateau watershed, but end about 100 river miles downstream of the mouth of Rifle Creek. Owing to the distance of the proposed action and that no water withdraws are proposed, the proposed action would have no effect on these Endangered fishes or their habitat.

Colorado River Cutthroat Trout (*Oncorhynchus clarkii pleuriticus*; cutthroat) are a Forest Service Region 2 Sensitive species (U.S. Forest Service, 2013) and occupy the North Elk Creek and Deep Creek 6th fields (Figure 3.16). Cutthroat are largely confined to headwater streams and lakes throughout the Colorado River drainage in Colorado, Utah, and Wyoming. Conservation Populations of cutthroat (< 10% genetic introgression or hybridization with other trout species/subspecies; UDWR, 2000) are believed to occupy about 11% of their historic range, rangewide; about 7% in Colorado (Hirsch *et al.,* 2013).

Adults reach spawning maturity at age 3 (Young, 1995), migrate to spawning sites on the rising limb of the hydrograph during spring runoff (Young, 2008), and spawn on the falling limb. Spawning habitat includes clean gravel with adequate water infiltration to oxygenate eggs. Alevins (newly hatched young) spend the early summer in the interstitial spaces between the spawning gravels and swim up as fry during July to August, depending on water temperatures (Young, 1995). Young-of-the-year inhabit pockets of slow water, often associated with structure, generally near the gravel they hatched into (Bozek and Rahel, 1991). Adult cutthroat are primarily insectivores and favor pools with structure.

A Conservation Population of blue lineage cutthroat occupies North Elk Creek (White and Yampa watershed natives; Metcalf *et al.*, 2012). Mansfield Creek in the Deep Creek 6th field (tributary to Clark Creek) also contains a Conservation Population of cutthroat that are probably also blue lineage. The blue lineage was stocked throughout much of Colorado in past decades, thus it's not unusual to find them in the "wrong" drainage. Under the current understanding of cutthroat genetics, Colorado River-drainage streams were historically populated with green lineage cutthroat which are being treated by

Forest Service Region 2 as Threatened species under the ESA, though ESA listing is not settled at this point given uncertainties around cutthroat taxonomy. Mansfield Creek could thus also be viewed as potential habitat for green lineage cutthroat and would therefore remain important.

No other Sensitive fish species have been found within or near analysis area.

All trout species, native and otherwise, and aquatic macroinvertebrates, are Management Indicator Species (MIS) in Region 2. Non-native Brook Trout (*Salvelinus fontinalis*), Brown Trout (*Salmo trutta*), and Rainbow Trout (*Oncorhynchus mykiss*) inhabit most of the 3rd order and larger streams in the vicinity of the analysis area (4th order were illustrated to keep Figure 1 legible).

Because cutthroat habitat requirements include those of other trout species, this discussion was framed around cutthroat. The aim of maintaining habitat suitable for other trout is therefore implied. Effects to cutthroat and other trout were considered at the site scale and at the relevant 6th field watershed scale (relevant to the site in question).

Aquatic macroinvertebrates are ubiquitous throughout streams in the analysis area, though the specific community composition varies by stream or stream reach. Effects to macroinvertebrates were considered at the site scale.

The ranges of Northern leopard frogs (*Lithobates pipiens*; frogs) and Boreal toads (*Anaxyrus boreas boreas*; toads) include the analysis area. Both are considered Sensitive species in Region 2. Effects to frogs and toads were considered at the site scale and throughout their range.

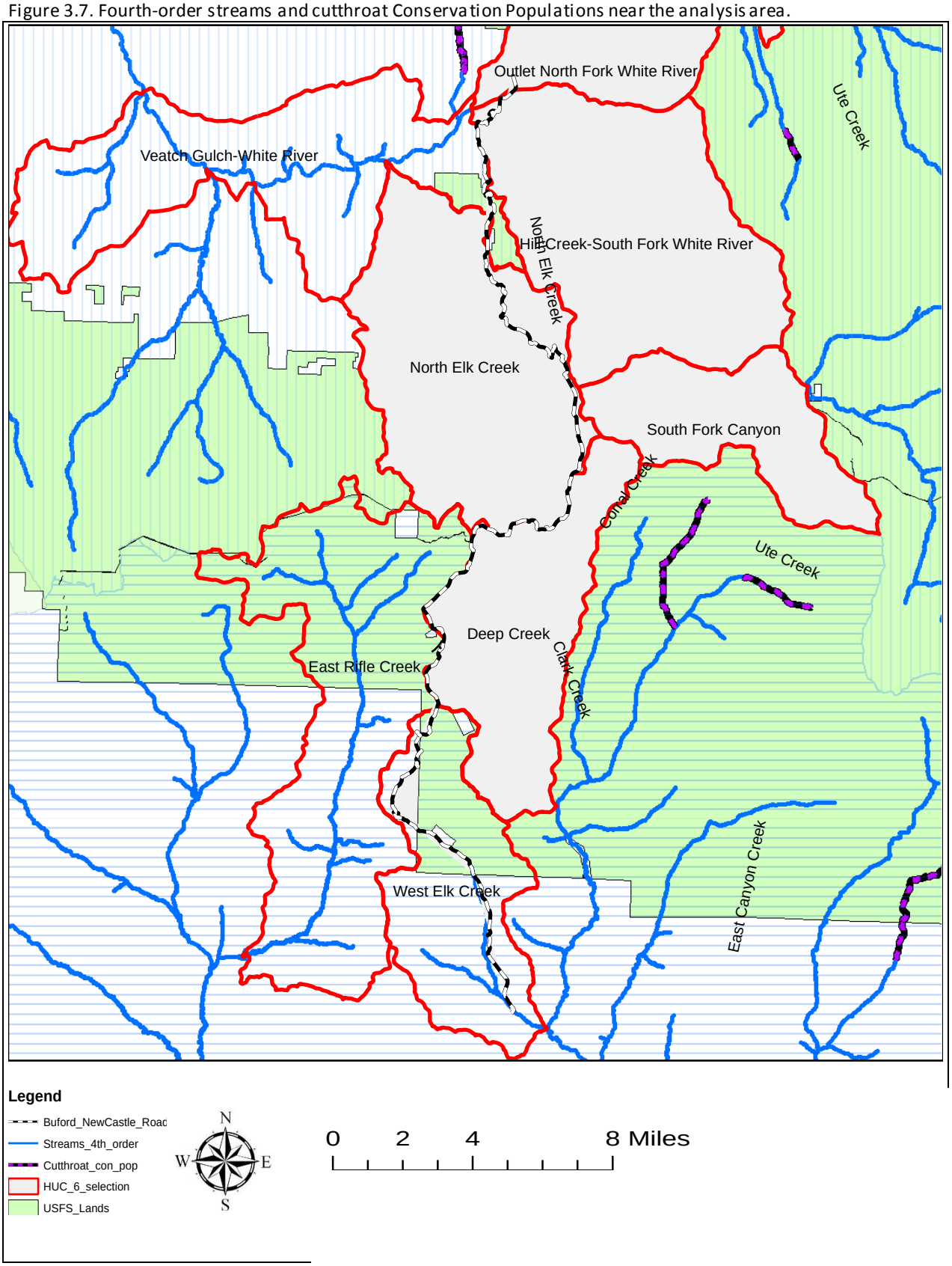
The conservation status of Boreal toads is currently under review with the U.S. Fish and Wildlife Service for consideration to be included under the provisions of the ESA, but at this point, the species does not have ESA status.

Declines in the Boreal toad population are largely due to mortality inflicted by the chytrid fungus. While the analysis area is within the toad's range, they have not been observed there, but their presence is plausible and therefore assumed.

At a large scale, Northern leopard frogs (frogs) are widespread and abundant, from the Great Basin east. Most of Colorado is occupied by Northern leopard frogs except for the arid northwest and the southeastern regions. Frogs are "locally common, but are now rare or extirpated in many areas, particularly in the mountains" (CPW (1)).

Northern leopard frog population declines in Colorado have been observed at least since the early 1980's. Declines have been attributed to habitat alteration and loss, the effects of introduced American bullfrogs (*Rana catesbeiana*) and gamefish, disease, pesticides, and droughts that limit the availability of year 'round water, "but the specific causes of the declines remain poorly known" (Smith, 2003).

Figure 3.7. Fourth-order streams and cutthroat Conservation Populations near the analysis area.



While Northern leopard frogs have not been observed within the analysis area, their presence is plausible and therefore assumed.

Aquatics Analysis

The Forest Plan requires management actions to maintain the Aquatic life – Class 1 Cold Water beneficial use (CDPHE, 2010) which includes occupation by cutthroat, trout, macroinvertebrates, and frogs. The Aquatics analysis was based on field visits in October 2015 and spatial analyses using ArcMap. Haul over paved roads was assumed to preclude impacts to aquatic resources (because the road surface would not contribute sediment to streams) and was therefore not analyzed. Brushing or other road treatments that would not disturb ground would have no effect on aquatic resources because they're not proposed near streams.

The project area would be between 5,800 – 10,100 feet in elevation. Stream hydrology in the analysis area is fueled by snowmelt, with a period of high discharge following snowmelt in the spring when even the smallest streams flow, followed by a steady decline in discharge and the number of streams flowing over the course of the summer. Winter flows are moderate with surface water flow probably only in the larger streams.

Because the proposed project is largely oriented along a ridgetop road, there is very little potential for interaction between the proposed activities and surface water resources. No fishbearing stream reaches are within or adjacent to proposed harvest units.

The Buford New Castle Road is a heavily used, arterial route. In October 2015, 75 potential gravel road/stream crossings on about 35 miles of the Buford New Castle Road were inspected and only 17 had surface water flow at that time. Streams with surface flow in October were assumed to be perennial (with year 'round flow). Most stream crossings were over the uppermost reaches of very small streams (bankfull widths less than approximately 2 feet). There was no visual evidence that stream habitat at the crossings was impaired. The Buford New Castle road crosses West Elk Creek two times on private land and the stream runs down the roadside ditch for about 0.1 mile on private land. In each instance, bankfull widths are only about 2 feet. West Elk Creek, which is mostly on private land, is presumed to be fishbearing (with non-native trout) but is very small, offering little fish habitat.

There are several crossings of very small streams in the uppermost reaches of the Middle and East Forks of North Elk Creek, on the Blanco Ranger District. Based on the very narrow widths and low discharge at these sites, the crossings were presumed to be upstream of cutthroat/trout distribution, though the upstream extent of fish in the North Elk sub-watershed is not known precisely. There are four crossings of very small headwaters of Vaughn Creek which is not known to be fishbearing (per Colorado Parks and Wildlife (CPW) database). There are two crossings of very small headwaters to Greenstreet Creek, which again, is not known to be fishbearing (CPW).

Another five crossings were of dry channels that presumably run water during the spring high. The remaining 53 potential crossings did not show signs of channelized streamflow (i.e. erosion or deposition) and are therefore unlikely to convey surface water with any regularity.

Proposed road curve widening that would involve ground disturbance would occur at or near (within 150 feet) a single stream crossing; of a perennial tributary to Vaughn Creek. There are no road/stream crossings within the Mansfield Creek drainage that would be used or modified under the proposed action.

Frogs and toads both require permanent, lentic water sources (pools, ponds, wetlands) and can utilize both riparian and upland habitats. There are only 2 known such habitats within 300 feet of the proposed harvest units (1 is within unit 305, the other would be approximately 65 feet from the western edge of the same unit). Given their very small size and shallow depth, both would be expected to freeze solid in the winter and would thus be unlikely to provide suitable overwintering habitat.

ISSUES AND INDICATORS

Impacts to fish would be limited to indirect effects related to fluvial sediment transport from the haul route via road/stream crossings to fishbearing stream reaches. Sediment could be generated by timber haul or by road curve widening (because it would involve ground disturbance near a stream crossing).

Because frogs and toads can use upland habitat, they can be killed directly by harvest related activities (by being run over or otherwise smashed, for example).

ENVIRONMENTAL EFFECTS

Anticipated Effects by Alternative

Alternative 1: No Action

Under this alternative, no timber harvest or road-construction or improvements would occur within the analysis area, beyond ordinary road maintenance. Without any means to affect change, Alternative 1 would have no effect on aquatic resources and the existing conditions described would be expected to continue.

Alternative 2: Proposed Action
Direct and Indirect Effects

Under the proposed action, timber harvest and haul, and road improvements would occur along the Buford New Castle Road. If any streams or ponds or wetlands were to be identified within harvest units, they would have no disturbance buffers of at least 100 feet which would preclude impacts to aquatic habitat or organisms.

Proposed timber haul would cross three headwater tributaries of North Elk Creek, which provides habitat for Sensitive cutthroat and other trout, at four road/stream crossings (three perennial streams and one seasonally intermittent; one perennial tributary would be crossed two times). The distance (in a straight

line) from the closest crossing to what is believed to be the upstream-most extent of the cutthroat Conservation Population is 9,236 feet, or 1.7 miles (per ArcMap); the farthest 2.1 miles (median distance = 2.0 miles).

The proposed road curve widening high on Vaughn Creek would not affect trout because that stream is not fishbearing. The Conservation Population of cutthroat in Mansfield Creek would be approximately 2,600 lateral feet and nearly 600 vertical feet (below) from the nearest edge of a harvest unit, well beyond any influence that stand might have on the stream. The Buford New Castle Road is farther yet.

Because of the substantial distance of the road/stream crossings from trout habitat, no impact to cutthroat or other trout species would be expected.

Proposed timber haul and road curve widening could increase sediment concentrations in the imme diate vicinity of road/stream crossings and subsequently alter aquatic macroinvertebrate community composition or abundance. However, because the Buford New Castle Road is a heavily trafficked route regardless of the proposed action, those crossing sites most likely to retain sediment have probably already done so (none appeared particularly degraded). The proposed action would not be expected to increase sediment beyond the background rate at the site scale. It's therefore unlikely that Alternative 2 would change the existing conditions relative to aquatic macroinvertebrates.

Neither Northern leopard frogs nor Boreal toads are known to occupy the analysis area. At the scale of the analysis area, effects of the proposed action on their lentic and riparian habitats would be prevented through the use of no disturbance buffers, should those habitats be identified. Because both species face direct mortality from timber harvest related activities, and because their presence in the analysis area is assumed, the proposed action could adversely impact individuals, but would not be likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing.

Cumulative Effects

Reasonably foreseeable actions that could influence aquatic species and their habitat in the analysis area include prescribed burning to benefit wildlife habitat or improve range conditions, additional timber harvest, road maintenance, continued private and commercial recreational use, and livestock grazing.

Because there would be no effects to cutthroat, trout, or aquatic macroinvertebrates at the site scale, there would be no cumulative effects associated with either alternative.

Given the assumed direct impacts to frogs and toads, it's possible that the propose d action would make an incremental, cumulative contribution to their decline throughout their range, but would not be likely to result in a loss of viability in the planning area, nor cause a trend toward federal listing.

Consistency with Forest Plan Direction and Sensitive and MIS Species

Either alternative would be consistent with management direction related to aquatic species.

Design Features

No design features in addition to those recommended in the Watershed Resources section of this EA are proposed.

Monitoring Recommendations

Monitoring of sediment production at road/stream crossings following proposed road work is recommended to ensure that sediment is not routed into streams. If frogs or toads are subsequently discovered within the analysis area, monitoring to determine their spatial distribution and areas of concentration would be recommended.

RANGE AND INVASIVE SPECIES

Resource Description

The following section describes the affected environment and effects of the Buford New Castle Project for Range resources which include three term grazing permits; one Cow/Horse allotment and two Sheep/goat allotments. The largest portion of the project being on the Mansfield/Seaman Park Sheep/ Goat allotment. There are four separate operations that have grazing permits within the project area.

Indicators

Range staff will measure utilization throughout the summer in pastures to verify that utilization has not surpassed the forest standards of 45% on palatable forage species. By monitoring the utilization within the sheep allotments and keeping utilization above forest standard.

FOREST PLAN DIRECTION

This section of the analysis the proposed action in relation to the range and invasive resources and it's consistency with the White River National Forest and Resource Management Plan
Chapter one, Forest-wide Goals and objectives
Goal 1 Ecosystem Health

Objective 1d. Increase the amount of forest and rangelands restored to or maintained in a healthy condition with reduced risk and damage from fires, insects, disease and invasive species

5.12 General Forest and Rangelands, Range Vegetation Emphasis – These areas are managed for the sustainability of the physical, biological, and scenic values of general forest and rangelands, while emphasizing forage production for livestock. Habitat and vegetation are managed to achieve and maintain the desired vegetation condition for livestock, wildlife, and recreational stock.

Goal 2 Multiple Benefits to People

Objective 2c. Improve the capability of national forest and rangelands to sustain desired uses, values, products, and services.

Desired Condition

"A variety of forested and non-forested plant communities and successional stages are maintained through a combination of human manipulations and natural processes. A diversity of desired plant and wildlife species is represented within the capability of the habitat".

"Soils exhibit infiltration and permeability rates that are appropriate for that soil type."

Temporal/Geographic Scope

Based on project description annual grazing monitoring will be required for at a minimum of ten years or until aspen regeneration has reached a stage of growth that is unavailable to grazing.

Most important areas that need to be monitored are the aspen clear cuts and regeneration units to ensure grazing utilization on aspen regeneration is limited.

Affected Environment

The only cow/horse allotment within the project boundary is located on the south end of the project area. This allotment is stocked with 695 cow/calf pairs from 06/28/2016 to 10/15/2016. Only one pasture is effected within the project boundary and that is the Gravel Pit pasture. There are up to 250 head of cattle in this pasture for 14 days from 06/27-07/10 (dates can vary). All 695 head will move through this pasture but are only in the pasture less than a day. Units 101,102, and 501 are within the allotment.

The sheep/goat allotment on the North end of the project area contains units 403,404,405,406. This allotment is for 1000 ewe/lambs from 07/03 – 09/09. The pasture within the cutting boundary is a 10 day pasture from 07/03 – 07/12 with dates varying.

The second sheep/goat allotment that is within the cutting boundary is the Mansfield/Seaman Park Sheep and goat allotment. The permit allows for 1400 ewe/lambs in two bands of 700 from 06/16 – 09/30. The majority of the activities are planned within this allotment.

Noxious weeds are known to be present within the cutting areas. Scattered infestation, totaling approximately 20 acres are within cutting boundaries, travel routes and around project area. Known weed species are Yellow Toadflax (*Linaria vulgaris)*, houndstongue *(Cynoglossum officinale)*, and Canada thistle *(Cirisium arvense)*. These infestation are normally treated annually as part of the district weed program. Inspection of harvest equipment will be required when entering the forest to prevent additional infestations.

Environmental Effects

Alternative 1: No Action

Direct and Indirect Effects

The direct and cumulative effects of the No Action Alternative would have little to no change to the existing range resource and grazing program that is now being implemented.

Indirect effects of not logging are that the timber stands would continue to convert to spruce /fir stands and reduce the available forage under those stands. Aspen stands do tend to have better sheep forage then conifer stands.

Alternative 2: Proposed Action

Direct, Indirect and Cumulative Effects

This proposal would have direct effects to the Mansfield/Seaman Park Sheep/Goat grazing allotment. Based on the available forage that is on the allotment, the allotment is considered understocked. The biggest limiting factor for utilization of forage on the allotment is developed water. The allotment has limited water developed on the northeast portion of the allotment and also has limited water development west and south of Lake Park. The best watered areas and more utilized areas are within or close by cutting units 105, 107, 108, 201 and 305. Grazing in these areas would be closely monitored to insure that there is not a direct conflict with sucessful aspen regeneration. She ep would utilize young aspen growth and do recognize it as palatable forage species. Cutting unit 201 (patch clearcut) is directly adjacent to the sheep corrals for this allotment. This area has higher concentration of sheep with increased utilization for 36 hours during fall shipping (Approx. 09/30).

Increased herding efforts would be required in annual operating plans with grazing permittees while aspen regeneration is at early stages of growth. Bedding areas would be altered to limit utilization in aspen regeneration areas. Additional water developments (dry earthen dams less than ¼ acre foot of water and less than nine foot dam) are proposed as part of this proposal, to relocate utilization away from prescription areas. The Range Specialist Report, located in the project file, contains areas identified for pond development. There were 24 locations identified, with a proposal to develop 10 – 12 of these locations.

Histrocally, cutting units tend to have thistle outbreaks; monitoring and treatment would be required.

Indirect effects

Indirect effects for this project are the possible changes in forage vegetation type in the cut units. Grazing patterns in the long term could be altered if the availability of palatable forage types change.

Cumulative Effects

This project does not have any known cumulative effects that adversely affect domestic livestock grazing and invasive species in the long term.

Design Features

Project design features included as part of the proposed action specifies that pre-treatment of noxious weeds would occur within, near, or along travel routes. All harvesting equipment would be cleaned and inspected before moving onto the National Forest. All disturbed sites would be revegetated with native plant species. Seed and mulch used in revegetation will be certified as weed free. Proposed locations for new water developments are included to help distribute grazing away from cutting units.

Monitoring Recommendations

The harvest units would be monitored for a minimum of four years after project completion and treat any new infestation in a timely manner. These design criteria would ensure that the spread of noxious weeds and the threat of new invasion of noxious weeds would be minimized. Aspen clear cut and regeneration units will be monitored for ten years or until aspen regeneration units are not available for forage by sheep.

Forest Plan Consistency

The proposed action is consistent with the Forest Plan as it relates to the Range and Noxious Weed Resources.

FIRE AND FUELS RESOURCES

This analysis includes the varying effects of the existing and potential natural fuel conditions compounded over time and wildland fire environment and how the two interact under varying environment conditions.

FIRE REGIMES

Within the Buford New Castle project area there is primarily one fire regime present, infrequent/high intensity.

Within this regime, some plant communities are more fire dependent than others. Fire dependent communities rely on fire as an integral part of their life cycle. If fires are suppressed, the health, composition and diversity of the plant community is altered. Fire dependency is further classified in terms of how fire affects these ecosystems.

- When light or low-intensity fires thin the vegetation and remove dead and downed surface fuels, reducing the threat of severe fires that could kill the stand, the stand is fire-maintained.
- When a high-intensity fire kills the resident forest stand and initiates its regeneration, the stand is fire-initiated.

FIRE BEHAVIOR

Within the Buford New Castle project, the dominant cover type respond to fire in different ways. Those found within the project area include the following:

- Englemann spruce is very fire sensitive and is often killed by even low intensity fires due to its thin bark and shallow root systems, resinous bark, low-growing branches, tendency to dense stands and moderately flammable foliage.

- Subalpine fir cohabitates sites with Engleman spruce, and like spruce, is very fire-sensitive. Both species are slow to regenerate after fire.

- Aspen generally depends on major disturbances such as fire for regeneration; fire kills the above ground portion of the tree but not the roots, which regenerates the stand through root crown or stump sprouting.

FIRE OCCURRENCE

Within the Buford New Castle project area fires have been actively suppressed since the onset of the "Suppression Era" which was about 1910 to present.

Although the number of fires on the forest as whole has remained fairly static, the zones in which fires are now occurring has changed. From 1910 to the 1970's most fires occurred in the lower elevations. More recently, fire is increasingly occurring in higher-elevation spruce-fir and lodgepole, reflecting the fact that after many years of effective fire suppression the stands are older and have an increased build-up of both surface and ladder fuels. This creates forests that are more resistant to suppression efforts when fire does occur.

EXISING CONDITION

Timber Stand Fuels Related Characteristics

Forests in the Buford New Castle Project consist of pure stands of aspen, aspen stands that have been overtaken by more shade tolerant conifer (seral aspen stands), and mixed conifer stands comprised of subalpine fir and Engelmann spruce.

In aspen, fuel loadings are typically light and comprised of a grass, forbs and shrub understory with an occasional buildup of aspen snags that have fallen with age and or windthrow. The spatial arrangement of this forest type generally tends to be more open and wildfire can pass through these stands with low to mixed fire severity. Fires in this fuel type are surface fires and are typically less resistant to control.

Other areas within the project have had successful conifer establishment, many trending towards conifer dominated stands. At the higher elevations theses stands are primarily subalpine fir with Engelmann Spruce. There is limited evidence of stand replacing wildfire within these stands. The spatial arrangement consists of tight spacing of the vertical and horizontal canopy with heavier fuel loadings of dead and down materials, snags and natural debris on the forest floor that is typically associated with older mixed conifer forests.

The fuels profile in these conifer stands tend to support a mixed surface and/or crown fire type and under drier conditions could lead to a potential high intensity crown fire if one did occur. The fire frequency in the cool higher elevation sites more closely resemble fire regime V and could exceed 200+ years. Fire in these fuel types are typically harder to suppress due to the potential of torching, spotting and crown fire activity.

Figure 3.8 - The photo above is an example of a remnant aspen stand that has been converted to a spruce-fir even aged timber stand.

ISSUES AND INDICATORS

Potential consequences associated with timber harvest and stand modification include the effects of the proposed action versus the no action alternative.

Research suggests that the fuels treatments proposed in the action alternative will create a mosaic of openings throughout the project area, these openings though small may have the limited potential to modify fire behavior and intensity within the treated stands, but is not expected to influence adjacent and outlying stands in any appreciable manner. These treatment effects on the growth of large wildland fires depend on the spatial arrangements of the individual treatments (Finney et al. 2001).

Indicators used in assessing the effects of the proposed project include: Current stand conditions, predicted stand condition after treatment(s) determined by fuel loading (tons per/acre), fuel arrangement (fuel bed depth, crownbase height, ect), and environmental factors.

FOREST PLAN DIRECTION

CONSISTENCY WITH FOREST PLAN AND OTHER REGULATORY DIRECTION

Rocky Mountain Region Goals: ***(Pg. 1-1 WRNF LRMP 2002 Revision).***

- Protect basic soil, air, water, and land resources;
- Provide for a variety of life through management of biologically diverse ecosystems;

White River NF Goals and Objectives: (Pg. 1-3, 1-8 WRNF LRMP 2002 Revision)

Goal 1: Promote ecosystem health and conservation using a collaborative approach to sustain the nation's forests, grasslands, and watersheds.

Objective 1d: Increase the amount of forest and rangelands restored to or maintained in a healthy condition with reduced risk and damage from fires, insects, disease, and invasive species.

Strategy 1d.7: Implement management practices, including prescribed fire that will move landscapes towards desired vegetation composition and structure as described in the management area description and the Historic Range of Variability.

Strategy 1d.9: Over the life of the plan, management practices that mimic ecological processes, such as fire, insect and disease, and other disturbances, will operate on forest and grassland landscapes in a manner consistent with desired conditions and management area direction.

Disturbance Process - Fire

Standards and Guidelines: *(Pg. 2-29 WRNF LRMP 2002 Revision)*

Standards

1. Decisions made concerning vegetation management activities including "no action" will minimize exposure of firefighters and the public to fire hazards

Guidelines

1. Fire management activities should be designed to sustain ecosystems including the interrelated ecological, economic and social components.
2. Where feasible and appropriate, utilize prescribed fire to accomplish resource management goals and objectives.
3. Minimize ground-disturbing activities associated with fire management actions.

TEMPORAL SCOPE

The fuel loading could be affected immediately (implementation up to 2 years), in the short term (2 to 5 years) and in the long term (10 or more years). The duration of the impact is highly dependent upon vegetation type, the amount of time required for the residual activity fuels to be either lopped scattered and or piled and burned or removed and the time it takes for re-establishment of the spruce-fir trees.

GEOGRAPHIC SCOPE

The area that could be directly affected is the project area. The area that could be indirectly affected and cumulatively affected is the project area and to a lesser degree the surrounding area immediately adjacent to the project area boundary.

AFFECTED ENVIRONMENT

The Buford New Castle Project is located on the White River National Forest (WRNF). The project area is located on the Big Beaver Reservoir, Buford, Meadow Creek Lake, Triangle Park, and Rifle Falls, and USGS quadrangle maps. This project lies within Rio Blanco and Garfield Counties.

ENVIRONMENTAL EFFECTS

The White River National Forest is proposing to implement approximately 660 acres of vegetation management activities on National Forest System lands located in Garfield and Rio Blanco Counties, Colorado. Potential treatment areas have been identified in the vicinity of the Buford New Castle Road (NFSR 245). Vegetation management activities include clearcuts, patch clearcuts, aspen improvement cuts, commercial thinning, group selection and individual tree selection harvests.

Alternative 1 – No Action

Direct and Indirect Effects

The no action alternative allows the stands to go through their natural ecological progression. Over time, the stands of pure aspen would eventually convert to seral aspen stands with encroaching shade tolerant conifers such as spruce-fir. Eventually, these stands would start to age and die off creating a heavy accumulation of ladder and dead and down fuels on the forest floor. The lack of age or structural diversity across many of the spruce-fir stands that comprise the analysis area would increase the probability that the majority of the area would reach a highly flammable state at the same or similar time. Without fire suppression, many of these stands or landscapes would be expected to undergo stand replacing fire during periods of drought and would regenerate as aspen.

Following stand replacing fire, aspen are capable of suckering from their roots, enabling them to quickly reestablish burned areas. However, as fires continue to be suppressed, the landscape containing the Buford New Castle Project is slowly converting to a spruce- fir dominated landscape, with aspen becoming a smaller component of overall species composition.

Past harvest units within the Buford New Castle analysis area would start to fill in in. Some of these past treatment areas were relatively small in scale and would do little to minimize the intensity of a rapidly spreading fire. Therefore, one should expect a large scale stand replacement fire to eventually occur within the analysis landscape.

The result of no action alternative indicates that the fuel hazard rating or possible risk of a catastrophic wildland fire within the Buford New Castle project area increases with time.

The majority of the acres within the project area move from a moderate risk or susceptibility to fire spread to a high or very high probability. Alternative 1 results in a steady increase in the fuel hazard risk rating and the correlating fire behavior outputs through time.

Cumulative Effects

Indirect effects of the no action alternative include forested stands becoming more susceptible to an increase in wildfire ignitions and intensity. Cumulatively, heavy fuel loadings are a factor in stand replacement fires where most if not all of the trees are burned. Burned areas may take decades to recover from intense wildfires.

Alternate 2 – Proposed Action

Direct and Indirect Effects

At the landscape level, the proposed treatments would not significantly reduce fire size, severity or intensity if ignited under extreme conditions. Indirectly, these treatments have the potential to reduce potential fire behavior within the treated areas to provide firefighters with a safe defensible space to initiate and carry out firefighting operations.

The potential effects on surface and aerial fuels by proposed treatments are as follows:

Surface Fuels – The treatment prescription and design criteria for *clearcuts, partial clear cuts and commercial thinning* call for piling of the slash and un-merchantable (larger material, ie. boles).

Removing the large diameter live and dead boles would reduce the amount of large dead and down fuels (the fuels that contribute to fire severity and resistance to control) available as surface fuels in future years. Slash remaining in the units after harvesting activities, including *commercial thinning* would be lopped and scattered to within 18" of the ground. This would increase the ¼ to 3 inch fuel load that does contribute to fire ignition probability and fire intensity. However, a recent Canadian study comparing slash loads in thinned stands indicates a six-fold increase in small diameter fuel loading in the area with no slash removed but the total fuel loading is still only approximately 5 tons per acre (Schroeder et al 2006).

Consequently, the amount of slash being left in this area should remain below the 20 tons per acre or less threshold that maximizes fire behavior, resistance to control, and fire severity (Brown et al. 2003).

Aerial Fuels - All of the proposed treatments, *clearcuts, partial clearcuts, aspen improvement cuts, commercial thinning, group selection and individual tree selection* would remove canopy biomass from the stands thus affecting two key parameters for crown fire initiation and propagation, Crown Bulk Density and average Canopy Base Height (Alexander 1988).

Crown Bulk Density (i.e. aerial fuels) would be lessened with the removal of live and dead trees. Average Canopy Base Height will likely decrease as younger healthier trees will be retained wherever

possible. With the expectation that little or scattered overstory would remain in the treated areas the crown fire threat is diminished in these stands.

Each of the proposed treatments would have a varying effect on the reduction of aerial fuels continuity and reducing the crown bulk density within each stand. Clearcutting and partial clearcutting are believed to the most effective method, as the canopy would be entirely removed and the crown fire potential would be eliminated.

Aspen improvement cuts would have little to no effect on crown fire potential as the aspen canopy is rarely receptive to crown fire initiation or spread.

Commercial thinning would limit the potential for crown fire runs when the crown bulk density or availability of the canopy fuels are reduced. This prescription however, may not prohibit the potential for isolated tree torching unless the residual thinned stand has had the average crown base height increased from the forest floor. Fire will be more prone to fall back to the surface and not sustain a crown run with this prescription.

Group selection and individual tree selection cuts would be similar in effectiveness as the commercial thinning and would depend upon the remaining numbers of interconnecting canopies in each stand.

Vegetation to Fuel Model Cross Walk

Mixed Conifer (spruce-fir) – These stands are expected to show an increase in herbaceous cover when the overstory is removed. GR1, a short sparse grass model has been chosen as the best characterization for these areas.

Mixed conifer (spruce-fir) – After treatment these stands are expected to have characteristics similar to Fuel Models TL1 (stands with minimal dead and down and a compact needle litter), TL3 (areas where slash is lopped and scattered) and TU1 (stands that have some understory).

Mixed Conifer with Aspen – The ground disturbance associated with the proposed mechanical treatment and the increased sunlight resulting from overstory removal should stimulate aspen regeneration in these stands. Fuel Model TU1 is expected to characterize fuels and fire behavior in these ecosystems.

Because the majority of the large diameter boles would be hauled away or piled and burned at the landings, total fuel loading would be significantly decreased as compared to the untreated areas. Consequently, fire severity (heat penetration into the soil) would be minimal as the residual surface fuels would burn out quickly with little residence time. The exception would be at the landing piles, where the inverse is true and fire severity is expected to be higher, but contained to pile locations. Resistance to control would also decrease with the large diameter surface fuel loading found primarily at the pile locations.

Conclusion

Reducing crown bulk density has some potential to influence fire behavior within the treated stands but is not expected to influence adjacent and outlying stands in any appreciable manner.

Although behavior and effects of wildland fires can be changed within a particular treatment unit or stand, the behavior and progress of a much larger fire may not be affected by small treatment units. Fire progression maps often reveal that small units are circumvented by large wildland fires (Dunn 1989, Salazar and Gonzales-Caban 1987) with little net effect on the overall growth of the fire. Instead, the progress of large wildland fires is affected by treatments that are (1) comparable to the size of the fire or (2) by treatments that collectively disrupt the growth of fires (Brackebusch, Finney 2001a, Gill and Bradstock 1998).

Furthermore, research from the 1988 Yellowstone fires and recently published fire histories from Rocky Mountain National Park report that the majority of the natural fires occurring in lodgepole pine types and high elevation mixed conifer are drought and weather rather than fuel driven events (Despain 1990, Baker and Buechling 2004, Schoennagel et. al. 2004). Hence, as stated in the no-action cumulative effects, one should eventually expect that a large scale stand replacement fire event would occur in the Bufford New Castle analysis area.

With treatment the fuels profile within the units at the < 5 year time would change. In aspen stands the overstory would have aspen with occasional spruce/fir individuals or groups interspersed. The understory would have grass and brush with very little in the way of a dead and down fuel load.

The units would temporarily convert to a grass/forb meadow with aspen and spruce-fir groups remaining.

The grass-forbs would have activity fuels spread throughout the units, except where whole tree skidding is implemented. This light flashy fuel profile would in the short term raise the rate of spread, but by piling the larger un-merchantable material and slash at the landings and burning the fuel bed would not be continuous.

Within approximately 20 years the aspen overstory would be pure aspen except for the occasional spruce-fir individual or group. The understory in aspen would be a mixture of brush and grass/forb with very little in the way of dead and down fuel. The understory would be a grass-forb mix. The activity fuel from the treatment will have decayed and or compacted. The continuous fuel bed of large down logs would not be present as it would with the no action alternative. Fire severity and resistance to control would be greatly diminished.

Older mature aspen with occasional spruce-fir individuals or groups would be present. Younger aspen trees would also be present especially on the perimeter of the stands. The under story would have mixture of low brush and grass -forb with a small amount of down heavy fuel load. The mixed conifer overstory would be ~ 50 year old regeneration with occasional aspen and spruce-fir individuals and groups. The understory would consist of a grass/forb low shrub fuel bed. Again the continuous fuel bed

of large down logs would not be present as it would with the no action alternative. Fire severity and resistance to control would be greatly diminished.

Table 3.17. Fire Behavior Predictions (BehavePlus) using severe late season drought inputs as described in Scott 2003.[1] (A wind reduction factor of 0.3 was used in this analysis.)

	Fuel Model TL1 Short needle litter	**Fuel Model TL3** Moderate downed logs	**Fuel Model TL7** Abundant large logs	**Fuel Model TU1** Timber with light understory	**Fuel Model TU5** Timber with heavy understory	**Fuel Model GR1** Short sparse grass
Rate of Spread (Ch/Hr)	1	4	6	11	27	16
Flame Length (Ft)	1	2	3	4	13	2
Transition to Crown Fire Assumes 10 feet to crown base	No	No	Yes	Yes	Yes	No
Crown Fire Rate of Spread (Mi/Hr)	2	2	2	2	2	2
Fireline Construction Rates[2] (Ch/Hr/person)	2	2	1	1	.4	4

[1] Scott (2003) recommends using the following weather inputs: 1-hr=3, 10-hr=4, 100-hr=6, live fuel moisture =70%, 20 foot wind speed=25 mph.
[2] Fire line construction rates taken from the NWCG Handbook 3, PMS #410-1, NFES # 0065, March 2004.

Cumulative Effects

The proposed activities coupled with past management actions would decrease fuel loadings within the project area. The action alternative meets all Objectives set forth by the Forest Plan standards and guidelines. The no action alternative contributes directly to natural fuel loading as mortality in declining stands increases.

The Buford-New Castle Project Area has been managed for livestock grazing, timber harvesting, fuel wood gathering and a variety of recreational activities. There were several small fires that have occurred in the past between 1980 and 2014 throughout the project area. There were several timber sales that occurred in the area between 1990 and 1999 and there were four sales which were implemented between 2005 and 2010. There are many roads that remain from past harvesting,

ranching and recreation activities within the project area. Evidence of previous timber harvesting activities includes roads, skid trails, landings, stumps, slash piles, root wads and paint on trees in the area adjacent to where sales have occurred in the past. Evidence of ranching and grazing (sheep and cattle) activities and range improvements includes fences, cattle guards, range trails, stock ponds and roads to access the stock ponds. Evidence of recreational activities includes dispersed campsites, motorized trails and hunter camps. There is evidence of dispersed camping in compacted use areas with minimal vegetative cover. Several motorized trails are also located in the project area. Previous grazing, recreation, and timber harvesting activities are factors, which affect the Existing Scenic Condition. The increase in human caused fires and the increase in recreational activities within the project area may have an impact to this area. There are also private land and residences adjacent to the forest.

Management activities, which are taking place at the present time, are a continuation of existing use including a variety of year around recreational activities and fuel wood gathering. There will be two sales occurring in the areas Meadow Creek (2017-2018) and Sheep Salvage (2017-2018). Livestock grazing will continue as a management activity in the area.

Based on the alternatives analyzed in detail, nothing is considered to be a significant fuels impact of the alternatives and concurrent actions when combined with past actions. The fuels impact analysis of the proposed alternatives is based on the design features being implemented.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

This project would not cause any irretrievable commitment of resources.

FOREST PLAN CONSISTENCY

The treatments described in the proposed action are consistent with the fire and fuels standards and guideline stated in the White River National Forest Plan.

SOCIAL ELEMENTS

SCENERY RESOURCES

Scenic resources vary by location and existing natural features including vegetation, water features, landform, geology, and human-made elements. All activities that forest visitors experience are performed in a scenic environment defined by the arrangement of the natural character of the landscape along with components of the built environment. Scenery resource analysis is used to examine the impacts of human influences on the scenic values associated with National Forest System lands.

SCENERY RESOURCE DESCRIPTION

The intrinsic beauty of the project area is a valued resource. Management activities could impact the quality of views from highly sensitive viewsheds, recreation use areas, and travel routes that access a major portion of the project area. The existing landscape character reflects influences of natural

processes and human activities. Changes in landscape character are managed by the Forest Service using scenery management system (SMS) objectives. Project activities have the potential to affect scenic quality, landscape character, and desired scenic condition in the project area.

SCENERY INDICATOR

Scenery will be measured whether or not scenic integrity objectives (SIO's) are met in the short- term and long-term and the design criteria needed to meet the SIO.

FOREST PLAN DIRECTION

Goals, Standards and Guidelines: The following goals, standards and guidelines are contained within the WRNF Land and Resource Management Plan 2002 Revision (the "Forest Plan").

Forest Plan Direction – National Strategic Goal (AA-17): The overall direction for managing the WRNF includes the national strategic goal to manage all NFS lands to attain the highest possible visual quality commensurate with other appropriate public uses, costs, and benefits.

Regional Goal for the Rocky Mountain Region (page 1-1, bullet 4): "Provide for scenic quality and a range of recreational opportunities that respond to the needs of forest customers and local communities"

Forest-wide Goal 2 (page 1-10): Provide a variety of uses, products and services for present and future generations by managing within the capability of sustainable ecosystems. *Strategy 2c.9* (*page 1-12*) states, "Within five years of plan approval, and each following 5 years, evaluate scenery management monitoring results and implement appropriate management adjustments".

Scenery Management Forest-wide Guidelines (page 2-34): Management activities should be designed and implemented to achieve, at minimum, the level of scenic integrity shown on the scenic integrity objective map. Plan, design, and locate vegetation manipulation on a scale that retains the color and texture of the landscape character, borrowing directional emphasis of form and line from natural features.

Travel System Infrastructure Guide 7 (Page 2-37): Design roads to minimize visual and environmental impacts where possible.

DESIRED CONDITION

The goal of SMS is to create and maintain landscapes having high scenic diversity, harmony, and unity for the benefit of society in general. Proposed project activities can affect landscape character, and the purpose of SMS is to manage those changes within an aesthetic and ecological framework. Scenic integrity indicates the degree of intactness, or wholeness, of the landscape character. The desired condition for scenery management is described below for each Management Area (MA) in the project area. *The Buford New Castle Project area is located in five Forest Plan Management Areas:*

Page 3-44, 4.3 Dispersed Recreation: These areas are managed to provide undeveloped recreation opportunities in natural or natural-appearing landscapes. Scenic integrity objectives range from moderate to very high.

Page 3-51, 5.12 General Forest and Rangelands – Range Vegetation Emphasis: These areas are managed for the sustainability of the physical, biological, and scenic values of general forest and rangelands, while emphasizing forage production for livestock. Scenery is managed to provide a range of scenic integrity objectives from low to moderate.

Page 3-53, 5.13 Resource Protection – Forest Products**:** These areas are managed to provide commercial wood products. Scenic integrity objectives range from low to moderate.

Page 3-55, 5.4 Forested Flora and Fauna Habitats: These areas are primarily forested ecosystems intermingled with grassland and shrub communities, and are managed to provide a mix of ecological and human needs. Scenic integrity objectives range from low to moderate.

TEMPORAL SCOPE

The scenic resource may be impacted immediately (implementation to 2 years), in the short term (2 to 10 years) and in the long term (10 or more years). The duration of impact is highly dependent on the vegetation type and how quickly revegetation of disturbed areas occurs.

GEOGRAPHICAL SCOPE

The area that could be directly affected is the project area. The area that could be indirectly and cumulatively affected is the project area and any area outside the project area from which proposed management activities can be seen.

The entire project area is mostly visible in Foreground and limited Middleground views from NSFR 245 which runs entirely through the middle of the project area with units on both sides of the road. The Buford New Castle Project area is in a high altitude environment with short growing seasons.

AFFECTED ENVIRONMENT

Scenic resources on NFS lands in the project area are assessed within the framework of the SMS, which is used by the Forest Service to inventory and manage the scenic resources of a landscape. SIOs are associated with the degree to which a landscape is perceived to be intact, or whole, and are consistent with MA direction.

ENVIRONMENTAL EFFECTS

Direct and Indirect Effects

Alternative 1, No Action

Under this alternative, current custodial management activities and other ecological processes would continue. The project area would be managed to protect and maintain existing improvements and uses. Commercial harvest and non-commercial vegetation management activities would not occur in the project area. There would be no temporary roads constructed for timber harvesting access. There would be no material available for biomass. The road corridor (NFSR 245) would continue to have inadequate site distance on corners and road intersections. There would be no road maintenance, clearing of brush and tree removal along roads, road grading, ditch and culver maintenance, gravel replacement, or curve widening or slope tapering. Occasional fires would continue to occur and may increase in occurrence without harvesting activity. Current management activities and the interaction between natural processes and human impacts would continue under a no action alternative. The

project area would be managed to protect and maintain existing improvements and uses. Human impacts, livestock, and wildlife would continue to affect the area by vegetation disturbances. General human uses in the area such as winter activities, motorized activities, dispersed recreation, wildlife viewing, livestock grazing, scenic viewing, hunting, and fuel wood gathering would continue unchanged. Scenic quality would remain in its current condition throughout the area and scenic character would change in the long term from natural processes, livestock, and human impacts.

Alternative 2 - Proposed Action
Direct and Indirect Effects for Management Activities

In general, the longest lasting scenery impact comes from color contrast or soil disturbance, generated from logging or from unnatural appearing edges created from management activities or the design of the units. The exact degree of scenery impact would depend on the type of harvest method, design and layout of treatment units, duration of impact, duration of view, distance from viewer, the stand character, number and frequency of entries, and the speed of the viewer traveling through the area. The ability to control how disturbances appear depends upon the harvest system used, landform, soil type, silvicultural prescription employed, slash disposal, cleanup, design of the treatment unit and the implementation. Other short term scenery effects that would be evident in foreground views would include evidence of harvest activities such as slash, stumps, root wads, landings, skid trails, temporary roads and paint. The effects that alterations have on these features are dependent on individual human values.

Timber harvest and temporary road construction can affect the scenery resource because of contrasts created between natural forest landscapes and those modified by management activities. These contrasts consist of changes in form, line, color, and texture of the vegetation. The type of harvest method used for the vegetation treatment may also contribute to the scenery impact. The scenic impact would increase where evidence of harvest activities such as slash, stumps, rootwads, landings, skid trails, roads, and paint are evident in Foreground Views. Opportunities to minimize scenic impacts are greater where slopes are less steep and unit size and shape can be manipulated more effectively.

Road and landing construction can involve noticeable alteration of landforms and may leave very long lasting scenery effects on the landscape. The closure of roads can help minimize the long term scenery impacts. Logging operations should be suspended when unacceptable damage to the soil and water resources may occur, which results in a negative scenic impact. Heavy equipment would not be operated when ground conditions are such that excessive damage would result.

Scenery effects generated by management activities vary in duration and intensity according to the type of vegetative treatment which is implemented. Silviculture treatments are divided into two types of silvicultural systems; even-aged and uneven-aged management. This proposal uses both even-aged and uneven-aged using a combination of clearcut, patch clearcut, aspen improvement cut, commercial thinning, group selection, and individual tree selection harvest prescriptions.

The effect level by amount of effect (or scenic impact) each prescription for this project has on scenic resources are as follows. Clearcuts in aspen (coppice cut), patch cuts and salvage have a Moderate

Effect. Commercial thinning, group selection, aspen improvement cut, and individual tree selection have a Low Effect.

Table 3.18 - Potential Effects on Forest Scenery by Silvicultural Treatment

Treatment	Form	Line	Color	Texture
Clearcut	Openings would create diversity in the existing canopy. The units will be designed to blend into the patterns of the natural vegetative mosaic, relying more heavily on feathering for blending.	By using a feathering technique to scallop the edges of the clearcuts, the edge or line of the cut will mimic natural patterns of the characteristic landscape.	Variety of color would be enhanced by the introduction of forbs and grasses, and various shrub species that would provide contrast against the Aspen and Spruce/Fir subtypes and encourage regeneration. By removing the conifers from within the units, color contrast of the conifers would be from conifers outside the unit boundaries.	Species diversity would create a more complex texture within the sale area.
Patch Clearcut	Openings would create diversity in the existing canopy. The units will be designed to blend into the patterns of the natural vegetative mosaic, relying more heavily on feathering for blending.	By using a feathering technique to scallop the edges of the patch clearcuts, the edge or line of the cut will mimic natural patterns of the characteristic landscape.	Variety of color would be enhanced by the introduction of forbs and grasses, and various shrub species that would provide contrast against the existing vegetation and encourage regeneration. By removing most of the conifers from the patches within the units, color contrast would be from the younger stand, ground cover inside the unit and the mature vegetation from outside the unit boundaries.	Contrast would be created from the even-age of the patches in the units against the uneven-aged stands adjacent to the harvest units. A stronger species diversity and an uneven age of the stand would be created.
Aspen Improvement Cut	The forest canopy would remain relatively continuous and unbroken.	Trees would be selected in a process that will not create unnatural lines in the canopy from harvest activity.	The color of the stand would be less diverse with the conifers removed. Seasonal variety of color would be enhanced by harvesting the spruce/fir stands that are encroaching on the aspen, allowing the aspen to regenerate. There would be seasonal color in the fall with the solid aspen canopy. The young aspen would add a little variety. When the leaves drop in the fall, the color of the stand would change to the winter color of the stands bare branches.	A two-age aspen stand would be created as the contrast with the mature aspen and the new aspen grows and matures. Age diversity in the aspen would create a more complex texture of the canopy within the stand summer texture. When the leaves drop in the fall would provide a winter textural pattern with the bare branches.
Commercial Thinning	Removing trees would increase the structural diversity. The units are designed to blend into the patterns of the natural vegetative mosaic.	Thinning the trees would decrease the number of trees, which would emphasize the strong vertical line of the existing stand. Trees would be selected in a process that would not create unnatural lines in the canopy from treatment activity.	Color of mature vegetation in stand would remain unchanged. Some additional undergrowth would add a little variety. Seasonal color would be enhanced by breaking up the canopy and possibly enhancing aspen growth.	Species diversity and the uneven-age of the stand would create a more complex texture of the canopy. Removal of the trees would decrease the textural complexity of the stand in the short term; in the long term it would be increased due to the trees, which will be regenerated.
Group Selection	The units are designed to blend into the patterns of the natural vegetative mosaic.	Trees would be selected in a process that would not create unnatural lines in the canopy from harvest activity.	Color of healthy vegetation in stand would remain unchanged.	Species age diversity with the uneven-age of the stand would create a more complex texture of the canopy.

Treatment	Form	Line	Color	Texture
Individual Tree Selection	The forest canopy would remain relatively continuous and unbroken.	Harvesting in several or all age classes within the stand would leave the existing stand relatively unchanged in vertical diversity. Greater viewing depth adds to the contrast. Increased site distance on road corners.	The color of the stand would remain basically unchanged.	Regeneration occurring in the small newly created openings would maintain the overall crown canopy texture.

The temporary roads and skid trails would be decommissioned upon completion of harvest activities at the end of the project. Decommissioning would be accomplished by returning the temporary roads to as near a natural appearance as possible by re-sloping drainage crossings, constructing water-bars, pulling in or rounding the back-slope where practical, scarification of the travel-way 12”- 18” deep, slashing the travel-way where practical and revegetating with native seed. There will still be evidence of the old road platform and skid trails, but it will not be as noticeable once there is vegetation growing. The scenic impact of the closed temporary roads and skid trails would diminish over time as they re-vegetate after they are closed post sale. The decommissioning of temporary roads and skid trails in this alternative minimizes the long-term scenery impacts.

After pile burning of slash is completed, blackened logs and stumps would be scattered back into harvest units. Piles within view of NFSR 245 should be burned. Small piles not visible from NFSR 245 and the ATV trail may be retained for wildlife needs. Evidence of the landings would be apparent, but the duration of time would depend on the amount of grading and disturbance required to construct them. Initially the disturbed area would be revegetated with native seed. The edges of the disturbances would be softened by the new vegetative cover. Most of the landings utilized for this project would be located directly adjacent to the NFSR 245 road and would not be constructed. Initially the disturbed area would be revegetated with native seed. The edges of the disturbances would be softened by the new vegetative cover. The scenic impact of the landings will diminish over time as they revegetate after they are seeded post sale.

A gravel pit outside the project area would be used for the project and will remain open at the completion of the sale and used for other projects in the future. The Hiner Springs Pit, an existing gravel pit outside the project boundary, will be used as material sources for the roadwork on this project.

The majority of the scenic impact will potentially be for users of the Buford-New Castle road (NFSR 245) and the ATV Trail within the project area from the project activities in the Foreground Views with some Middleground views. Scenic impacts of any significance are normally confined to the Immediate Foreground and Foreground Views. Straight edges and unnatural appearing shapes of proposed units and proposed temporary roads would increase the impact on the scenery resource in areas of high visibility for Middleground Views. Initially, marking paint on trees, stumps, slash, root wads, landings and skid trails would be noticeable to users. The hauling activities, including log truck and chip van traffic and dust from vehicles would be visible along the designated haul route from the project to Interstate-70. The activities associated with the timber harvesting operation and vegetation management activities

would be visible from the air for flights over the sale area, but the scenery impact would be minimal. For the areas which would be open to snowmobile use post sale, the evidence of the harvesting activities would be minimal due to the entire area being covered with snow.

The proposed clearcuts and patch cuts will be laid out with irregular shapes and with feathering on the edges, appearing more like natural openings. In the **short term,** the stand would have a positive effect on the vegetative mosaic. In the **long term,** the vegetative mosaic would be varied with different size natural appearing openings and diversity in stand character, species and age class. The texture and canopy of the stands would have variety and diversity. Most of the units are in a forgiving landscape due to the varied vegetation mosaic and vegetation types, the mixed conifer and aspen forest, meadows and open parks within some of the dense timber stands.

Based on the view potential of the units, the units have been designed to minimize the scenery impact. Various design tools would be utilized such as location of openings and design of unit shapes to mimic openings in the adjacent vegetative mosaic implementation of scenic resource design features in the following ways as described below. Initially, tree paint marked on trees adjacent to the roads and trails, stumps, slash, root wads and skid trails may be noticeable to users of the area. Scenery design features would be used to reduce the scenery impacts of the proposed vegetation management area.

Summary of Proposed Action

In summary, the number of acres visually affected in this alternative is approximately 660 acres (22 units) total using a variety of vegetation treatment methods to accomplish the work. The units in this project have been designed to minimize the scenery impact. Various design tools would be utilized such as location of openings and design of unit shapes to mimic openings in the adjacent vegetative mosaic. Most of the scenic impact to the users of this area would be within Immediate Foreground and Foreground views of the roads and the ATV Trail, post-sale. Approximately 0.8 miles of existing and constructed temporary roads would be used to access units. This alternative would have a positive overall scenery effect due to the improvement in the vegetation health, the long-term scenic improvement of the vegetation and the scenery improvements. All treated areas in this alternative would meet the Adopted Scenic Integrity Objectives (SIOs) can be achieved if the recommended scenery design features are implemented.

Cumulative Effects

Past Actions: The Buford-New Castle Project Area has been managed for livestock grazing, timber harvesting, fuel wood gathering and a variety of recreational activities. There were several small fires that have occurred in the past between 1980 and 2014 throughout the project area. There were several timber sales that occurred in the area between 1990 and 1999 and there were four sales which were implemented between 2005 and 2010. There are many roads that remain from past harvesting, ranching and recreation activities within the project area. There are closed roads with old road platforms that were not re-contoured and evidence of these closed roads will be apparent to users of this area for many years. Evidence of previous timber harvesting activities includes roads, skid trails, landings, stumps, slash piles, root wads and paint on trees in the area adjacent to where sales have occurred in the past. Evidence of ranching and grazing (sheep and cattle) activities and range

improvements includes fences, cattle guards, range trails, stock ponds and roads to access the stock ponds. Evidence of recreational activities includes dispersed campsites, motorized trails and hunter camps. There is evidence of dispersed camping in compacted use areas with minimal vegetative cover. Several motorized trails are also located in the project area. Previous grazing, recreation, and timber harvesting activities are factors, which affect the Existing Scenic Condition. The number of manmade disturbances in this area may have an impact on the visitor experience for the users who visit this area. The number of manmade disturbances in this area has a minor scenic impact on the visitor experience for the users who visit. There is evidence of humans throughout the project area. There are also private land and residences adjacent to the forest, but within viewing distance.

Concurrent Actions: Management activities, which are taking place at the present time, are a continuation of existing use including a variety of year around recreational activities and fuel wood gathering. There will be two sales occurring in the areas Meadow Creek (2017-2018) and Sheep Salvage (2017-2018). Livestock grazing will continue as a management activity in the area.

Based on the alternatives analyzed in detail, nothing is considered to be a significant scenery impact of the alternatives and concurrent actions when combined with past actions. The scenic impact analysis of the proposed alternatives is based on the design features being implemented.

Anticipated Actions: The project area will be positively affected by changes in vegetation to increase the species and age class diversity throughout the area using the various vegetative prescriptions. The overall scenery effect and long-term scenery and scenic improvement of the vegetation due to the increased species diversity would create a more visually pleasing vegetative mosaic. The recreational and safety improvements would create a better user experience. Year around recreation activities would continue with the potential for increased use. Sheep and cattle grazing would continue in the area. There are no additional timber sales in the White River National Forest Five Year Action Plan for this area. Based on the past and concurrent actions discussed above and the proposed alternatives analyzed in detail, the cumulative effects of the activities in the area would not raise the impact to a significant scenery impact.

Figure 3.9 – Aspen ~20-years post-harvest.

The aspen stand in the background was harvested in 1994.

MONITORING RECOMMENDATIONS

If the No Action Alternative is implemented, monitoring and evaluation would continue to occur at a forest-wide, programmatic scale. If Alternative 2 is implemented, a site specific project-level monitoring and evaluation plan should be developed and implemented when project is completed.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Given time, all actions within this alternative are reversible. Forested vegetation is a renewable resource and can be managed for many desired attributes and changes to the forested landscape. Treatment of the forest vegetation is not an irreversible or irretrievable commitment of the resource. Because vegetation grows back over time, timber harvesting activities would not cause irreversible impacts. Actions such as road building and other activities associated with timber harvest in most cases would be viewed as a permanent action on the landscape although the effects would be lessened over time when roads are decommissioned.

FOREST PLAN CONSISTENCY

The Forest Plan allows some disturbances related to scenery in managed areas, as long as the alterations meet the Adopted Scenic Integrity Objectives. Alternative 2 can meet all Scenic Integrity Objectives set by the Forest Plan standards and guidelines provided that: 1) the proposed activities do not exceed the scale presented in Chapter 2 of this Environmental Analysis (EA) and 2) the project design features are implemented.

RECREATION

Resource Description

The following section describes the affected environment and effects of the Buford New Castle Project for recreation resources this includes the following categories: dispersed recreation campsites; motorized use (OHV, full size vehicles and snowmobiles); and recreation special uses.

The project area is the location for several large events throughout the summer including and not limited to Colorado Traditional Archers shoot, the Pyro run and weddings. The project area is also a popular hunting area in the fall. Access to the NFST 2290 trailhead is located within the project boundary and continues throughout the project area.

Indicators

Potential impacts would be limited access to dispersed camping within project boundary during harvesting.

Indicators: Increased dispersed camping outside of proposed treatment units.

Alternative 1: Dispersed camping would be available in the area

Alternative 2: Dispersed camping would be available in other areas within close distance

Potential impacts from closure of NFST 2290 and Forest Service road 245.

Indicators: Disturbance from alternative parking areas to access 2290 trail, and increased traffic on alternate roads when closures are in effect.

Alternative 1: No change to forest trail and road access

Alternative 2: Alternative trailhead access and alternative forest access is available to public

Potential impacts of harvesting activities during special use and permitted events

Indicators: Events would be moved to alternate locations and increased use would occur in other locations

Alternative 1: Possible alternative event location are already being analyzed and areas could be changed with this alternative without proposed project

Alternative 2: Alternative event locations would be located or timed with logging operations

Forest Plan Direction

This section of the analysis the proposed action in relation to the recreation resources and it's consistency with the White River National Forest Land and Resource Management Plan. The Buford New Castle project area is located in management area 4.3.

Chapter one, Forest-wide Goals and objectives

Goal 1 Ecosystem Health

Objective 1d. Increase the amount of forest and rangelands restored to or maintained in a healthy condition with reduced risk and damage from fires, insects, disease and invasive species

Goal 2 Multiple Benefits to People

Objective 2a. Improve the capacity of the national forest and grasslands to provide diverse, high quality recreational opportunities.

Chapter Three, Management Area Direction

4.3 Dispersed Recreation – Dispersed recreation areas are managed to provide undeveloped recreation opportunities in natural or natural-appearing landscapes.

Standard

- These areas are not part of the suitable timber land base
- Vegetation management operations should be designed to maintain the desired recreation setting

Desired Condition

"A wide varity of backcountry recreation opportunities exist as long as they do not interfere with maintaing a natural-appearing landscapes. Resource management activities are compatible with, and reduce impacts to, recreation resources and opportunities."

"Biological communities are maintained or improved to provide an attractive setting for visitors, complement the recreational values, and provide varied plant communities, structural stages, and associated wildlife."

Temporal Scope

The proposed project description indicates that harvest could last up to 4 years, during this time recreation activities will be limited within cutting units. Some recreational opportunities could be restricted or limited for 2-4 years after project to provide for forest health measures.

Geographic Scope

Dispersed campsites along NFSR 245 have been established within the Buford New Castle Project for many years, these sites are frequently used throughout the summer and fall months. This road access is one of the main entrances into the Flat Tops since the road was constructed and is heavily traveled. This road connects New Castle to the White River National Forest.

The 2290 trail was recently establish when NFSR 245 was closed to unlicensed motorized travel. This route has now become important to the recreation experience of this area. Travel will be restricted at certain times in these areas but design features restrict hauling and harvesting during the highest used times.

Affected Environment

The Buford New Castle Road (NFSR245) has traditionally been the main access to the Flat Top Mountains. The road is maintained regularly for passenger vehicles. NFSR 245 is heavily traveled and sections are opened year-round. In the summer months, the road is primarily used to access dispersed camping areas. Dispersed camp sites are common along the road and occupied most weekends throughout the summer. These campsites do not have any permanent structures and no provided amenities. Visitors who seek this remote experience come prepared with water, waste facilities, and shelter. Dispersed sites are occupied June – November with the highest use during hunting season(s). Most of the visitors using these sites for hunting come from out of state and contribute to our local economy.

Popular dispersed campsites were inventoried in 2009 and revisited in the Environmental Assessment for the BNC Unlicensed Parallel Route EA NFSR 2290 . A site was defined as an area where vehicles have accessed, bare ground was exposed and a human made fire ring was present. In accordance with the White River Forest Plan, the BNC Unlicensed Parallel Route Decision required campsites within 100 feet of lakes, streams and system trails to be decommissioned.

The West Elk Trailhead is the main parking area for OHV, snowmobile and cross country ski trail use off of NFSR 245. The trailhead has an outhouse and three kiosks. This is a popular gathering spot and recreation event area. Events that have taken place include the Colorado Traditional Archers and Pyro 5 and 7k run. In the summer, the trailhead provides parking and access to a 9 mile OHV trail that parallels NFSR245 and provides over 200 miles of motorized opportunities for unlicensed vehicles. This 9 mile trail was constructed in 2011 in partnership with the White River Trail Runners. They have adopted this route and assist with ongoing maintenance. In the winter, the trailhead provides parking for both the Rifle Snowmobile Clubs groomed trails and the West Elk Multi Use Club's cross country and snowshoe trails. The two clubs work together to provide both motorized and non-motorized recreational opportunities and maintain the outhouse and parking area. Snowmobiles have access to over 200 miles of groomed routes in combination with the Flattoppers Snowmobile Clubs groomed routes on the east side of the flat top mountains. Generally, the local communities of Rifle, Silt, New Castle, Glenwood Springs and Eagle residents use these trails. The West Elk Multi-Use Club grooms and maintains four loop trails, offering 12 miles of cross country ski trails and 3 miles for snowshoeing. There has been an increase of use on these winter trail systems. Other uses include; dog mushing and sledding.

A number of Special Use Permits have been issued for Recreation Events along NFSR245. Two of the events have been mentioned above have been held at the West Elk Trailhead and at Lake Park; Colorado Traditional Archers Event and the Pyro 5 and 7k run. Additional events have been held in and surrounding the project area in both winter and summer months. The Rifle Snowmobile Club hosts an annual poker run on Presidents Day weekend donating all proceeds to grooming efforts and costs. These events bring between 200-500 participants to the Flat Top mountains. Smaller events that regularly occur include educational events, family reunions, and weddings. Garfield Country Search and Rescue has provided avalanche training from the trailhead on weekends during the busy winter months. Any event held on the forest that anticipates 74 or more people need authorization of a Special Use Permit for their recreation event.

Environmental Effects

Alternative 1: No Action

Direct, Indirect and Cumulative Effects

The direct, indirect and cumulative effects of the No Action Alternative would have little to no change to the existing recreation experience and settings for dispersed recreation campsites; motorized use (OHV, full size vehicles and snowmobiles); and recreation events.

Alternative 2: Proposed Action

Direct, Indirect and Cumulative Effects

This proposal would have direct effects to the existing recreation settings and experiences in the project area to dispersed campsites, motorized use (OHV, full size vehicles and snowmobiles) and existing special use permits for recreation events.

Disperse Camping Opportunities

Direct effects

The proposed action would directly impact the existing disperse camping opportunities. To minimize effects to dispersed camping experiences, design features were established that require avoiding inventoried dispersed sites and would be incorporated during project layout and contract development and administration. These restrictions are in the project design features table, which are a part of the proposed action. Popular dispersed campsites were inventoried and will be identified prior to sale implementation. These sites would need to be restored if used as landing and staging areas. Some of the inventoried dispersed campsites would have less privacy due to the removal of the trees and could temporarily lead to displacement of dispersed campers. Dispersed camping is permitted in general forested areas in surrounding areas offering similar or enhanced experiences as long as sites are in accordance with the Travel Management Plan and Forest Plan direction. During the harvesting operation, dispersed camp sites located in and surrounding the project area would directly be impacted with traffic, noise, dust and debris. In an effort to mitigate these effects to dispersed campers, design features have been included to restrict hauling and harvesting activities from Friday at noon to Sunday at midnight, no hauling on holidays and two days prior through the opening day of each big game hunting seasons.

Wood and slash on or near dispersed camp sites would be either chipped and hauled off or piled and burned in the following years after logging has concluded. Historic campsites would be available soon after logging has been completed.

Indirect effects

Indirect effects from the harvesting activity may result in the natural restoration of some disperse campsites along NFSR 245. Lack of use following harvesting operations may provide an opportunity for vegetation growth allowing sites to return to their natural condition. Other indirect effects may include but are not limited to new dispersed camping sites in the surrounding areas.

Cumulative effects

Historic logging projects are no longer affecting dispersed camping. Forseeable projects, including the Meadow Creek Timber Sale and Sheep Salvage Sale, may limit dispersed camping within their respective

geographic areas for 1-5 years. Cumulatively, this would result in a minor reduction in dispersed camping opportunities across the greater landscape.

Road closures and Motorized Use (ATVs/UTVs, Driving for Pleasure and Snowmobiles)

Direct effects

The Forest Service recognizes that road closures would be inconvenient to the public. These closures would be clearly signed and news releases would be sent to the Glenwood Post. Updates regarding closures and timber activities would be available at local offices. Closures would only be implemented during periods when harvesting occurs within 2-tree lengths of system roads and trails. Closures of up to four (4) hours may be implemented. Additionally, the following design features have been incorporated into the project proposal:

- Hauling and road closures will be restricted Friday at noon to Sunday at midnight to minimize conflicts with recreational traffic on NFSR 245.
- Hauling, road maintenance, road closures and road reconstruction will be restricted on federal holidays along NFSR 245 from noon the day before the holiday to midnight the day of the holiday.
- Hauling and road closures will be restricted 2 days prior through the opening day of each big game hunting season

Notification of closure times and locations would be advertised and posted in advance. Closure sections and alternate routes would be clearly defined. The daylighting sections would most likely be closed for the full 4 hours. Other sections may have shorter closures. Travelers accessing the forest from both north and south could be affected.

The contract purchaser would determine closure hours, but it is anticipated that closures will fall between the hours of 8:00 am to 12:00 pm and 12:30 pm to 6:30 pm.
While inconvenient to some, the following alternate routes can be used to access the area from Rifle, Silt, New Castle or Meeker:

Table 3.19 – Alternate Routes During Proposed Road Closure

Route #	Name	Description	Recommended Vehicle Type
825	Little Box	From Rifle, Silt or New Castle, travel to Rifle Mountain Park, then follow NFSR832 for 1.5 miles, then NFSR825 for 3.7 miles to the intersection with the BarHL Road. Turn right and travel 0.5 miles to NFSR 245.	High Clearance 4WD. No Trailers
832/211	Coulter Mesa/BarHL Route	From Rifle, Silt or New Castle, travel to Rifle Mountain Park, then follow NFSR832 for 1.5 miles to the intersection with Little Box Road. Turn left and follow NFSR832 for 12.3 miles until the intersection with the BarHL Road. An additional 12.7 miles will bring travelers to the BNC road.	SUV or higher clearance passenger car recommended during dry weather. During wet conditions, high clearance 4WD is recommended.
211	BarHL Route via Flag Creek	From Meeker, travel to Flag Creek via CR13 for approximately 7 miles. Turn left on CR38. Follow CR38	High Clearance 4WD

Route #	Name	Description	Recommended Vehicle Type
		for approximately 4.5 miles to a small trailhead. From the trailhead the road turns into NFSR 211 and is 4WD only. In approximately 18 miles the intersection with the BNC road is reached.	No Trailers Alternate ATV Route

Alternate ATV/UTV routes are available. Route Maps are available at the Rifle District Ranger Office and the Blanco District Ranger Office.

Closures would be in effect to maximize operations to reduce the overall impact on recreation users. There may also be periods of time when sections of the atv/utv trail may be closed to accomodate harvesting activities adjacent to the NFST 2290. Alternate location are available to access the trail. The trail can be accessed from the FS860 road and the FS832 road. This project would also improve sight distance to increase the safety for the riders. Design Features were established to prevent full size vehicles and equipment from using the trail, however, skidding and crossing the trail is likely. A short .4 mile long section of the trail would be used as a haul/skid route to access unit 201. The previously planned location was cutting a new scar through a meadow, while the existing ATV trail was the actual road template traveling through the park. By utilizing a short section of the ATV trail for hauling, creating a new road template can be avoided. A design feature to ensure the ATV trail is not obliterated following hauling have been incorporated into the proposed aciton. The harvesting contract would require the trail to be protected and returned to its original condition following harvesting activities. The experience and views of traveling along trail 2290 would change from riding in heavily wooded and meadow sections to riding in and out of timber sale units and meadows. The wooded sections of trails created natural pinch points to reduce full size vehicle traffic. Design features were established to retain these pinch point in transitions along trails in meadows and timber. This direct effect is temporary, as the forest regenerates, the experience along the trail would be restored and most likely enhanced. The Forest Service has received complaints from forest visitors in the past that the trail is lacking turnouts for two way traffic and a need for improved sight distance.

This area is a well know snowmobile riding destination. The Rifle Snowmobile Club has groomed snowmobile routes in and surrounding the project area. They have a special use permit authorizing the grooming, signing and maintenance of the trail system and trailhead. The snowmobile club and winter enthusiasts (dog mushers, cross country skiers, and snowshoers) who use these groomed routes would be directly affected if there is an early snowfall. To minimize impact to winter recreation use, a design feature was established to restrict harvesting activities after December 20th to provide riding opportunities in our snowiest months.

A design feature has been added that prohibits snow machine travel through harvested areas until forest regeneration is at a height and density that would restrict snow machine travel. If monitoring indicates damage is occurring, physical closures and more signing might be required to stop access. Restricting access to these areas will reduce the hazards that could be caused by stump heights. Since the forested areas are currently not being used for winter motorized use, restricting areas post-harvest is not expected to cause a measureable reduction in the area open to snowmachine travel.

Indirect effects

An indirect effect of harvesting operations along trail 2290 may result in vehicle use with widths greater than 65” and social trail creation. To minimize concern, trails would be clearly marked and debris would

be placed along the route to maintain the character and experience on the atv/utv trail. This project may displace summer atv/utv use and winter recreationalists.

Cumulative effects
This project does not have any known cumulative effects that adversely affect motorized opportunities.

Recreation Events
Direct effects
The project area is a desirable location to host large recreation events and is popular with local communities. There are two annual events that occur in the project area; the Colorado Traditional Archers Event and the Pryo 5 and 7k Run. These events would be directly affected by the harvesting activity due to traffic along NFSR 245 and/or dust. The Colorado Traditional Archers event is located in Lake Park area at this time and uses the surrounding forested area to place 3D animal size targets mimicking natural environments to practice and compete in archery competitions. During the 2016 Colorado traditional Achers event alternate locations would be identified for future events. The proposed action may displace their group of 200-500 participants for 1-3 years during and following harvesting. Along with these two events, weddings, family reunions and large gatherings have traditionally applied for special use permits to use this area. Design features were established to mitigate effects by encouraging USFS staff to coordinate treatment activities and recreation events.

Indirect effects
This project area may indirectly displace these groups temporarily while project is implemented and for a short term after implementation, impacting other areas of the national forest system lands.

Cumulative effects
There are no known cumulative effects that adversely affect special use permits for recreation events.

Monitoring Recommendations
A design feature has been added that prohibits snow machine travel through harvested areas until forest regeneration is at a height and density that would restrict snow machine travel. If monitoring indicates damage is occurring, physical closures and more signing might be required to stop access.

Irreversible and Irretrievable Commitment of Resources
Activities as a result of the implantation of the Buford New Castle Project would not cause an irreversible or irretrievable commitment of the recreation resource.

Forest Plan Consistency
The proposed action is consistent with all applicable Forest Plan Standards and Guidelines related to recreation management and Management Area 4.3. The proposed Silvicultural activities would provide varied plant communities and structural stages. In addition, design features incorporated into the project proposal address issues related to recreation management.

HERITAGE
Resource Description

Section 106 of the National Historic Preservation Act of 1966 (NHPA) require that Federal agencies take into account the effects of a Federal undertaking on any cultural resource that is eligible to or listed in

the National Register of Historic Place (NRHP). Activities associated with vegetation management activities, especially the use of heavy machinery, are considered undertakings. Archaeological materials, as specified by 36 CFR 296.3, such as structures, shelter, features, artifacts, rock art, human remains, or any portion or piece of the preceding which possess scientific, historic, and/or social values of a cultural group are defined as a cultural resource.

The criteria applied to evaluate cultural resources for the NRHP eligibility are based on the quality of historical significance present in cultural resources that possess integrity of location, design, setting, materials, workmanship, feeling and association. The NRHP eligible cultural resources are associated with one or more of the following: significant persons, events, or patterns in prehistory or history; distinctive engineering, artistic, or architectural characteristics; or the potential to yield data important to prehistoric or historic research. The Forest Heritage personnel, in consultation with the State Historic Preservation Office (SHPO), determines significance and NRHP eligibility of cultural resources.

Forest Plan Direction

Forest-wide goals include incorporating tribal resource management values into forest management activities (Forest Plan, page 1-16). Forest-wide standards for American Indian rights and interests and heritage resources include protecting important cultural areas for current and future tribal use by recognizing the cultural landscape and geographic diversity left by Ute ancestors. This includes acknowledging intellectual property rights; protecting sensitive and proprietary traditional tribal knowledge; conducting all land management activities in such a manner as to comply with all applicable federal, state, and local regulations; and leaving human remains undisturbed unless there is an urgent reason for their disinterment (Forest Plan, page 2-33).

Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations, require that any federal undertaking consider impacts to historic properties. All historic properties will be identified and protected by completing heritage resource survey prior to any direct or indirect impact from the project. Heritage resource values can be protected effectively by implementing the provisions of the following federal laws and their respective regulations:

- National Historic Preservation Act of 1966 (P.L. 89-665 as amended)
- National Environmental Policy Act of 1969 (P.L. 91-190)
- American Indian Religious Freedom Act of 1978 (P.L. 96-341)
- Native American Grave Protection and Repatriation Act (P.L. 101-601)
- Religious Freedom Restoration Act of 1993 (P.L. 103-141)

In the event of accidental disturbance of historic graves or reinternment, the appropriate tribal, state, and forest policies will be followed. Forest policies are contained in the Burial Policy for the White River National Forest.

The Forest Plan also establishes guidelines for protecting significant heritage resources sites from damage by project activities or vandalism through project design, specified protective measures, monitoring, and coordination. In addition, the guidelines specify the sites on the National Register of

Historic Places be managed under approved management plans or annual operation plans (Forest Plan, page 2-33).

Consultation with American Indian people is recommended when projects have the potential to affect cultural rights and practices to help ensure the protection, preservation, and use of areas that are culturally important to tribes. Physically affecting the integrity of traditional cultural properties, including forest product collecting places, should be avoided when possible. The Forest Service National Resource Book on American Indian and Alaskan Native Relations should be used when developing an agency-to-tribe consultation process (Forest Plan, page 2-33).

Desired Future Condition

The Forest Plan identifies no explicit desired future condition for heritage resources.

Temporal Scope

The time period within which heritage resources may be directly or indirectly affected is the duration of project implementation.

Geographical Scope

The project location is the area in which heritage resources may be directly or indirectly affected. The area of potential effect includes the proposed treatment units and any areas that may be affected by landings, temporary road construction, skidding, haul roads or any other ground-disturbing activities.

Affected Environment

This section provides a brief overview of the heritage resources within the project area. More detailed information can be found in heritage resource inventory report *Buford New Castle Vegetation Management Project Cultural Resource Inventory, White River National Forest, Garfield and Rio Blanco Counties, Colorado* (Espinoza 2016) on file at the White River National Forest Supervisor's Office in Glenwood Springs, Colorado.

A record search of the Colorado Office of Archaeological and Historic Preservation Compass database and the WRNF cultural resource database identified a total of 29 cultural resource inventories within a ½ mile radius of the project area. Eleven archaeological sites (5 isolated finds and 6 sites) were identified within the ½ mile radius record search. Of the 29 previous inventories, a total of 17 were conducted within the Buford New Castle project area (Table 3.20). According the record search, none of the 11 previously recorded archaeological sites are located within the proposed project area.

In 2016, Espinosa Cultural Services, LLC (ECS) was contracted by the White River National Forest to conduct a Class II cultural resource inventory within the proposed Buford New Castle Vegetation Management Project area. A total of 367 acres of the un-surveyed area was inventoried for this project. During this field effort, ECS identified 3 cultural resource sites within the area of potential effect. Both the sites (5GF5341 and 5GF5342.1) and the isolated find (5GF5380) have been recommended as not

eligible for inclusion in the NRHP under any criteria. On January 25th, 2017 the State Historic Preservation Office concurred with these findings.

Following the record search and after the ECS contract was completed, the Forest Service discovered that 40 acres within the APE (Area of Potential Effect) were not adequately surveyed, reducing the total inventoried acreage from 660 acres to 620 acres. These 40 acres are within proposed units 404, 405, and 406. To comply with Section 106 of the National Historic Preservation Act of 1966, as amended, these areas not adequately surveyed will be dropped from the proposed action.

If any cultural resources within the project area are found to be eligible or potentially eligible for the NRHP, they will be avoided or protected from any ground disturbing activities.

Table 3.20: Surveys previously completed in or adjacent to the project areas.

Report Number	Title
GF.FS.NR128	Rocking Chair Ranch Access Road
GF.FS.NR2	West Elk Gravel Pit
R1984021508012	Deep Plunge Timber Sale
RB.FS.NR6	North Elk Pipeline
GF.FS.NR86	Mansfield Allotment Stock Pond #1
MC.LM.R214	Buford/New Castle Road Clark Springs Blowdown
GF.FS.NR91	Mansfield Allotment Stock Pond #6
GF.FS.NR151	Rifle District Stock Pond
GF.FS.NR22	Seaman Park II Timber Sale
MC.FS.R39	Middle Clark Timber Sale
GF.FS.NR55	Aspen Clearcut Vista
MC.FS.R206	Buford/New Castle Road
GF.FS.NR147	Buford/New Castle ATV Parallel Route
GF.FS.R40	CRI Of Proposed Snowmobile Parking Expansion
GF.FS.R13	Caroline Timber Sale
GF.FS.NR5	East Triangle Park Timber Sale
MC.FS.R583	Buford New Castle Vegetation Management

Environmental Consequences

Alternative 1 - No Action

Direct and Indirect Effects

Under the no action alternative, historic properties would be unaffected. If the project was not implemented, there would be no potential for disturbance to cultural resources. Therefore, any archaeological properties that exist within the project area would likely remain undisturbed.

Alternative 2 - Proposed Action

Direct and Indirect Effects

The proposed action consists of 22 vegetation treatment units that will be subject to clearcuts, patch clearcut, improvement cut, commercial thinning, group selection and individual tree selection harvests. All treatment units would use ground-based machinery to harvest trees and remove trees from the stand. Conventional logging equipment includes harvesters, rubber tire and track skidders, stroke de-limbers, chip vans and logging trucks. Due to the nature of the proposed action, the ground disturbing activities associated with this alternative would have a greater effect on cultural resources than the no action alternative. Ground disturbing activities have the potential to bury, damage or destroy a cultural site.

ECS conducted a cultural resource inventory as part of this analysis and no NRHP properties were identified within the treatment areas (pending SHPO coordination). Despite best efforts to locate cultural resources with the project area, unanticipated cultural deposits are possible with any ground disturbance. If an unanticipated discovery occurs through project implementation, work would halt within that area until a Forest Archaeologist evaluates the site and proposes any necessary mitigation measures. If a Traditional Cultural Property or sacred site is found, all activity in the vicinity of the discovery would cease, and a Ute tribal representative would be notified.

Cumulative Effects

There are no known reasonably foreseeable actions expected to occur in the project area. In addition, there are no recently completed projects that adversely impacted heritage resources. Therefore no additional impacts to historic properties within the area are expected to occur.

Forest Plan Consistency

The project alternatives are consistent with the Forest-wide goals to incorporate tribal resource management values into forest management activities (Forest Plan, page 1-16). All alternatives can meet these goals by implementing avoidance and protective measures from heritage resources and traditional cultural locations.

ENGINEERING

Introduction

This report addresses transportation requirements needed to provide an efficient and safe transportation facility capable of handling commercial, recreational and administrative use. Site-specific transportation requirements for commercial timber haul are addressed. Design features and recommendations for future road reconstruction projects along the Buford New Castle Road Corridor are also included.

The U.S.D.A. Forest Service proposes to implement vegetation management treatments on approximately 660 acres in the vicinity of the Buford New Castle Road Corridor by means of commercial timber harvest through timber sale contract, long term stewardship contract or private firewood permit. Between 12,500 to 20,000 CCF (hundred cubic feet) of timber may be harvested from this operation.

The planned haul route from the Project Area would follow the Buford New Castle Road (NFSR 245) either north towards Buford or south to I-70 then east to Gypsum or west to State Highway 50 and south to Montrose. Past sales in the area have hauled south to Silt or New Castle and I-70 and beyond. Due to a restricted bridge, haul to New Castle is discouraged. Garfield County overweight permits would be required to use this route.

Other roads in the area would be utilized for log haul from individual units. These roads will be further discussed in this document.

Present and Future Transportation needs for the area

Commercial interests removing forest products from the area, grazing permittees administering their allotments and recreationists use the road system in the area. Recreational interests include hunting, camping, fishing, horseback riding, bicycle riding, hiking, wildlife observation, gathering of forest products, pleasure driving and all-terrain vehicle (ATV/UTV) users. Winter use is predominantly snowmobile, but cross-county skiing, snow shoeing, dog sledding and other winter activities also occur.

Travel Management strategies for the Proposed Buford New Castle Project are fully discussed in the White River National Forest 2011 Travel Management Plan. Winter and Summer Travel Management strategies for the analysis area can be found at the Rifle or Blanco Ranger District offices or online at http://www.fs.usda.gov/detail/whiteriver/home/?cid=stelprdb5328680

Forest Plan

The White River National Forest Land and Resource Management Plan - 2002 Revision, as Amended provides the overall direction for managing transportation on the White River National Forest, including meeting the following national strategic goal and objectives applicable to this project: (Forest Plan, page 1-14)

Goal 4 Effective Public Service

Ensure the acquisition and use of an appropriate corporate infrastructure to enable the efficient delivery of a variety of uses.

Objective 4a: Improve the safety and economy of Forest Service roads, trails, facilities, and operations and provide greater security for the public and employees.

Strategy 4a.1: Within five years of plan approval, conduct appropriate maintenance on 25 percent of the Forest Development Transportation System each year.

The Forest Plan also provides the overall direction for managing transportation on the White River National Forest, including meeting the following Travel System Infrastructure Forest Wide Standards and Guidelines applicable to this project: (Forest Plan, pages 2-39, 2-40)

Standards

- Close and rehabilitate temporary roads when no longer needed for project purposes.
- Permit motor vehicle travel up to 300 feet from designated travelways for direct access to campsites, parking, firewood cutting, or gathering forest products provided that:

- Minimal resource damage occurs;
- Such access is not otherwise prohibited.

Guidelines

- Emphasize maintenance and reconstruction of the existing road and trail system to standard.
- Emphasize public safety in the development and use of the travel system.
- Design roads to minimize visual and environmental impacts where possible.
- Public access restrictions may be imposed for health, safety, or other considerations.
- Maintenance level 3, 4, and 5 roads will continue to be managed for public access with passenger cars.

The Forest Plan includes management area prescriptions with specific standards and guidelines for particular areas. If a specific resource is not addressed in a management area prescription, this indicates that the forest-wide standards and guidelines provide adequate direction. In addition, federal and state laws and regulations and the Forest Service Directives System always apply, although they are not specifically identified in management area direction.

Segments of eight White River National Forest management areas are located within the Buford New Castle Project. Five of the management area segments contain units and or access/haul roads. Three of the management area segments do not have units or access routes to units. The management direction and standards and guidelines, for transportation within each management area are described below. (Forest Plan – Chapter 3)

Travel Management Strategies by Management Area

MA 4.3 Dispersed Recreation (page 3-44)

Roads are generally open to motorized activities. The travel system may include motorized and non-motorized trails.

MA 5.12 General Forest and Rangelands –Range Vegetation Emphasis (page 3-51)

Roads vary from primitive to paved surfaces. Some roads may be closed seasonally to protect road surfaces, and to reduce maintenance needs and disturbance to wildlife.

MA 5.13 Resource Production – Forest Products (page 3-54)

Numerous open roads provide commercial access and roaded recreational opportunities, while closed roads provide non-motorized opportunities. An extensive road and trail system exists, ranging from 4-wheel drive roads to maintained gravel roads. Some roads are closed seasonally, while others are closed after timber removal is complete.

1. Roads should not be constructed to higher standards than those required to meet the needs of timber production.

2. Protect trails and associated improvements.

MA 5.4 Forested Flora and Fauna Habitats (page 3-56)

Visitors can find dispersed recreation opportunities including both motorized and non-motorized, although they may also find that access is restricted, at times, through the use of seasonal or year-long closures. Human use is often high during fall hunting seasons. The area has a road and trail system.

Some roads are closed seasonally; others are closed after timber harvest is complete. Temporary roads are preferable to permanent roads for the removal of forest products.

1. New roads and trails needed to implement management in the area should be low-standard, single-purpose roads.

2. Roadways open to motorized travel will not exceed an average travelway density of two miles per square mile. (NOTE: Roadway densities will not be impacted by this project)

MA 5.43 Elk Habitat (page 3-61) Polygon #16 (Page 3-63)
Roads used for timber harvesting provide limited access for hikers, mountain bikers, horseback riders, and other non-motorized travelers and hunters. Trails may also be present, providing access to these areas.

Non-motorized recreational activities are provided, including hiking, mountain biking, horseback riding, hunting, and cross-country skiing. Motorized opportunities are limited. Travel closures may exist based on elk habitat objectives.

1. Travelways open to motorized travel will not exceed an average travelway density of one-half mile per square mile during seasonal periods when the area is designated for calving, migration, winter, or summer habitat (see Wildlife Guideline 2, below).

(NOTE: Roadway densities will not be impacted by this project)

The Buford-New Castle Project Analysis Area does not fall within a designated roadless area, but portions of project area boundary are contiguous to roadless area boundaries.

EXISITING TRANSPORTATION SYSTEM

This project is an opportunity to address the following:

- Clear vegetation, brush and trees to provide better sight distance at road intersections and on curves along NFSR 245
- Daylight the Buford New Castle road corridor to provide facilitate drying of road, create scenic viewpoints and to provide acceptable clearing widths for maintenance activities such as roadside ditch cleaning and reconstruction, culvert catch basin and outlet ditch cleaning and reconstruction, berm removal, roadside leadout ditch maintenance and construction.
- Meet Forest Service Handbook 7709.56.40 and *AASHTO Guidelines for Geometric Design of Very Low Volume Local roads <400ADT* design standards for an existing road
    - Further study NFSR 245 to determine if road widening, curve widening or slope tapering is required per the handbook and design guide. Initial survey indicate there are several areas that may need treatment to increase user comfort, but may not be necessary to increase safety, since there is little evidence of site-specific safety problems related to horizontal alignment.
        - Review the existing sign plan and install safety signing as appropriate along the Buford New Castle corridor
        - Maintain to standard other roads within the project area

Potential impacts to the project transportation system have been identified through public scoping or other means. The potential impacts to be addressed are as follows:

- Road closures would affect commuters and recreationists.
- Potential for vehicular accidents between logging traffic, recreationists and commuters.
- Repeated hauling by log trucks can result in road damage.

Roads

NFSR 245 - Buford/New Castle Road

The Buford New Castle Road is a Maintenance Level 3 and 4, double land, Service Life G, Arterial providing access to the area from Buford to the north and New Castle, Silt or Rifle to the south. It is the primary access into the southern portion of the Blanco Ranger District and the northern portion of the Rifle Ranger District. Traffic is generally mixed and free flowing, providing a safe service to all traffic. During heavy traffic there is periodic dust.

The White River National Forest Travel Management Plan (2011) currently lists the entire length of the Buford New Castle Road as a facility open to licensed motorized vehicle use only. The restriction was based on an engineering judgment of mixed use conducted and finalized in 2006. The route has been signed with "Highway Legal Vehicles Only".

Garfield County has jurisdiction between MP 4.3 (southern Forest Boundary) and MP 10.6. The Forest Service has jurisdiction between MP 10.6 and MP 34.4 (northern Forest Boundary). The original (1940's) template (14' travelway with turnouts) has been widened to an average width of 16 to 20 feet or more, probably as a result of road maintenance activities.

Summer maintenance is provided by Garfield County and Rio Blanco County via Cooperative Road (Schedule A) Agreements, by the Forest Service through force account or contract and through maintenance provided by Timber Sale Purchasers if sales are in progress. Winter maintenance on open portions is provided by Garfield County.

In its current state, this road can adequately handle loaded log trucks or other commercial traffic only when conditions are dry and solid or frozen. When the road subgrade has high moisture content, unacceptable deformation of the road template can occur. Several locations may experience subgrade failure and become impassable to passenger vehicles. Such failure is most likely to occur in early summer and late fall.

The standard of the road has not kept up with the increasing volume of traffic. An apparent high value is put on semi-primitive motorized access to the area. As the regional population and affluence increases, demand is growing for the opportunity to take sightseeing trips in passenger vehicles, have four-wheel drive adventures or use ATVs and motorcycles. The variety of users on the road may include a mix of motorcycles, sedans, motor homes, livestock vans, log trucks, other commercial vehicles and pickups or trucks pulling a variety of trailer types. User expectations are evidenced by a demand to pull horse, ATV/snowmobile, camp and other trailers in and out during poor weather conditions. Portions of the road are used during all seasons and can experience rutting during spring and early winter. Travel on open portions during the winter generally provides for one-way four-wheel drive travel.

Summer use is considered moderate. Average daily traffic (ADT) documented in 2012 traffic counts indicate approximately 162 vehicles per day travel along the Buford New Castle corridor. Weekday ADT is approximately 147 vehicles per day and weekend ADT is approximately 199 vehicles per day. Peak use occurs in October.

During the winter months NFSR 245 is a marked and groomed snowmobile trail and motorized use is limited to snowmobile traffic from the Buford snowmobile parking lot (located off forest to the north) to the Rifle Snowmobile parking area (MP 12.3).

A crushed aggregate stockpile is currently located at the Hiner Springs Gravel Pit. A Co-Operative Agreement between Garfield and Rio Blanco Counties and the Forest Service provided for crushing the material. Both counties have utilized this pit and surfacing has been replaced on sections of NFSR 245. As budgets allow surface replacement would continue.

<u>NFSR 245.4A – Road Camp</u>
NFSR 245.4A (0.45 miles) is listed in the Forest Transportation Inventory as Maintenance Level 2, Local, Service Level J facility. Service Level J facilities indicate that traffic flow is slow and may be blocked by management activities. Two-way traffic may be difficult. Travel with low clearance vehicles is difficult.

The Forest Service Road Crew provides maintenance approximately every 7 to 10 years. The road accesses a permitted spring development, and the main purpose of the road is to provide administrative access to the spring development. The road is currently deeply rutted with steep grades, poor soils and is located in the bottom of a drainage. The road dead ends at the spring development.

<u>NFSR 245.4C – (No Name)</u>
NFSR 245.4C (0.2 miles) is listed in the Forest Transportation Inventory as Maintenance Level 2, Local, Service Level J facility

The road accesses inholdings and 2 cabins. The main purpose of the road is to provide administrative access to inholdings. Maintenance is provided by the cabin owners. The road has some aggregate surfacing, with rocks showing. A partially buried PVC pipe (probably used as a water line) is located along the edge of the road.

<u>NFSR 243 – Big Ridge</u>
NFSR 243 (1.6 miles) is listed in the Forest Transportation Inventory as Maintenance Level 2, Local, Service Level J facility. The Forest Service Road Crew provides maintenance approximately every 7 to 10 years. The road has been used for log haul in the past. The road is currently deeply rutted with steep grades, poor soils and large rocks in the travelway. The first 500 feet is heavily rutted and braided. Some clearing may be required prior to haul.

<u>NFSR 462 – (No Name)</u>
NFSR 462 (0.2 miles) is listed in the Forest Transportation Inventory as Maintenance Level 2, Local, Service Level J facility. The road accesses dispersed camping sites, an old material source and the snowmobile club's groomer shed. The Forest Service Road Crew provides maintenance approximately every 7 to 10 years. The road has some aggregate surfacing.

There are INFRA and GIS database and mapping errors that should be corrected.

NFSR 820 – Ogden Place
NFSR 820 (2.2 miles) is listed in the Forest Transportation Inventory as Maintenance Level 2, Local, Service Level J facility. The Forest Service Road Crew provides maintenance approximately every 7 to 10 years. The road accesses dispersed camping areas, a trail and an inholding. The road is narrow with steep grades, steep side slopes, few turnouts and poor subgrade. There is minimal area for a pickup truck to turn around at the closure gate where the road enters private lands.

NFSR 860 – Lake Park
NFSR 860 (2.3 miles) is listed in the Forest Transportation Inventory as Maintenance Level 2, Local, Service Level J facility. The Forest Service Road Crew provides maintenance approximately every 7 to 10 years. The road accesses dispersed camping areas, the BNC Motorized Trail (NFST 2290) and a sheep corral.

Trails

BNC Motorized Trail (NFST 2290)
Approximately 7.7 miles of the BNC Motorized Trail (NFST 2290) will be affected by this project. Refer to the Recreation specialist report for more details on NFST 2290.

The Ute Trail
Since prehistoric times, Native Americans traveled across the Flat Tops as part of their seasonal rounds in pursuit of summer hunting grounds. Over the course of thousands of years, these routes have become well-known trails. Later travelers also followed these trails, ultimately turning them into major transportation networks. Gradually, knowledge of the exact location of the Ute Trail became lost as the Utes quit using it. In the late 1980s, an active interest in relocating the trail was begun. The effort to relocate the Ute Trail is ongoing, and several sections of the trail exist in the proposed Buford New Castle Timber Sale Project Analysis Area.

Snowmobile Routes
During the winter months NFSR 245 is a groomed and marked snowmobile route. The Project Area is heavily used by snowmobiles during the winter season. Winter haul would impact snowmobile use. It has been determined that winter haul will not be allowed for this project. Refer to the Recreation specialist report for more details on winter use.

ROAD AND TRAFFIC MANAGEMENT

Description of Alternative Access Routes

There are no reasonable transportation alternatives to the existing transportation system. All needed routes have access to NFSR 245. No other transportation alternatives are available other than not harvesting timber. That decision is dependent upon other resource management objectives.

Project Assumptions

The permanent road system would not change by EA alternative. The route analysis is based on preliminary study of work required. Further surveys and design may reveal more work or different types

of work would be required. These costs may vary at time of implementation. Mitigation revealed through NEPA may also create additional required work.

Cost Assumptions

This project would likely be accomplished using the White River National Forest Long Term Stewardship Contract. A provision of the Long Term Stewardship contract provides that pre-haul maintenance would be performed by the Forest Service or the Forest Service would pay the contractor to perform pre-haul road maintenance. During and post-haul maintenance would be provided by the contractor.

It is assumed that the Forest Service road crew would perform pre-haul road maintenance. Pre-haul maintenance costs for this project are based on Forest Service estimated costs for timber sale road maintenance. Costs are generated from a Forest Service cost guide and 2015 equipment rental and labor rates. The estimated costs are used for contract appraisals for all timber sales on the White River National Forest.

The contractor would be responsible for maintaining all roads during and post-haul with no compensation by the Forest Service. The timing of work accomplishment shall be based on Contractor's Operating Schedule. During and post-haul maintenance costs are based on Cost Allowance Rates for pre-haul maintenance in the White River Long Term Stewardship Contract AG-82X9-C-13-9002 (Modification 6).

Project Roads

Road Reconstruction/Road Maintenance/Travel Management

This report addresses the site-specific transportation requirements needed to provide efficient and safe commercial timber haul from the proposed analysis area and travel management recommendations. Recommendations generated from this report may be incorporated into the Buford New Castle Project Area Environmental Assessment.

Road maintenance requirements described for this proposed project would provide for adequate haul on dry or frozen roads during the normal operating season. The soil and subgrade conditions, which exist in the Project Area and along portions of the haul route, may not withstand heavy use during intermittent wet weather or extended periods of dry weather. To avoid permanent damage of the roadway and surrounding resources, haul would be restricted if signs of damage begin to occur.

Design features for timing of road maintenance for the project has been developed and is as follows:

- Hauling, road maintenance, road closures and road reconstruction will be prohibited on federal holidays along NFSR 245 from noon the day before the holiday to midnight the day of the holiday.
- To minimize conflicts with recreational traffic on NFSR 245 road maintenance, road reconstruction, road closures and log hauling activities shall be prohibited 2 days prior through the opening day of each big game season - including archery and muzzle loader seasons.

Pre-haul maintenance would be performed by the Forest Service or contractor via task order. Pre-haul maintenance could consist of clearing, drainage structure maintenance, blading of the travelway, dozer

maintenance of the travelway and spot surfacing. Pre-haul maintenance would be conducted to allow for conventional log truck haul. Some routes would not be suitable for chip van access. The contractor would be responsible for any work required to access routes with chip vans or to place chipping equipment in locations where vans can be staged. Removal of dips and waterbars and widening of curves or additional clearing could be required to access some areas with chip vans and other equipment.

The contractor would perform during and post-haul road maintenance on all roads utilized during this project. Frequency of maintenance would depend upon weather conditions, number of loads hauled and conditions under which haul is performed. During haul road maintenance would consist of blading annually per each 200 loads of material hauled, culvert and ditch cleaning, cleaning of leadout ditches and a seasonal closeout to reestablish drainage for the winter if needed. Any drainage structures or other road features removed to allow access with chip vans will need to be reconstructed at the contractors cost as a part of post-haul maintenance.

Due to the popularity of this area for snowmobiling, restrictions on winter operations have been incorporated into the project proposal. Project design does allow harvesting or haul beyond the winter travel management date of November 23rd to December 20th. The contractor would be responsible for any snow plowing required for log haul.

Long term stewardship contract provisions do not provide for collecting surface rock replacement deposits. Therefore, they would not be collected for this project. If this were a conventional timber sale the surface rock replacement deposit for this project would be approximately $69,000. These funds would be used to purchase more aggregate to be placed on NFSR 245.

<u>NFSR 245 – Buford-New Castle Road</u>
The estimated cost for reconstruction of NFSR 245 (including daylighting and site distance clearing, curve widening, subgrade treatment, aggregate placement, culvert installation/replacement, ditch construction or reconstruction and widening the travelway in some locations) could be in excess of $50,000 mile. A maintenance estimate (2016 INFRA) for NFSR 245 estimated annual maintenance to be approximately $44,000 and deferred maintenance to be approximately $73,000. Maintenance and reconstruction activities should be shared through co-op agreements with counties, timber purchasers and the Forest Service depending upon budgets. It is unreasonable to expect work to be completed in the near future.

Based on recommendations included in the 2001 Buford-New Castle Road Corridor Analysis Area Transportation Report a sign plan has been developed, but due to budget constraints signs have not been purchased and installed. Culverts were installed and culvert markers were placed, but over time many have been damaged or are missing. Some of the recommended sight distance clearing and hazard tree removal has been completed on the northern sections of road.

Roadside clearing for sight distance, daylighting and hazard tree removal would occur if the proposed project is implemented. As budgets allow other roadwork, including safety signing, replacing culvert markers, additional brushing for sight distance, curve widening/slope tapering, roadside and leadout ditch reconstruction and widening of the travelway may occur. Any work performed on NFSR 245 could extend the operating season for any commercial use, improve the travelway for user comfort, and decrease routine maintenance costs.

Further investigation is recommended to determine if improvement for areas with inadequate sight distance due to steep slopes, inadequate curve widening or lane width is warranted. Studies show that where documentable site-specific safety problems do not exist, it is unlikely that any roadway or roadside improvements would provide substantial safety benefits. Site-specific safety problems may include: a pattern of curve-related crashes; physical evidence of curve problems, such as substantial edge rutting or encroachments, etc.

NFSR 245 may require routine spot road maintenance pre, during and post-haul. Maintenance (when needed) would include spot blading of the travelway, culvert and ditch cleaning and cleaning of cattleguards (if needed). The forest service and Garfield County would most likely perform pre-haul maintenance. Coordination with Garfield County is recommended so that during and post-haul maintenance cycles are conducted in a timely manner and the timber contractor performs their commensurate share.

It is anticipated that Garfield County would continue to place magnesium chloride near residences between MP 4.3 (southern forest boundary) and the trailhead. Application of dust abatement during haul may be required of the timber purchaser, depending on timing of haul and weather conditions.

It is estimated that between 1,250 and 2,000 loads of material could be hauled along this route.

Table 3.21 – Estimated maintenance costs for pre, during and post-haul maintenance for all project roads.

Road Number and Description	Pre Haul Maintenance (Responsibility of FS)	During Haul Maintenance	Post Haul Maintenance	Estimated Log Truck/Chip Van Loads (To be hauled on route)
243 - Big Ridge	$15,075	$950	$2,614	199
245 - BNC - Segment 1 (Unit 406 South to NFSR 243)	$7,840	$467	$0	22
245 - BNC - Segment 2 (NFSR 243 South to NFSR 211 - Triangle Park)	$21,365	$2,735	$15,625	309
245 - BNC - Segment 3 (NFSR 211 - Triangle Park to Lettuce Patch)	$8,550	$5,830	$7,480	858
245 - BNC - Segment 4 (Lettuce Patch to Southern Forest Boundary)	$51,140	$127,701	$8,216	1626
245.4A	$11,305	$380	$1,642	111
245.4C	$760	$0	$116	106
462/825	$215	$0	$232	19
820	$7,580	$0	$232	108
860	$6,820	$1,212	$462	304
Totals	$130,650	$139,275	$36,619	16260
With 15% Mobilization	$150,248	$160,167	$42,112	
Cost Per CCF (based on 16,260 CCF)	**$9.24**	**$9.85**	**$2.59**	

During periods of haul, the Buford New Castle Road should be signed with "Heavy Truck Traffic" or "Logging Truck" signs each forest boundary. All roads and trails intersecting the Buford New Castle Road or other haul roads should also be signed with signs warning the public duri ng periods of log hauling. All roads and trails accessing units would be remain open to the public and should be signed with "Entering Logging Area, Proceed With Caution".

Flaggers, closure gates or special orders are required when harvesting operation s occur within two tree lengths from an open Forest System or County Road. During the week (M-F), roads may be closed for up to 4 hours in active units. Special orders would be prepared by the timber, recreation or engineering staff and signed by the Forest Supervisor. News releases regarding the closures would be issued and signs (meeting USFS standards) will be posted on the ground at major access points.

NFSR 245.4A – Road Camp

NFSR 245.4A is suitable for high clearance vehicles only. Prior to log haul dozer maintenance and construction of drainage structures to reduce erosion and to reinforce poor subgrade locations would be required. Drainage structures would include reinforced rolling dips. NFSR 245.4A would be suitable for haul only when the travelway surface is dry or frozen to prevent excessive rutting and surface erosion, both on the road and at the turnaround.

There is minimal area for truck turnaround and log decking at the dead end on this road. It is unlikely that there is room to set up a portable chipper, decking area and turn chip vans around at this location. Disturbance beyond existing conditions would not be advisable due to poor soils, distances from spring development and the drainage.

The turnaround area may also require reinforcement to prevent rutting and sediment release. A 4 to 6 inch layer of chips could provide adequate reinforcement and provide support in this area. Post haul maintenance would include scarification to a depth of 12 – 18 inches and seeding if chips are placed at the staging area.

After use it is recommended that the existing closure gate be locked and the road used for administrative access to the spring only. It is estimated that between 85 and 136 loads of material could be removed from Unit 105 and hauled along this route. The BNC Motorized Trail intersects with this haul road and should be marked with log truck traffic signs.

NFSR 245.4C – (No Name)

It is estimated that between 80 and 130 loads of material could be removed from Unit 107 and hauled along this route.

It is anticipated that minimal maintenance will be required along this route. Some materials from the unit may be skidded to a different location. Sight distance clearing at the intersection with NFSR 245 must be performed prior to haul.

NFSR 243 – Big Ridge

NFSR 243 is suitable for high clearance vehicles only. Prior to log haul dozer maintenance and construction of drainage structures to reduce erosion and reinforce poor subgrade locations would be required. Drainage structures would include reinforced rolling dips. The braided section requires turn piking and surfacing with pit run to prevent further resource damage and provide adequate intersection with the Buford New Castle Road. Some clearing will be required prior to log haul to allow for loaded log trucks to efficiently drive along the road. NFSR 243 will be suitable for haul only when the travelway surface is dry or frozen to prevent excessive rutting and surface erosion.

It is estimated that between 150 and 245 loads of material could be removed from Unit 109 and hauled along this route.

NFSR 462 – (No Name)
It is anticipated that minimal maintenance will be required along this route. It is estimated that between 15 and 25 loads of material could be removed from Unit 301 and hauled along this route.

INFRA and GIS database and mapping errors should be corrected. NFSR 462 and NFSR 825 should be the same route and renumbered NFSR 825 - Snowshed.

NFSR 820 – Ogden Place
The first 0.5 miles of NFSR 820 will be utilized for log haul. Logs may need to be skidded for short distances along the road to a suitable landing zone and truck turnaround. NFSR 820 is suitable for high clearance vehicles only. Prior to log haul dozer maintenance and construction of drainage structures to reduce erosion and to reinforce poor subgrade locations would be required. Drainage structures would include reinforced rolling dips. NFSR 820 will be suitable for haul only when the travelway surface is dry or frozen to prevent excessive rutting and surface erosion.

It is estimated that between 80 and 135 loads of material could be removed from Units 501/102 and hauled along this route. Sight distance clearing at the intersection with NFSR 245 must be performed prior to haul.

NFSR 860 – Lake Park
The first 0.4 miles of NFSR 860 will be utilized for log haul. This road segment is adequate for log haul in its current condition. Spot maintenance including construction of drainage structures to reduce erosion and to application of pit run to reinforce poor subgrade locations would be required prior to use. Drainage structures would include reinforced rolling dips. NFSR 860 will be suitable for haul only when the travelway surface is dry or frozen to prevent excessive rutting and surface erosion.

It is estimated that between 235 and 375 loads of material could be removed from Units 108/201 and hauled along this route. Sight distance clearing at the intersection with NFSR 245 must be performed prior to haul.

Figure 3.10 - Sight distance at intersection of NFSR 860 and NFSR 245.
October 15, 2015 – Donna Graham Photo

New Road Construction/Temporary Roads

No new permanent road construction is planned for this project. The Forest Service would approve skid trails and temporary roads. An average skid distance of 1000 feet for favorable and 500 feet for adverse skid should be used. Where possible (meeting harvest needs - skidding distances and landing locations) portions of existing skid trail or old temporary roads would be used as temporary haul roads. Public access to temporary roads should be restricted (signed as closed to public traffic) during all logging operations.

Approximately 0.8 miles of temporary road may be necessary to access cutting units. Approximately 0.4 miles of an existing ATV trail (NFST 2290) would be utilized as a temporary road. Approximately 0.4 miles of new temporary road construction may be constructed and decommissioned after use.

Figure 3.11 - NFST 2290 to be utilized as a temporary road.
Donna Graham – photo

Decommissioning would be accomplished by returning the temporary road to as near a natural appearance as possible by resloping drainage crossings, constructing waterbars, pulling in or rounding the backslope where practical, scarification of the travelway (12– 18 inches), slashing the travelway where practical and revegetation (native seeding). Earthen or rock barriers (preferred) may be placed to block off the beginning of the road. Temporary road locations may require clearance for cultural resources prior to construction. The ATV trail should be scarified, drainge structures (dips) installed and seeded after use.

Depending upon terrain and type of clearing temporary road costs can range from $1,000 to $15,000 per mile. Costs include mobilization, construction and decommissioning. Costs for this project are derived from Cost Allowance Rates for Construction of Temporary Roads in the White River Long Term Stewardship Contract AG-82X9-C-13-9002 (Modification 6)

Material Sources and Waste Areas

One existing material sources may be utilized for this project. The Hiner Springs Pit is located in the NE¼ of Section 35, Township 3 South, Range 91 West. The Hiner Springs Pit will continue to be utilized as a material source, and rehabilitation of the pit would not occur at this time.

Table 3.22 – TOTAL ESTIMATED ROAD MAINTENANCE COSTS

Work Item for Buford New Castle Timber Sale Project	Approximate Miles	Estimated Costs	Average Estimated Cost Per Mile	Estimated Cost per CCF
Road Maintenance - Pre-Haul Maintenance for all roads	33.1	$150,250	$4,539	$9.24
Road Maintenance - During-Haul Maintenance for all roads	31.8	$160,170	$5,037	$9.85
Road Maintenance - Post-Haul Maintenance for all roads	28.4	$42,115	$1,483	$2.59
Temporary Road Construction and Decomissioning	0.8	$4,805	$6,006	$0.30
Surface Rock Replacement Deposit		N/A		$0.00
Engineering Services Deposit		N/A		$0.00
TOTAL ESTIMATED COSTS		**$357,340**		**$21.98**

Costs and values reflected in this analysis are estimates only and the final cost estimate may vary once the project is implemented

SUMMARY

Coordinate sale activities and road management needs between Forest Service and other users to reduce user conflicts and safety problems encountered during road maintenance activities, logging operations and log haul. Maintenance and reconstruction activities on NFSR 245 should be shared through co-op agreements with counties, timber purchasers and the Forest Service depending upon budgets.

Roadside clearing for sight distance, daylighting and hazard tree removal will occur if the proposed project is implemented. As budgets allow other roadwork, including safety signing, replacing culvert markers, additional brushing for sight distance, curve widening/slope tapering, roadside and leadout ditch reconstruction and widening of the travelway may occur. Any work performed on NFSR 245 could extend the operating season for any commercial use, improve the travelway for user comfort, and

decrease routine maintenance costs. It is unreasonable to expect work to be completed in the near future.

Road maintenance on NFSR 243, 245.4A, 245.4C, 462, 820 and 860 would be designed to provide long term drainage and sediment control; yet allow most of the travelway to return to a high clearance vehicle or Maintenance Level 2 facility after commercial haul is completed.

The soil and subgrade conditions that exist in the project area may not withstand heavy use during intermittent wet weather or extended periods of dry weather. To avoid permanent damage of the roadway and surrounding resources haul would be restricted if signs of damage begin to occur.

Design features have been developed for this project for user safety and to prevent user conflicts has been developed and is as follows:

- Hauling, road maintenance, road closures and road reconstruction will be prohibited on federal holidays along NFSR 245 from noon the day before the holiday to midnight the day of the holiday.
- To minimize conflicts with recreational traffic on NFSR 245 road maintenance, road reconstruction, road closures and log hauling activities shall be prohibited 2 days prior through the opening day of each big game season - including archery and muzzle loader seasons.
- Flaggers, closure gates or special orders are required when harvesting operations occur within two tree lengths from an open Forest System or County Road. During the week (M-F), roads may be closed for up to 4 hours in active units. Special orders will be prepared by the timber, recreation or engineering staff and signed by the Forest Supervisor. News releases regarding the closures will be issued and signs (meeting USFS standards) will be posted on the ground at major access points.

Temporary or decommissioned roads to be rehabilitated shall use the following techniques including:

- Placing stumps, rocks, slash and logs on the ripped (12” to 18” depth) road density and depth to mimic the surrounding forest floor areas.
- Push, pull or deposit excavated soils and rock to fill in road cut.
- Every 10 to 200 feet along the roadway beginning at junctions, fell or place live and/or dead trees across the roadway and suspend off cutbanks where feasible.
- Install waterbars, outsloping and cross drains as needed to stabilize the rehabilitated surface.
- Seed compacted sites following ripping, using the seed mix described in the Botany Design Features.

Temporary road locations may require clearance for cultural resources prior to construction. Temporary roads would be signed as closed to public use for safety reasons. Under Timber Sale Contract provisions or Long Term Stewardship clauses, proposed locations for temporary roads may be changed with Forest Service approval.

After haul it is recommended that the existing gate on NFSR 245.4A – Road Camp be locked and the road used as administrative access to the spring development.

INFRA and GIS database and mapping errors should be corrected for NFSR 462 and NFSR 825. They should be the same route and renumbered NFSR 825 - Snowshed.

Further investigation is recommended to determine if improvement for areas with inadequate sight distance due to steep slopes, inadequate curve widening or lane width is warranted.

ECONOMICS

Resource Description

The financial analysis compares the costs and benefits that can be quantified in terms of actual Forest Service expenditures and revenues received within the project area at one point in time. Revenues and costs fluctuate with markets and local economies. This type of analysis does not account for non-market benefits, opportunity costs, individual values, or other values that are not easily quantifiable. The No Action Alternative is used as a baseline to show the marginal increase or decrease in costs or benefits from the existing level, as a result of the proposed project/s. Estimated benefits and costs are analyzed and presented in 2016 present net value dollars. The financial analysis is not the complete answer but rather one tool decision makers use to gain information about resources, alternatives, and trade-offs between costs and benefits.

The financial analysis was completed in conformance with FSM 2430, FSH 2409.18 and FSM 1970. The analysis was completed using Quick-Silver Version 7.0 which is an economic and financial analysis program approved for resource and capital investments in Forest Service Region 2. The latest cost and benefit values were used. Once all the project alternatives and their costs, revenues and benefits are defined, Quick-Silver takes over to calculate a variety of financial and economic measures, including:

Present Net Value (PNV)
Present Value Benefits
Present Value Costs
Benefit/Cost Ratio (B/C)

The analysis includes financial benefits/costs for the project as a whole.

Financial Revenue

Financial revenues are estimates of Forest Service revenues that are expected to occur as a result of the project. For this project, the financial revenue was assumed to consist of stumpage revenue generated over a period of three years for forest products associated with the project. Timber volumes assumptions are taken from the estimates included with the silvicultural systems discussed in the proposed action of the Environmental Assessment. Forest product values were determined by applying the Advertised Rates from project TEA appraisal using Region 2 Appraisal Bulletin BU230416 of May 2016.

Financial Costs

Financial costs are estimates of Forest Service appropriation expenditures directly resulting from the project.

Timing assumptions for each cost item is located and documented in Quicksilver 7 reports for each alternative. Cost values for Sale Preparation and Sale Administration were derived from representative costs from the Piney 2012 financial analysis report. Analysis and documentation costs are included in the Sale Preparation cost estimate. For the purposes of this analysis, it is assumed that Deposits for Reconstruction Engineering Services (DRES) will not be collected. Regeneration surveys costs were derived from survey monitoring costs used in past timber sales.

Indicators

Indicators for the financial analysis provide information relevant to the financial position of the project if the project is implemented. The analysis compares estimated Forest Service direct expenditures with estimated financial revenues associated with this project. Two important items measured by this analysis are benefit/cost ratio and financial present net value. The benefit/cost ratio can be used to determine the most financially efficient project alternative. The financial present net value can identify the degree to which an alternative may contribute to an above-cost or below-cost project based on the present value of revenues and financial costs.

Table 3.23 – Economic Indicators and Measures for Assessing Effects

Resource Element	Resource Indicator	Measure	Used to address: P/N, or key issue?	Source (LRMP S/G; law or policy, BMPs, etc.)?
Project Cost	Present Net Value	Financial Benefits (Dollars)	No	Forest Service Manual (FSM 2430), WO Amendment 2400-2008-1, 2432.12 and 2432.22c
Project Cost	Benefit/Cost Ratio	Ratio of Financial Benefits to Cost	No	Forest Service Manual (FSM 2430), WO Amendment 2400-2008-1, 2432.12 and 2432.22c

Scoping did not identify the economic cost of project implementation as an issue, but timber industry did provide comments that the Forest Service should reduce implementation costs as much as possible, especially road construction, reconstruction and slash disposal in order for the sale not to appraise deficit.

Forest Plan Direction

The 2002 White River National Forest Land and Resource Management Plan (2002 LRMP) does not provide standards and guidelines for financial analysis for project level activities.

Desired Condition

In accordance with Forest Service Handbook 2409.18, WO Amendment 2409.18-2002-1, 13.1, the financial analysis would:

- Promote consistent development and systematic use of financial and economic information in timber sale project decision making.

- Integrate analysis of timber economic factors with other resource considerations to provide decision makers with an understanding of the financial implications and trade-offs.
- Ensure that financial measures are considered as decision criteria when evaluating timber sale proposals, and when selecting a project alternative in accordance with the objectives and standards and guidelines of the forest plan.
- Improve cost efficiency by evaluating and identifying opportunities to reduce costs and enhance benefits, including revenues.

Temporal Scope

The temporal context of the financial analysis is project implementation through one growing rotation (2017-2096) of trees. The majority of the financial expenses (sale prep, sale administration) will be incurred within 5 years of implementation (2017-2022).

The temporal boundaries for analyzing the direct and indirect effects are the time period during project implementation (2017-2022). The project would be expected to be completed in this time period.

The temporal boundaries for analyzing the cumulative effects are the time period during project implementation (2017-2022). The project would be expected to be completed in this time period.

Geographical Scope

The spatial boundary for analyzing the financial analysis and the direct effects is the project area. The spatial boundary for analyzing the indirect effects to financial analysis include the western slope of Colorado due to the available forest product markets and contractors that would use supplies and services in the area.

Affected Environment

This project is a vegetation management project with forest product removal. The project can be accomplished using timber sales or stewardship contract (Integrated Resource Service Contract, Integrated Resource Timber Contract). Implementation of the project would be funded by the Forest Service. The financial analysis focuses on the revenues and the costs related to the removal of forest products for vegetation management purposes.

Forest product markets are indicative of existing infrastructure, supply and demand for manufactured wood products and their by-products. Currently, demand for forest products associated with this project include dimensional lumber and biomass for bioenergy production. The working circle for product utilization for this project is expected to be Montrose Forest Products, LLC (Montrose, Colorado) and Colorado Timber Resources LLC (Parshall, Colorado). Other potential forest product outlets are Confluence Energy (Kremmling, Colorado), K&K Lumber (Silt, Colorado) and Eagle Valley Clean Energy LLC (Gypsum, Colorado).

Although there are markets for the forest products associated with this project, the forest products have low revenue values.

Economic Effects

No Action

The financial analysis summarized in Table 4 indicates that No Action Alternative would result in a net present value of $0 for the project as a whole, the Forest Service. A benefit/cost ratio is not applicable since no revenues or expenses have been incurred by the project. No additional investment road systems or vegetative planning would be undertaken within the next 10 years.

Table 3.24 – Economic Indicators and Measures for the No Action

Resource Element	Resource Indicator	Measure	No Action
Project Cost	Present Net Value	Financial Benefits (Dollars)	$0
Project Cost	Benefit/Cost Ratio	Ratio of Financial Benefits to Cost	N/A

Proposed Action – Direct and Indirect Effects

Present Net Value

The proposed action has a negative net present value of ($41,895). The Forest Service expects to receive minimum forest product values from the project. The revenues do not compensate for the expenses necessary to manage the forest stands into rotation. Competitive timber sale bidding may increase revenues from the project. Any increased forest product revenues from the project would result in reduced costs of implementation.

Indirect Effects

Local businesses near Rifle, Silt and New Castle would be expected gain business during the implementation of the project. Contractors for logging operations would rely on the local businesses for food, housing/lodging, fuel, supplies and miscellaneous services over the life of the project. This would bring economic activity to the locality. Forest products removed from the project area would be utilized on the western slope primarily as sawtimber and biomass products. These products would contribute to local economies as sawtimber would be remanufactured into dimensional lumber and biomass products would be utilized as feedstock for energy production.

Benefit/Cost Ratio

The benefit/cost ratio equals the sum of the discounted benefits divided by the sum of the discounted costs. This ratio measures the efficiency of specified inputs (i.e., costs) to produce specified outputs (i.e., benefits). A benefit/cost ratio of less than 1.0 are indicative that expenses are greater than monetary returns and consistent with the project's negative present net value. The Proposed Action shows an overall benefit/cost ratio of 0.51.

Indirect Effects

Although the benefit/cost ratios are less than 1.0, local businesses in Rifle, Silt and New Castle would be expected to gain business during the implementation of the project. Contractors for logging operations would rely on the local businesses for food, housing/lodging, fuel, supplies and miscellaneous services over the life of the project. This would bring economic activity to the locality.

Table 3.25 – Economic Indicators and Measures for the Proposed Action Direct/Indirect Effects

Resource Element	Resource Indicator	Measure	Proposed Action Direct/Indirect Effects
Project Cost	Present Net Value	Financial Benefits (Dollars)	($41,895)
Project Cost	Benefit/Cost Ratio	Ratio of Financial Benefits to Cost	0.51

Cumulative Effects

Past, Present, and Reasonably Foreseeable Activities Relevant to Cumulative Effects Analysis

Past timber sale activity adjacent to or within the project area since 2005 include – Seaman Park Salvage, Fourmile, Middle Mountain and Wells Ridge. Future timber sale activity adjacent to the project area include Meadow Creek and Sheep Salvage. Other vegetation management projects across the western slope of Colorado exist that supply timber industry with forest products. Timber industry is not dependent upon this project alone to meet their production and capacity needs.

Net Present Value

Past and present vegetation treatments do not add cumulatively to the net present value of the project. Future vegetation treatments, if added to this project, would be expected to increase efficiencies and reduce costs, thereby increasing the present net value of this project if implemented at the same time.

Benefit/Cost Ratio

Past and present vegetation treatments do not add cumulatively to the benefit/cost ratio of the project. Future vegetation treatments, if added to this project, would be expected to increase efficiencies and reduce costs, thereby increasing the benefit/cost ratio of this project if implemented at the same time.

Forest Plan Consistency

There are no Forest-wide goals and objectives or Management Area standards and guidelines to directly apply to the financial analysis of the project alternatives. This analysis is in compliance with Forest Service Manual and Forest Service Handbook direction relating to economic and financial analysis at the project level.

Chapter 4. Finding of No Significant Impact

As the responsible official, I am responsible for evaluating the effects of the project relative to the definition of significance established by the CEQ Regulations (40 CFR 1508.13). I have reviewed and considered the Environmental Assessment (EA) and documentation included in the project record and I have determined that the Proposed Action will not have a significant effect on the quality of the human environment. As a result, no environmental impact statement will be prepared. My rationale for this finding is as follows, organized by sub-section of the CEQ definition of significance cited above.

Context

The significance of an action must be analyzed in several contexts and varies with the setting. In the case of site-specific actions, significance depends more on the effects in the locale rather than the world as a whole. Both short and long term effects are relevant (40 CFR § 1508.27).

This decision and the Buford New Castle EA incorporate by reference the White River Forest Plan and are tiered to the Forest Plan Final Environmental Impact Statement (FEIS), which analyzed and disclosed effects of potential forest management at a larger scale. The activities planned in the Buford New Castle Project are similar to other projects completed on the White River National Forest and are within the range of effects anticipated in the Forest Plan FEIS.

The environmental effects of this project are analyzed at varying scales (e.g. stand level or project level) as described for each resource in the EA and in individual specialist reports located in the project record. I have reviewed the cumulative effects of past management combined with this project and reasonably foreseeable future actions as they are analyzed in the EA and feel that the context of this decision is limited to the land in and adjacent to the project area. The analysis in the EA indicates that project design, application of Forest Plan standards and guidelines, best management practices, and design features will minimize negative impacts to all resources. Given the finite time period and localized nature of impacts described in the EA, the project will have no measurable effects at the regional or national levels and therefore consideration of significance will focus on the local setting.

This decision and the effects analysis on which it is based applies only to this local area. After a thorough review of the effects analysis contained in the EA, I find that this project does not establish a local, regional, or national precedent, nor does it have any substantial applicability beyond the bounds of the White River National Forest.

Intensity

Intensity is a measure of the severity, extent, or quantity of effects, and is based on information from the effects analysis of this EA and the references in the project record. The effects of this project have been appropriately and thoroughly considered with an analysis that is responsive to concerns and issues raised by the public. The agency has taken a hard look at the environmental effects using relevant scientific information and knowledge of site-specific conditions gained from field visits. My finding of no significant impact is based on the context of the project and intensity of effects using the ten factors identified in 40 CFR 1508.27(b).

1. Impacts that may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial.

As described in the EA and project record, there are likely to be both beneficial and adverse effects to certain resources from taking actions proposed in Alternative 2. In reaching my finding of no significant impact, I did not ignore or trivialize negative effects by "offsetting" them with beneficial effects. The EA demonstrates that, due to careful project design that incorporates protective measures (Forest Plan standards and guidelines, water conservation practices, and site specific design features), the possible negative effects are relatively minor and of short duration, and are not directly, indirectly or cumulatively significant.

2. The degree to which the proposed action affects public health or safety.

As discussed in the EA, there should be no significant effects to public health and safety from the project. Potential hazards associated with felling trees adjacent to travel corridors, as well as hauling forest products, have been address through site specific design features (Safety/Recreation Design Features #1, 2, 4, 6-9, 11).

3. Unique characteristics of the geographic area such as the proximity to historical or cultural resources, parklands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.

There are no park lands, prime farmlands, research natural areas, wilderness areas, or wild and scenic rivers in or near the project area, and therefore none would be affected by this project. Riparian areas within the project area will be protected by the application of best management practices and project design features (Watershed/Fisheries Design Features #1-26). Ecologically sensitive areas (e.g. wetlands) have been avoided in the design of harvest units and roads. In addition, approximately 215 acres of clearcut and patch clearcut located in the Sterry Lake Special Interest Area was removed from the proposed action prior to scoping. Cultural resources on or eligible to the National Register of Historic Places and found within the project area have been or will be documented and avoided during operations.

4. The degree to which the effects on the quality of the human environment are likely to be highly controversial.

In the context of the National Environmental Policy Act, controversy refers to cases where substantial scientific dispute exists as to the size, nature, or effects of a major federal action on some human environmental factor, rather than to public opposition of a proposed action or alternative. The effects on the quality of the human environment are not likely to be highly controversial. There is no know scientific controversy over the impacts of the project.

5. The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.

The White River National Forest has considerable on-the-ground experience with the types of activities to be implemented in this project. The range of site characteristics is similar to those taken into

consideration and disclosed in the Forest Plan FEIS, Chapter 3, and the effects of this project are within the range anticipated in that FEIS and the Forest Plan Record of Decision. The effects analysis (EA and project record) demonstrates that the effects of these activities are not uncertain or significant and do not involve unique or unknown risks. The body of knowledge gained through years of project-level and programmatic monitoring, timber sale inspections, stand examinations, wildlife surveys, and applied research provides a basis for the effects analysis in the EA and supports my determination that there will be no highly uncertain effects or unique or unknown risks associated with this project.

6. The degree to which the action may establish precedent for future actions with significant effects or represents a decision in principle about a future consideration.

This is not a precedent setting decision. Similar actions have occurred for decades in the local area and across the forest and the Region. The effects of implementing the Proposed Action were disclosed in the EA and the project record, and are within the range of effects of these similar actions. They are also within the range of effects disclosed in the Forest Plan FEIS, which analyzed the effects of the types of activities that will be implemented under the Proposed Action at a larger scale. The implementation of the Selected Alternative does not make a commitment to do anything in other areas on the White River National Forest or any other national forest. It will not set a regional or national precedent. For these reasons, I have determined this action does not establish a precedent for future actions with significant impacts. All actions are wholly consistent with the Forest Plan.

7. Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.

The EA and the individual resource reports in the project record disclose the combined effects of this project with other past, present, and reasonably foreseeable future actions. None of the actions included in the Proposed Action would create significant impacts alone or when considered with other actions. The interdisciplinary team carefully chose cumulative effects analysis areas and timeframes that would most thoroughly examine and predict effects. Based on the analysis in the EA, and incorporating by reference the range of effects predicted in the Forest Plan FEIS, I have determined that implementing the Proposed Action will not result in significant cumulative effects.

8. The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.

No National Register Historic Properties (NRHP) were identified within the treatment areas. Despite best efforts to locate cultural resources with the project area, unanticipated cultural deposits are possible with any ground disturbance. If an unanticipated discovery occurs through project implementation, project Design Features require work will halt within that area until a Forest Archaeologist evaluates the site and proposes any necessary mitigation measures. If a Traditional Cultural Property or sacred site is found, all activity in the vicinity of the discovery will cease, and a Ute

tribal representative will be notified. Therefore, the Proposed Action avoids potential traditional cultural locations.

9. The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.

Biological Assessments (BA) were prepared for federally listed threatened, endangered and proposed (T, E, and P) terrestrial, aquatic, and species.

The terrestrial BA determined the Buford New Castle Project would have "No Effect" on yellow-billed cuckoo, Mexican spotted owl, and North American wolverine. A determination was made the project "May Affect, Not Likely to Adversely Affect" Canada Lynx. According to the BA, proposed vegetation treatments would occur on "less than 1% of the lynx habitat within the Bar HL Lynx Analysis Unit (LAU) and less than 1% of the lynx habitat in the Clinetop Lynx Analysis Unit". In addition, "high quality, multi-storied spruce-fir with dense horizontal cover would not be affected". The project would adhere to all lynx Standards and Guidelines in the Southern Rockies Lynx Amendment, would not increase designated snow compaction or travel ways, and does not occur in any Lynx Linkage Area.

Federally listed T, E, and P aquatic species on the Blanco and Rifle Ranger Districts include the Colorado pikeminnow, humpback chub, bonytail cub, razorback sucker, and green lineage Colorado River Cutthroat trout. According to the aquatics BA, "owing to the distance of the proposed action and that no water withdraws are proposed, the proposed action would have no effect on these Endangered fishes or their habitat". In addition, "no threatened green lineage cutthroat are known to exist in the analysis area".

There is no habitat present for any Threatened or Endangered plant species within the Buford New Castle Analysis Area, therefore there would be no effect to any Federally listed plant species. The Buford New Castle Project would have "No Impact" to individuals of any T, E, or P plant species. The BA for rare plant species documented the potential habitat for twelve sensitive plant species within the project area, however, no individuals were found during surveys.

10. Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment.

The Proposed Action has integrated Watershed Conservation Practices (WCP's) into the design of proposed individual harvest units and temporary roads. The Watershed Resources Report and Design Features (pages 27-30) of the EA, detail how WCP's were applied site-specifically to individual harvest units and temporary roads proposed for this project. Site-specific applications of WCP's are the basis for concurrence with the State of Colorado that this project would adequately protect and maintain water quality, and that planning and design of this project has thereby complied fully with the Clean Water Act.

Design features are incorporated into the Proposed Action to mitigate air quality effects from pile burning. Smoke impacts as a result of burning slash piles would be temporary and minor in nature.

Further, the pile burning for this project would be conducted in accordance with state air quality standards and within burning periods approved by the State of Colorado. Such consultation with and concurrence from the state enable this project to fully comply with the Clean Air Act.

The wildlife and aquatic Biological Assessments (BA's) are hereby incorporated by reference. The BA's taken together with the design features integrated into Proposed Action detail the action taken to avoid adversely impacting any Threatened or Endangered species, as well as the residual impacts that would still occur to those species as a result of this project.

This project would not adversely affect any Forest Service Sensitive species, to any extent that would cause a trend toward listing of any such species as Threatened or Endangered. The wildlife, aquatic and botanical Biological Evaluations (BE's) discuss in detail the anticipated effects that this project would cause on Sensitive species. These reports are hereby incorporated by reference. The BE's, in concert with design features, specify the site-specific measures that have been designed into individual harvest units and roads for this project to avoid or minimize effects on Sensitive species.

In compliance with the National Historic Preservation Act (NHPA), this project area has been surveyed for historical and cultural resources. Standard provisions in the timber sale or stewardship contract require that if any new cultural resources are discovered during implementation of this project, they would also be protected. These measures are further detailed in the Design Features portion of the EA, and taken together with consultation with the State Historic Preservation Office, constitute this project's compliance with the NHPA.

The Proposed Action is fully consistent with the Forest Plan for the White River National Forest. The resource reports detail more fully how the Proposed Action achieves consistency with the individual goals, objectives, standards, guidelines, and management area direction in the Forest Plan.

The Proposed Action is also fully consistent with the seven management requirements specified in the regulations for the National Forest Management Act, as more fully discussed in the NFMA Compliance Report, which is hereby incorporated by reference.

Environmental Justice (Executive Order 12898) requires consideration of whether projects would disproportionately impact minority or low-income populations. Planning for this project has complied with this order through its scoping and public involvement efforts. Public involvement for this project has not identified any adverse effects on local minority or low-income populations. Nor has internal scoping by the Forest Service interdisciplinary team been able to identify any adverse or disproportionate effects that this project might cause to local minority or low-income population.

CHAPTER 5. AGENCIES, ORGANIZATIONS, AND INDIVIDUALS CONSULTED

Agencies

Alden Naranjo, Southern Ute Indian Tribe
Amy Platt, Environmental Protection Agency, Region 8
Betsy Suerth, Garfield County Road & Bridge Dept.
Betsy Chapoose, Ute Indian Tribe
CDPHE, Air Pollution Control Division
Chairman Gary Hayes, Ute Mountain Ute Indian Tribe
Chairman Jimmy Newton, Jr., Southern Ute Indian Tribe
Chairwoman Irene Cuch, Ute Indian Tribe
City of Glenwood Springs
City of Glenwood Springs, Street Dept.
City of Rifle
Clint Chappell, Rio Blanco Road and Bridge
Dave Morlan, Rio Blanco Road and Bridge
Garfield County Commissioners
Garfield County Oil & Gas Liaison
Honorable Scott R. Tipton, US Representative
Jim Rada, Garfield County Public Health
John Denison, Colorado State Forest Service
John Hickenlooper, Governor of Colorado
Kamie Long, Colorado State Forest Service
Ken Distler, EPA/Region 8, Air Program
Mark Udall, US Senator
Mesa County Commissioners
MichaelBennett, US Senator
Perry Will, CPW Area Manager
Sara Gallup, CDPHE, Prescribed Fire/Smoke Specialist
Sarah Fowler, EPA Region 8, Wetlands Program, Mail Code: 8-EPR-EP
Steve Bennett, BLM - Colorado River Valley Field Office
Town of New Castle
Town of Silt
US Army Corps of Engineers
Wyatt Keesbery, Garfield Road and Bridge

Organizations

Ancient Forest Rescue
Colorado Mountain Club
Colorado Outfitters Association
Bob Elderkin, Colorado Mule Deer Association
Caitlin Balch-Burnett, Defenders of Wildlife
Cathy Carlson, National Wildlife Federation
Colorado Timber Industry Association
Dan Casey, Colorado Timber Industry Association
Dave Lambert, Colorado Cave Survey
David Nickum, Colorado Trout Unlimited
Grand Valley Citizens Alliance
Harold Shepard, Center for Water Advocacy
INFORM Colorado
Jake Schlesinger, Environment Colorado
Jeff Berman, Colorado Wild
Joe Bair, Flattoppers Snowmobile Club
John Shideler, West Divide Cattle Growers Association
Jon Nestor, Mule Deer Foundation
Jonathan Ratner, Western Watersheds
Josh Pollock, Center for Native Ecosystems
Ken Nuebecker, Trout Unlimited
Kirk Cunningham, Rocky Mtn Chapter of Sierra Club
Melissa Decquer, Western Resources Advocates
Nancy Fishering, Intermountain Forest Association
Pete Maysmith, Conservation Colorado
Peter Hart, Wilderness Workshop

Rifle Snowmobile Club
Rocky Smith, Rocky Mountain Wild
Ron Baird, Biodiversity Legal Foundation
Sloan Shoemaker, Wilderness Workshop
Suzanne Jones, Wilderness Society
Ted Zukowski, Land & Water Fund of the Rockies
Terry Fankhauser, Colorado Cattlemen's Association
Tom Troxel, Intermountain Forest Association
White River Trail Runners

Individuals/Businesses

Amy Hofelich
Angelo Loria
Art Smith, ETC Canyon Pipeline, LLC
Barb Hill
Barry Shideler
Ben Shideler, Shideler Estate
Bert Griefenberg
Beverly Klein, VIX Ranch Co.
Bill Burke, Bill Burke's 4-Wheeling America, LLC
Bill McKee, CDPHE, Water Quality Control Division
Bill & Lori, Robinson
Bonnie, Hardy
Brad Piehl, CBBC
Brenda Linster, EnCana Oil & Gas (USA) Inc.
Brian & Jane Dexter Farris
Charles Boyer
Charles & Angela Ryden
Chris Clark, Plains Exploration & Production Co.
Chris Leverich
Chuck Dennis
Citizen Telegram
Clay Hofelich
Craig & Doris Bair, Bair Ranch Co.
Daily Sentinel
Daniel O'Connell
Daniel Swanstrom
Dennis Hoefer, Dick Pennington Guide Service
Dennis Devey
Dick Artley
Doug Jones, Doug Jones Sawmill
Dow & Kathy Rippy
Drew Deaton, Windsor Energy Group, LLC
Dry Elk Valley
Earl and Claudette Elder
Elmer and Mildred Roberts
Emma Suarez, Esq, Pacific Legal Foundation
Frances Coulter
Frank & Sheila Daley
Fredric Lee
Gary & Joanne ErpestadRon Rogers, Spring
Glenwood Springs Post Independent
Creek Ranch
Gary & Karen Hill
George Strong, Strong Log Homes
Gerald and Beverly Burk
Greg Noss, High Country 4 Wheelers
Greg Davis, Williams Production RMT Company
Hawkins & Associates, Inc.
Hayden Truscott, SourceGas Energy Services Co.
HowardHallman, FHTF
Intermountain Resources, LLC
Jack Allard, Coulter Lake Guest Ranch
James & Kathy Toomer
James R. Lemon
Jan and Kelly Gessell
Jay Fowler, SourceGas Energy Services Co.
Jeff Miner, Cache Creek Outfitters
Jeff Mead, Mamm Peaks Outfitter
Jerry Abboud, Colorado Off-Highway Vehicle Coalition
Jerry Fazzi
Jess Peonio, Orion Energy Partners LP
Jim Dschaak, Windsor Energy Group, LLC
Jim Suehring
Jim Graves, Maralex Resources Inc.
Jim and Zeny Ply
Joanne Couey
Joel Karr
John Shideler, Shideler Land & Cattle LLC
John & Dorothy Nauroth
Jon Vaughn

Judith Lee Martins
Kelly Couey
KendricWait
Kim Horn
Kimelise Bracher
K & K Lumber
KristineTracz
Larry & Susan Robinson
Linda Pavelka, Noble Energy Inc.
Louis/Carol/Warren Doedoe, West Elk Ranch
Mark Hayes
Matt Barber, Bill Barrett Corporation
McCray Ranch Co. Ltd
Moore Paul, W3 Outfitters Inc
Norm Birtcher Montrose Forest Products
Norman Hardy
Pam Caskie, NWCCOG
Patty Bullock, Saddletramp Outfitters
Patty & Gary, Ragle/Galloway Dunn Galloway Ranch
Phyllis Hyrup
Puma Paw Ranch LLC
Ralph Fruetel
Raylene Milne, Antero Resources Piceance Corp.
Reed Williams, Willsource Enterprise
Rick Kuester
Rob Bleil, Williams Production RMT Company
Robbie Guinn SG Interests
Robert Wheeler
Ron Velarde CPW, NW Service Center
Ronald Constien
Roy Savage
Russ and Val Lee
RuthAnn Morss, EnCana Oil & Gas (USA) Inc.
Scott Hall, Black Diamond Minerals, LLC
Sharon Gardner
Stanley Dempsey, Environmental Strategies
Stephanie Mosher
Steven Hardy
Terral E. Anderson
Terry and Julie Kirk
ThomasKourlis
Tim and Gina Pedrick
Tom Olden, Pine Martin Logging
Warren & Carla Roberts
Wayne Pollard, Belgum Ranch
Wayne Bankert, Laramie Energy, LLC
Wayne Pollard
Wayne McCray
Zane & Charla Farris, Bear Wallow Ranch
Zeke Williams

APPENDIX A: LITERATURE CITED

Alexander, R.R. 1987. *Ecology, Silviculture, and Management of the Engelmann Spruce-Subalpine-Fir Type in the Central and Southern Rocky Mountains.* Agriculture Handbook 659, Ft. Collins CO: USDA-Forest Service, Rocky Mountain Forest and Range Experiment Station.

Alexander, R.R, Shearer, R.C. and Shepperd, W.D. 1990. *Abies lasiocarpa.*. Subalpine Fir in R.M. Burns and B.H. Honkala, technical coordinators. *Silvics of North America, Volume 1 Conifer*. Agriculture Handbook 654. USDA, Forest Service, Washington, D.C. http://www.na.fs.fed.us/pubs/silvics_manual/Volume_1/abies/lasiocarpa.htm

Alexander, M.E. 1988. Help with making crown fire hazard assessments. In protecting people and homes from wildfire in the interior west. Proceedings of the Symposium and Workshop, USDA For. Serv. Gen. Tech. Rep. INT-251, 147-153.

Alexander, E. Rate of Soil Formation: Implications for Soil-Loss Tolerance. *Soil Science* 145:1, Jan, 1998. pp.37-45.

Alexander, R.R and Shepperd, W.D. 1990. *Picea engelmannii.*. Engelmann spruce in R.M. Burns and B.H. Honkala, technical coordinators. *Silvics of North America, Volume 1 Conifers*. Agriculture Handbook 654. USDA, Forest Service, Washington, D.C. http://www.na.fs.fed.us/pubs/silvics_manual/Volume_1/picea/engelmannii.htm

Beschta, R.L., Pyles, M.R., Skaugset, A.E., Surfleet, C.G. 2000. Peakflow responses to forest practices in the western cascades of Oregon, USA. Journal of Hydrology. 233: 102-120.

Bowden, Phil., Rebitzke, Eric. 2006- 2010. Upper Eagle River Beetle Salvage Project, Fuels Effects Analysis Report.

Bozek, M.A., and F.J. Rahel. 1991. Assessing Habitat Requirements of Young Colorado River Cutthroat Trout by Use of Macrohabitat and Microhabitat Analyses, Transactions of the American Fisheries Society, 120:5, 571-581. Online http://dx.doi.org/10.1577/1548-8659(1991)120<0571:AHROYC>2.3.CO;2. Accessed 30 November 2015.

Brackebusch, A.P. 1973. Fuel management a prerequisite not an alternative to fire control. Journal of Forestry. 71(10):637-639.

Brown, J.K., E. D. Reinhardt and K. A. Kramer. 2003. Coarse woody debris: Managing benefits and fire hazard in the recovering forest. RMRS GTR-105.

Buechling, A. and W.K. Baker, 2004. A fire history form tree rings in a high-elevation forest of Rocky Mountain National Park. Can. J. For. Res. 34: 1259-1273.

Colorado Department of Public Health and Environment. 2010. Aquatic Life Use Attainment. Colorado Parks and Wildlife (1). Species Profile: Northern Leopard Frog. Online http://cpw.state.co.us/learn/Pages/SpeciesProfiles.aspx. Accessed 2 December 2015.

Colorado Parks and Wildlife (2). Species Profile: Boreal Toad. Online http://cpw.state.co.us/learn/Pages/SpeciesProfiles.aspx?species=toad. Accessed 2 December 2015.

Corn, P.S., and J.C. Fogleman. 1984. Extinction of montane populations of the Northern leopard frog (*Rana pipiens*) in Colorado. Journal of Herpetology 18:147-152.

Corn, P.S., and L.J. Livo. 1989. Leopard frog and wood frog reproduction and Colorado and Wyoming. Northwestern Naturalist 70:1-9.

CRCT Conservation Team. 2006. Conservation agreement for Colorado River cutthroat trout (*Oncorhynchus clarkii pleuriticus*) in the States of Colorado, Utah, and Wyoming. Colorado Division of Wildlife, Fort Collins. 10p.

Daddow, R.L and G.E. Warrington. Growth limiting soil bulk densities as influenced by soil texture. 1983. USDA Forest Service Report WSDG 00005. Fort Collins, CO.

Despain, D.G., 1990. Yellowstone Vegetation: consequences of environment and history in a natural setting. Roberts Rinehart Inc. Publishers. Boulder, CO. 239 p.

Dunn, A.T. 1989. The effects of prescribed burning on hazard fuels in the chaparral: toward a new conceptual synthesis. In: Berg N.H., tech. coord. Proceedings of the symposium on fire and watershed management. Gen. Tech. Rep. PSW-109. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific Southwest Research Station: 23-29.

EPA (US Environmental Protection Agency). 2005. National Management Measures to Control Nonpoint Source Pollution from Forestry. EPA Office of Water

Espinoza, Dee Ann, 2016. Buford New Castle Management Project Cultural Resources Inventory, White River National Forest, Garfield and Rio Blanco Counties, Colorado. On file at the White River National Forest Supervisor's Office, Glenwood Springs, Colorado.

Finney, M.A. 2001a. Design of regular landscape fuel treatment patterns for modifying fire growth and behavior. Forest Service. 47(2): 219-228.

Finney, M.A. 2001b. Spatial strategies for landscape fuels treatments. Botelho, H., eds. Workshop on tools and methodologies for fire danger mapping: proceedings of workshop. Vila Real, Portugal: Universidad de Traj-os-montes el Alto-Douro, Departmento Forestal: 157-163.

Fire Regimes Condition Class Guidebook Version 1.0.5, 2003.

Graham R.T. Technical Editor. 2003. Hayman fire case study: Summary. RMRS GTR-115.

Hirsch, C.L., M.R. Dare, and S.E. Albeke. 2013. Range-wide status of Colorado River cutthroat trout (*Oncorhynchus clarkii pleuriticus*): 2010. Colorado River Cutthroat Trout Conservation Team Report. Colorado Parks and Wildlife, Fort Collins.

Jones, J.A., and G.E. Grant. 1996. Peak flow responses to clear-cutting and roads in small and large basins, western Cascades, Oregon. Water Resources Research. 32(4): 595-974.

Jones, J.R., and N.V. DeByle. 1985. Aspen Ecology and Management in the Western United States. General Technical Report RM-119, Rocky Mountain Forest and Range Experiment Station, Forest Service, USDA.

Metcalf, J.L., S.L Stowell, C.M. Kennedy, K.B. Rogers, D. McDonald, J. Epp, K. Keepers, A. Cooper, J.J. Austin, and A.P. Martin. 2012. Historical stocking data and 19th century DNA reveal human-induced changes to native diversity and distribution of cutthroat trout. Molecular Biology 21:5194-5207.

Methodology to Determine Use Attainment for Rivers and Streams. Policy Statement 10-1. Water Quality Control Commission. Denver, Colorado.

National Park Service, 1997. How to Apply the National Register Criteria for Evaluation. National Register Bulletin 15. U.S. Department of the Interior, National Park Service, Interagency Resources Division, Washington, D.C.

Page-Dumroese, D. Abbott, A, and Rice, T. 2009. Forest Soil Disturbance Monitoring Protocol. General Tech. Report WO-82b.

Perala, D.A. 1990. *Populus tremuloides*. Quaking aspen in R.M. Burns and B.H. Honkala, technical coordinators. *Silvics of North America, Volume 2. Hardwoods*. Agriculture Handbook 654. USDA, Forest Service, Washington, D.C.
http://na.fs.fed.us/pubs/silvics_manual/Volume_2/populus/tremuloides.htm

Robichaud, P.R. 2000. Fire effects on infiltration rates after prescribed fire in Northern Rocky Mountain forest, USA. Journal of Hydrology 231-232.

Salazar, L.A.; Gonzales-Caban, A. 1987. Spatial relationship of a wildfire, fuelbreaks, and recently burned areas. Western Journal of Applied Forestry. 2(2):55-58.

Schenk, Christopher. 1992. Stratigraphic correlations between the Eagle Valle Evaporite and Minturn Formation, Eagle Basin, NW Colorado. *in* USGS Bulletin 1787: Evolution of Sedimentary Basins

Schoennagel, T., T.T. Veblen, and W.H. Romme. 2004. The interaction of fire, fuels, and climate across Rocky Mountain Forests. BioSci. 54: 661-676.

Scott, J.H. 2003. Canopy fuel treatment standards for the wildland-urban interface. USDA FS Proceedings. RMRS-P-29.

Scott, V.E. and G. L. Crouch. 1988. Breeding birds in uncut aspen and 6 to 10 year old clearcuts in southwestern Colorado. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. Research Note RM-485.

Scott, V.E. and G. L. Crouch. 1987. Response of breeding birds to commercial clearcutting of aspen in southwestern Colorado. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. Research Note RM-475.

Smith, B.E. 2003. Conservation Assessment for the Northern Leopard Frog in the Black Hills National Forest South Dakota and Wyoming. USDA Forest Service. Online http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsm9_012268.pdf. Accessed 3 December 2015.

Troendle, C.A. and King, R.M. 1985. The Fool Creek Watershed – thirty years later. Water Resources Research, 21(12): 1915-1922.

Troendle, C.A. and W.K. Olsen. 1994. Potential effects of timber harvest and water management on streamflow dynamics and sediment transport. Sustainable Ecological Systems Proceedings. United States Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station, GTR RM-247, pp. 34–41.

Turner, M.G., W.H. Romme and D.B Tinker. 2003. Surprises and lessons form the 1988 Yellowstone fires. Front Ecol. Environ 2003.

Tweto, O. 1983. Geologic Map of Colorado. U.S. Geological Survey and Colorado Geological Survey. Digitized 1:500,000 scale map.

UDWR. 2000. Genetic considerations associated with cutthroat trout management. Publication Number 00-26. Utah Division of Wildlife Resources. Salt Lake City, Utah. 9 pp.

USDA Forest Service, 2006. Forest Service Handbook (FSH) 2509.25 Amendment No:2509.25-2006-1 Chapter –Zero Code. Watershed Conservation Practices Handbook. Effective Date: May 5, 2006

US Forest Service. 2014. Forest Service Manual 2470. US Forest Service, National Headquarters (WO), Washington, DC

USDA Forest Service. 2013. Forest Service Manual 2600, Wildlife, Fish, and Sensitive Plant Habitat Management, Rocky Mountain Region (Region 2). Supplement No.: 2600-2013-1.

USDA Forest Service, 1993. Holy Cross Soil Survey- Parts of Garfield, Grand, Mesa, Pitkin, and Summit Counties. Unpublished data.

USDA Forest Service. 2002. Land and resource management plan – 2002 revision. White River National Forest, Rocky Mountain Region.

USDA Forest Service. 2010. Cumulative Watershed Effects of Fuel Management in the Western United States. Rocky Mountain Research Station General Technical Report RMRS-GTR-231.

USDA Forest Service, 2006. Watershed conservation practices handbook, FSH 2509.25 – R2 amendment 2509.25-96-1. Rocky Mountain Region (R2), Denver, CO.

USDA NRCS (Natural Resources Conservation Service). 2010. National Soil Survey Handbook, Part 618: Soil Properties and Qualities. FSH 2509.18

U.S Department of Agriculture, Forest Service. 1973. National Forest Landscape Management. Vol.1. U.S. Dep. Agric., Agric. Handbook 434.

U.S Department of Agriculture, Forest Service. 1995. Landscape Aesthetics, A Handbook for Scenery Management, U.S. Dep. Agric., Agric. Handbook 701.

U.S Department of Agriculture, Forest Service. 1977. National Forest Landscape Management. Vol.2, Ch. 4 (Roads). U.S. Dep. Agric., Agric. Handbook 483.

U.S Department of Agriculture, Forest Service. 1977. National Forest Landscape Management. Vol.2, Ch. 5 (Timber). U.S. Dep. Agric., Agric. Handbook 559.

U.S Department of Agriculture, Forest Service. 1987. National Forest Landscape Management. Vol.2, Ch. 8 (Recreation). U.S. Dep. Agric., Agric. Handbook 666.

US Fish and Wildlife Service (1). Northern Leopard Frog (*Rana pipiens*). Online http://www.fws.gov/nevada/nv_species/nleopard_frog.html. Accessed 2 December 2015.

US Fish and Wildlife Service (2). Boreal Toad. Online http://www.fws.gov/mountain-prairie/species/amphibians/borealtoad/. Accessed 2 December 2015.

Veblen, T.T., K.S. Hadley, and M.S. Reid. 1991a. Disturbance and stand development of a Colorado subalpine forest. Journal of Biogeography 18:707-716.

Veblen, T.T., K.S. Hadley, E.M. Nel, T. Kitzberger, M.S. Reid, and R. Villalba. 1994. Disturbance regime and disturbance interactions in a Rocky Mountain subalpine forest. Journal of Ecology 82:125-135.

White River Forest Plan, Final Environmental Impact Statement Volume 3, Appendix D

White River National Forest Land and Resource Management Plan. 2002. Recreation, Travel Management and Scenery Resource Management Area Standards and Guidelines.

White River National Forest Land and Resource Management Plan, 2002 Revision. United States Department of Agriculture, Forest Service; Rocky Mountain Region; White River National Forest.

White River National Forest Land and Resource Management Plan Final Environmental Impact Statement. 2002.

Young, Michael K., tech. ed. 1995. Conservation assessment for inland cutthroat trout. General Technical Report RM-256. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 61 p.

Young, Michael K. 2008. Colorado River cutthroat trout: a technical conservation assessment. Gen. Tech. Rep. RMRS-GTR-207-WWW. Fort Collins, CO: USDA Forest Service, Rocky Mountain Station. 123 p. Online http://www.fs.fed.us/rm/pubs/rmrs_GTR-207-WWW.pdf. Accessed 30 November 2015.