ENVIRONMENTAL IMPACT STATEMENT

Lincoln National Forest Land and Resource Management Plan
Chaves, Eddy, Lincoln, and Otero Counties, New Mexico

03-08-86-01

Type of Action	Administrative
Lead Agency	USDA Forest Service
Responsible Official	Sotero Muniz, Regional Forester
For Further Information	James R. Abbott, Forest Supervisor Lincoln National Forest Federal Building, Eleventh and New York Alamogordo, New Mexico 88310

Abstract

A Proposed Action and six alternatives for a Land and Resource Management Plan (Forest Plan) for the 1,103,495 acre Lincoln National Forest are described and compared. The Proposed Action (PA) and alternatives are:

PA Responds to the recreation, timber, fuelwood, access, law enforcement, and insect and disease issues, and emphasizes wildlife habitat management.

A Projects current resource management. It responds well to the fire issue and partially resolves the timber issue.

B Attempts to meet Resource Planning Act objectives. It emphasizes wildlife habitat management and responds to the recreation, fire and grazing issues.

C Highly responsive to the timber, fuelwood and grazing issues.

D Resolves the recreation and fire issues at a high level and emphasizes wildife habitat management.

E Responds to the insect and disease and recreation issues.

F Attempts to resolve the issues addressed in the PA, but constrained by a budget 30 percent lower.

The PA constitutes the Forest Service preferred alternative. The Forest Plan, when approved, will guide future management of the Forest and will ordinarily be revised on a ten year cycle or at least every fifteen years. Accomplishment of the planning objectives is contingent upon programmed funding by Congress.

Lincoln National Forest Plan

Environmental Impact Statement

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Errata Sheet
for
Environmental Impact Statement

Chapter 4

Page 150, paragraph 1, third sentence:

Should read: "Alternatives C and F maintain over half of the facilities at the higher level, ...

Page 163, paragraph 1:

Change table reference from Table 68 to Table 67.

Page 181, Table 83:

Acres treated via fuelwood sales in Period 1, Alternative C should be 1200 acres.

1. Purpose of and Need for Action

OVERVIEW

This Environmental Impact Statement (EIS) describes a Proposed Action (Preferred Alternative) and alternatives to the Proposed Action for the future management of the land and resources of the Lincoln National Forest (Forest). Each alternative provides a different way to address local, regional, national public issues and management concerns; responds to resource management opportunities; provides for use and protection of resources, and fulfills legislative requirements. Every alternative generated a different mix of goods and services from the Forest. Each alternative was evaluated to determine its potential to provide a sustained yield of goods and services in a way that maximizes long-term public benefits in an environmentally sound manner. Alternatives were evaluated as to how well they maximized net public benefits. Net public benefits (NPB) is an overall expression of the value to the nation of all outputs and positive effects (benefits) less all associated inputs and negative effects (costs) whether they can be quantitatively valued or not. Net public benefits are measured by both quantitative and qualitative criteria rather than a single measure or index. The Proposed Action is the alternative that, in the opinion of the Forest Service, provides for a level of goods and services that maximizes long-term net public benefits and is the Forest Service Preferred Alternative.

The EIS describes the affected environment, discloses the significant environmental consequences, and responds to issues, concerns, and opportunities (ICO) of implementing the Proposed Action and Alternatives. An EIS is required by the implementing regulations for NFMA [36 Code of Federal Regulations (CFR) 219]. The EIS is prepared in the format recommended in National Environmental Policy Act (NEPA) of 1969, Council on Environmental Quality (CEQ) Regulations [40 CFR 1500-1508]. The Proposed Action is the Forest's Land and Resource Management Plan (Plan), which is a separate document. Preparation of the Plan is required by the Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974, as amended by the National Forest Management Act (NFMA) of 1976. For purposes of NEPA disclosure, the EIS and Plan are treated as combined documents [40 CFR 1506.4].

A Notice of Intent to prepare an EIS for the Plan was published in the Federal Register on March 13, 1980. The EIS and Plan are being circulated for review and comment. After the close of the comment period, the Plan will be revised as necessary and the revised EIS will be filed with the Environmental Protection Agency, and made available to the public. The Regional Forester will use the revised EIS in making a decision under NFMA as to approval of the Plan [36 CFR 219.10(c)]. This decision will be documented in a Record of Decision which will be available to the public.

OBJECTIVES

The purpose of the Plan is to provide for multiple use and sustained yield of goods and services from the Forest to maximize long-term net public benefits in an environmentally sound manner [36 CFR 219.1(c)]. The Forest Plan will accomplish these objectives by:

- Determining public issues, management concerns and resource use, and development opportunities identified at the national, regional, and local levels.

- Defining management practices appropriate to the range of resource conditions found on the Forest.

- Assigning combinations of management practices to lands for which they are most suited based on productivity and sensitivity of the land and the needs expressed in the issues and concerns.

- Specifying the resource production outputs and schedules associated with implementing specific management practices.

- Establishing standards and guidelines for resource use and protection.

- Establishing monitoring standards to ensure that actual outputs and effects are consistent with those planned.

- Providing a framework for project level decisions and for development of budget proposals.

- Integrating individual resource planning activities.

- Coordinating Forest Service planning activities with the efforts of other Federal agencies, State and local governments and Native American tribes.

- Providing input to subsequent RPA Programs and Regional Guides.

The Forest plan is a plan for the physical and biological management of the Forest. It is not a plan for the various administrative activities necessary to operate the Forest Service as an agency. For example, the plan does not address personnel matters, fleet equipment, or internal organization changes. However, it does address managing the public lands to produce the goods and services desired by the public.

The Plan will guide management of the Forest until a new plan is prepared. Management practices and standards and guidelines in the Plan are not irreversible. When a new plan is prepared, all aspects of the Plan will be re-evaluated based on improved data, monitoring results, and new or revised issues, concerns, and opportunities. A new plan will normally be prepared at 10 year intervals but must be prepared at least every 15 years. Provision for preparation of a new plan or amendment of the Plan is specified in the regulations for implementation of the NFMA of 1976 [36 CFR 219.10(f) and (g)]. The planning horizon used to estimate outputs and effects was 200 years. The displays in the EIS show data for only specified portions of the planning horizon, usually the first 50 years. While long range effects have been estimated, the plan is only valid until a new plan is prepared, thus committing the Forest to a course of action no longer than 15 years.

The Plan either incorporates, supercedes, or replaces all previous resource or land use management plans prepared for the Forest. Following approval of the Plan, all future permits, contracts, and other instruments for the use and occupancy of the Forest must be consistent with this Plan. In addition, all subsequent administrative activities affecting the Forest, including budget proposals, will be based on the Plan [36 CFR 219.10(e)].

It is important to note that all proposals in the plan can be accomplished from a physical, biological, economic and legal perspective. It is not certain they will be accomplished. First, the plan establishes both minimum and maximum targets. For example, the number of acre-feet of water meeting water quality goals is a minimum number of acre-feet to be attained if possible; whereas the allowable sale quantity is the maximum regulated volume of timber that can be sold over the planning period - not the volume that must be sold.

Secondly, all outputs may be affected by the budget. Inherent in the plan's proposed outputs is the budget to achieve them. The plan is implemented by way of various site-specific projects, such as the building of a road, development of a campground, the sale of a timber stand, etc. If the budget is reduced in any given year, the projects scheduled for that year may have to be rescheduled. If the budget is significantly reduced in any given year or over a period of several years, the plan itself may have to be amended (36 CFR 219.10(f)) and, consequently, will reflect different target outputs.

The Plan and EIS will guide all subsequent project implementation. Specific project proposals will be tiered to the EIS [40 CFR 1508.28]. Tiering means that, if needed, future environmental documents for projects based on the Plan will summarize or incorporate by reference the issues discussed in this EIS. Environmental documents for those projects will focus on site specific issues, concerns, and opportunities unique to the project. Environmental assessments will not be prepared for projects that have been found to have no significant effects, individually or cumulatively, to either the biological or physical components of the human environment [40 CFR 1508.14], or to have been addressed in other environmental documents, including this EIS.

PLANNING PROCESS

National and Regional Planning

Forest planning occurs within the overall framework of both national and regional planning as structured by the laws and implementing regulations. The National RPA Program sets policy, standards, guidelines, and resource production objectives in response to identified national issues, concerns, and opportunities. The RPA Program also assigns national production objectives (RPA targets) to each Forest Service Region. A Regional Guide establishes management standards and guidelines, addresses regional issues and concerns, and responds to the National Program by distributing RPA Program targets to the individual National Forests. The Southwestern Regional Guide of August 1983 provides this direction for the Forest.

The planning process is a continuously repeating process in that the information from the Forest level flows up to the national level, is incorporated in the RPA

Program, and then flows back to the Forest level. The RPA Program and Regional Guide are updated every five years.

Forest Planning Process

The planning process specified in NFMA regulations [36 CFR 219.12] was followed in development of the plan. The planning process used an interdisciplinary (ID) approach. An ID team was formed of professionals with diverse backgrounds in the physical, biological, economic, and social sciences. The ID team approach ensured that the perceptions and in-depth knowledge of different specialists were integrated into a common management plan.

The NFMA planning process represents a logical, rational and trackable approach to natural resource decision making. The planning actions as described in the NFMA regulations [36 CFR 219.12(b)-(k)] and used in the planning effort are:

- Identification of purpose and need.
- Development of planning criteria.
- Inventory data and information collection.
- Analysis of the management situation.
- Formulation of alternatives.
- Estimation of effects of alternatives.
- Evaluation of alternatives.
- Preferred alternative recommendation (Proposed Action).
- Plan approval.
- Monitoring and evaluation.

The implementing regulations for NFMA [36 CFR 219] require that a number of analyses be done during the planning process in contrast to the requirements for items to be displayed in the Plan. Examples of process requirements are identification of lands not suited for timber production, suitability and potential capability for forage production, probable occurrence of minerals and potential for future mineral development, and an overview of cultural resources. The EIS and Plan are not intended to contain all of the documentation for process requirements. Complete documentation is contained in a number of files and process reports. For example, the Analysis of the Management Situation (AMS) report documents most of the planning process requirements specified in 36 CFR 219.13 through 219.26. Appendix B contains a description of the analytical process used to prepare the Plan.

Planning Records

The documents and files that chronicle the forest planning process are available for inspection at the Forest Supervisor's Office during regular business hours. The planning records contain detailed information and criteria used in

developing the Plan as required in 36 CFR 219.10(h). Planning records are incorporated by reference at appropriate points in the text and appendices of this EIS and Plan.

Coordination of Planning

Planning for management of the Forest is coordinated with other land managers and private landowners. Coordination is a continuous process facilitated by the planning effort described in the EIS and Plan.

There are 167,571 acres of private land within the Forest boundary. Some of these inholdings are small scattered tracts which originated as homesteads and others are larger tracts which may have been the result of past land exchanges or lands which were not available when the Forest was proclaimed.

Notification of private landowners was attempted through press releases in local newspapers within the zone of influence and through business reply mailers sent to local postal patrons within the zone. As a result of these efforts, many of the landowners became involved in the planning process.

The Mescalero Apache Tribe occupies a reservation which separates one of the Forest's four Ranger Districts from two others (See Vicinity Map in front of this document). The Tribe was notified during the initial public involvement programs. Follow-up letters were sent requesting any comments they might have regarding the planning effort. Meetings were held with tribal leaders of the Mescalero Apache Tribe.

The Mescalero Apache Indian Reservation contains 460,225 acres and the tribe has a population of approximately 2,080. Tribal use of the Forest is limited to the operation of the Ski Apache Ski Area. The Forest is available and convenient for use by Tribal members for recreational and other activities, but the amount of use is unknown. The Mescaleros have four mountain peaks that are significant to them. None of these peaks are located on the Forest. No other traditional or sacred places which might affect Forest programs are currently known to exist on the Forest.

In addition, the Regional Forester sent a letter to the pueblos of Acoma, Cochiti, Isleta, Jemez, Laguna, Nambe, Picuris, Pojoaque, Sandia, San Felipe, San Ildefonso, San Juan, Santa Ana, Santa Clara, Santa Domingo, Taos, Tesuque, Zia and Zuni informing them of the planning process. All the pueblo governments were asked to comment on the planning process and to meet with Forest Service representatives to discuss concerns.

Numerous Federal, State, county, and local agencies in the area were contacted during the initial public involvement phase, which started on March 15, 1980, and coordination has continued since that time.

Personal contacts were made with representatives of several agencies to review and discuss their planning efforts. These contacts were to identify potential areas of coordination or conflict between the Forest Plan and plans of other agencies. Contacts were made with:

- The Bureau of Land Management (BLM), which as a cooperating agency, conducted a joint study evaluating BLM administered lands that are adjacent to the Forest in the Guadalupe Mountains for wilderness designation. This joint study was terminated when the BLM lands were withdrawn from wilderness consideration on December 30, 1982.

- New Mexico State University, Las Cruces, to request a study of off-road vehicle (ORV) use and management.

- New Mexico Game and Fish Department to develop a list of indicator species, population projections for deer and elk, wildlife standards and guidelines, projections of demand for hunting and fishing, and land management planning (LMP) process.

- U.S. Fish and Wildlife Service to develop a list of indicator species and management prescriptions for threatened and endangered species.

- New Mexico Game and Fish Department concerning their desire to increase game species numbers and the need to consider ORV closures to protect wildlife habitat. Continued protection of threatened or endangered species was of interest to both the Forest and the Department.

- U.S. Fish and Wildlife Service, which was interested in the Forest's threatened and endangered species program, to discuss the protection being given to these species.

- Mescalero Apache Indian Tribe to discuss timber management, management of insects and diseases, and the proposed expansion of Ski Apache, formerly called Sierra Blanca Ski Area.

Appendix A provides a complete list of agencies, tribes, and organizations contacted and the results of these contacts.

Planning Area

The Forest is an administrative unit of the Southwestern Region of the Forest Service, U.S. Department of Agriculture. It consists of 1,103,495 acres of National Forest System land divided into four ranger districts; Smokey Bear; Cloudcroft; Mayhill; and Guadalupe (see Vicinity Map in the front of this document). The use of the administrative unit as the planning area for the Forest Plan is permissible under 36 CFR 219.4 (b) (3).

The Forest lies within Lincoln, Otero, Chaves, and Eddy counties of New Mexico. Communities within and adjacent to Forest boundaries are included in the Forest's social and economic sub-areas (see Chapter 3). The rapidly growing metropolitan area of El Paso, Texas, is located less than 100 miles south of the Forest. Other large population centers whose inhabitants use the Forest for economic and recreation purposes include; Artesia, Carlsbad, Hobbs, Las Cruces, and Roswell, New Mexico; Lubbock, Midland, and Odessa, Texas; and Juarez, Mexico. Approximately 3 million people reside within this general area although only 154,000 live in the four-county area where the Forest is located.

PUBLIC ISSUES

Issues Development

National Forest System planning has an important function beyond meeting requirements of the RPA and NFMA. Planning is a logical and conceptual approach to problem-solving. Planning identifies problems and sets a course to resolve those problems. The first phase in this process is to define the problem clearly through identification of public issues and Forest Service management concerns.

An "issue" is a subject or question of widespread public interest relating to management of the National Forest System lands, and is determined through public participation. A "management concern" is an issue or problem relating to National Forest management which has been identified by Forest Service personnel. Once the issues and concerns were identified they were no longer distinguished; both are referred to as issues and are treated identically in the planning process.

The public involvement program concentrated on identification of significant issues, concerns, and opportunities (ICO's). A preliminary list of issues was developed by the Forest and incorporated into a brochure and response form. The brochure was mailed to approximately 4,400 members of various publics. There were 432 brochures returned with 2,800 individual comments. The analysis of this mailing gave the planning team a list of issues which were of most concern to the public.

A second brochure was developed based on the results of the first mailer. The intent was first to inform the public of the decision process and to display tentative decision criteria and secondly to have the public express the level of their satisfaction with management of the Forest. This second brochure was mailed to the same list of people as the first. Additionally, eight public meetings were held requesting the same information. The public meetings were attended by approximately 200 people, and the response to the second mailing was 430 returned brochures. The list of issues to be resolved from both public mailings were merged into one, and the issues were placed into similar categories. This list was then merged with management concerns identified by the Forest management team and was the basis for the issues and concerns which the Forest Plan addresses.

Formal and informal levels of consultation have been maintained with Federal, State, and local government entities. A concerted effort has been made to coordinate with New Mexico Department of Game and Fish to incorporate their State Comprehensive Plan objectives into Forest planning.

There has been continued dialogue with interest groups, particularly local representatives of the timber industry and recreation organizations.

A cooperative agreement called for joint analysis by the Forest Service and BLM of the Further Study Areas from The Roadless Area Review and Evaluation (RARE II) and the BLM Wilderness Study Areas. The New Mexico Wilderness Act of 1980 disposed of all Further Study Areas on the Forest except the Guadalupe Escarpment Wilderness Study Area (WSA), which is addressed in the Forest Plan.

The BLM Wilderness Study Areas were removed from the Forest planning effort in December of 1982 as a result of a decision by the Secretary of the Interior to remove them from the Wilderness Study Area effort, but were reinstated on December 16, 1985, in order to comply with the decision handed down by the U.S. District Court for the Eastern District of California (Sierra Club v. Watt).

Documentation of the public involvement process, including public comment, is available for review at the Forest Supervisor's Office in Alamogordo.

Appendix A contains a detailed description of the formulation of issues, concerns, and opportunities.

Issues Addressed

Issues are described below. They establish a scope of the EIS [40 CFR 1501.7 and 1508.25].

1. Produce Timber and Wood Fiber:

   "A sustained yield level of sawtimber and other timber products has not been confirmed for the Forest resulting in an inability to clearly establish an allowable cut. The timber resource on the Lincoln exists in an uneven distribution of age classes with a disproportionate amount of immature sawtimber. This disproportion among age classes complicates the scheduling of non-declining even flow of timber products from the Lincoln which is essential for maintaining a viable local milling operation."

   "Demand for fuelwood from the Forest is rapidly expanding. This expansion will require increased management and harvest of woodland species for which the Forest has incomplete inventory information; only rough, unproven silvicultural techniques; insufficient management funding; and inadequate access."

2. Manage and Utilize Range Resources and Improve Range Grazing:

   "A [significant] moderate percentage of the range land is in unsatisfactory condition frequently resulting in watershed degradation. Wildlife and domestic livestock are often in competition for the same forage. Grazing capacity has not been fully defined in relation to other resource values. The Forest has a large number of small grazing permits which complicates implementation of effective grazing management systems."

3. Manage Fire to Improve and Protect Resources:

   "The Forest has had a history of large disastrous man-caused fires which have resulted in property and resource damage. The risk of more of these fires is related to increased numbers of improvements and activities. The present fire program appears to be inefficient in distributing the fire management effort and in recognizing appropriate Forest Service, State and private responsibilities."

4. Adjust Land Ownership as Needed to Support Resource Management Goals:

"Rights-of-way are inadequate to efficiently protect, manage, amd provide for the use of National Forest lands. The ownership pattern makes for inefficient management and creates problems in access, utilities, and unauthorized occupancy."

5. Provide Various Recreation Options:

"Developed recreation demand exceeds current supply. Overuse is occurring on developed and concentrated dispersed areas. Group facilities are inadequate. Recreation development on private land has not been coordinated with uses of public land, resulting in uncaptured opportunities in some cases and unwanted impacts in others."

"Demand for dispersed motorized recreation opportunities is rapidly increasing in numbers and variety. Hunters and other travelers who drive vehicles off of system roads, travelways, and trails are causing unacceptable resource damage. There is a conflict between motorized and non-motorized use on the existing road and trail network."

"Current cave management is not responsive to public demand and is resulting in damage to the caves."

6. Assess Probabilities of Mineral Exploration and Development for Immediate and Future Needs, and Consider Non-Renewable Resources in the Management of Renewable Natural Resources:

"The Forest has a number of dangerous abandoned mine workings.

"A Wilderness Study Area was established to provide time to assess its oil and gas potential. Exploration and development is complicated by the need to prevent damage to cave resources also located in the area."

7. Construct, Operate, and Maintain Transportation Facilities:

"There is a lack of understanding between the Forest and other agencies about jurisdiction of existing roads which complicates their operation and maintenance. The Forest lacks clear resource-based standards and guidelines for transportation system management, resulting in inconsistent or inefficient expenditure of funds, damage to the facilities, and resource damage."

8. Provide for Various Wilderness Management Options:

"A wilderness or non-wilderness recommendation needs to be made on the Wilderness Study Area."

9. Law Enforcement:

"A public issue was expressed that the Lincoln is not consistently, or uniformly, enforcing rules and regulations. This problem was perceived to be Forest-wide and of particular concern were occupancy, grazing, and vehicular trespass, and fuelwood theft."

10. Regional/Local Users:

"A noticeable issue among the Lincoln's public is the contrast in proprietary interests between regional (largely West Texas) users of the Forest and local citizens who are both users and residents."

11. Insects and Diseases:

A significant portion of the Forest is infected by dwarf mistletoe, or is susceptible to damage caused by the western spruce budworm. Dwarf mistletoes cause growth reduction and mortality in infected trees. Western spruce budworm causes defoliation and kills trees or parts thereof. The effects of these pests limit the Forest's ability to attain resource objectives.

Table 2 in the next chapter displays how the planning issues are addressed by the Proposed Action and the alternatives. These issues also help to determine which effects need to be discussed in Chapter 4 (Environmental consequences).

READER'S GUIDE

This Reader's Guide is provided to assist the reader in understanding what information is presented in subsequent chapters of the EIS. To thoroughly comprehend the implications of the EIS, the reader is asked to completely read the remainder of this document.

Chapter 2

Alternatives Including the Proposed Action. This chapter is based on information and analysis presented in Chapter 3 and Chapter 4. It describes the objectives of alternatives and presents costs, outputs, and important environmental impacts in comparison form in order to display the extent to which each alternative resolves issues and produces goods and services.

Chapter 3

Affected Environment. This chapter describes the environment of the area affected by the Forest Plan, including the physical and biological setting, the socioeconomic setting, and current resource situation and management for specific resources.

Chapter 4

Environmental Consequences. This chapter discloses the environmental impacts of all alternatives, any adverse environmental effects which cannot be avoided should the Proposed Action be implemented, the relationship between short-term uses of the environment and maintenance and enhancement of long-term productivity, and any irreversible or irretrievable commitments of resources which would be involved in the Proposed Action should it be implemented.

Chapter 5

List of Preparers. This chapter lists people who were primarily responsible for preparing the EIS, or significant background papers.

Chapter 6	Consultation With Others. This chapter lists the businesses, industries, conservation organizations, federal agencies, Indian Tribes, individuals, local governments and/or officials, State agencies and/or officials, and others that received the EIS and Plan or the Summary document of the EIS.
Chapter 7	References. A list of references pertaining to various aspects of the planning process, used in developing alternatives and environmental impacts.
Glossary	Provides an alphabetical listing of special terms or words and their definition.
Appendix A	Presents a chronology of public involvement activities which were used to develop the issues addressed. It also includes criteria for issue development, a listing of the various publics contacted and/or consulted, a listing of the issues, and a display of issue resolution by each of the alternatives considered in detail.
Appendix B	Describes the analysis process used in developing the alternatives. It focuses attention on the quantitative methods used to perform the analysis.
Appendix C	The Guadalupe Escarpment Wilderness Study Area, a technical report. This report evaluates the environmental consequences of both wilderness and non-wilderness designation of the Forest's wilderness study area and BLM's three wilderness study areas adjoining it in relation to protection of cave resources and determination of oil and gas potential.

Table 1 lists the resources, uses, and activities evaluated and displayed in the Plan and DEIS. These items appear as headings for topics discussed in Chapter 2, Chapter 3, Chapter 4, the Appendices, and form the basis for all evaluation. They were developed from the issues and regulatory requirements in 36 CFR 219 and 40 CFR 1500-1508 to help the reader understand what is discussed in Chapters 2, 3, and 4. The listed items and units of measure have been used consistently throughout the document to enable the reader to relate one chapter with another as well as trace specific issues and opportunities through the document. The relationship between the item and ICO or regulation has also been listed in the table.

For example, one item in the table is downhill skiing. Recreation visitor days (RVD) and ski area capacity in people at one time (PAOT) are listed as units of measure for evaluating downhill skiing. The reader will see a comparison of the number of RVDs and PAOT capacity for each alternative in Chapters 2 and 4 and the existing RVDs and PAOT capacity in Chapter 3.

It was sometimes difficult to decide under which heading to put a discussion. Many items are interrelated and could be discussed in several places. However, to minimize duplication, most items are only discussed once and are placed under the most appropriate heading.

The issues, opportunities, and regulatory requirements in 36 CFR 219 are addressed in Chapters 2, 3 and 4. A summary of units of measure are used in evaluating and comparing alternatives in relationship to issues, opportunities and regulations, are as follows:

Table 1. Reader's Guide

Headings and Evaluation Items Used In Chapters 2, 3, & 4	Unit of Measure	Connection to ICO's & 36 CFR 219, 40 CFR 1500
Recreation		
Developed Recreation	Recreation Visitor Days (RVD) people at one time (PAOT) & demand satisfied, narrative	CFR 219.21 Recreation Issue
Downhill Skiing	RVD, PAOT and narrative	
Dispersed Recreation	RVD, recreation opportunity spectrum (ROS), acres, narrative	
Off-Road Vehicle Management	Miles of system roads and trails and narrative	CFR 219.21(g)
Visual Resource	Visual quality objectives (VQO) acres, narrative	
Cultural and Historic Resource	Narrative	CFR 219.24(all)
Caves	RVD and narrative	
Trails - User Conflict	Miles-reconstruction Maintenance Level Designated use PAOT - trailheads	
Wilderness Study Area	RVD, acres and narrative	Recommendation made
Wilderness Opportunity and Management	RVD, acres and narrative	CFR 219.17

Table 1. Reader's Guide (con't)

Headings and Evaluation Items Used In Chapters 2, 3, & 4	Unit of Measure	Connection to ICO's & 36 CFR 219, 40 CFR 1500
Timber Management Intensity		CFR 219.14-16 CFR 219.27 Timber Issue
Harvest Rates	Millions of board feet (MMBF), acres, basal area, cubic feet, narrative	
Age-Class Distribution	Acres and narrative	
Silvicultural Treatment	Narrative	
Suitable Timber Land	Acres, narrative	
Allowable Sale Quantity	Millions of board feet (MMBF)	
LTSYC and Growth	Narrative and MCF	
Fuelwood Sold	Millions of board feet (MMBF), narrative	CFR 219.15 CFR 219.27 Timber Issue
Range		
Forage Production and Use		CFR 219.20 Range Issue
Range Condition and Trend	Narrative	
Permitted Use	Thousands animal unit months (MAUM) and narrative	
Capacity	MAUM and narrative	
Management Intensity	Acres and narrative	
Improvements	Range improvement investment in dollars	

Table 1. Reader's Guide (con't)

Headings and Evaluation Items Used In Chapters 2, 3, & 4	Unit of Measure	Connection to ICO's & 36 CFR 219, 40 CFR 1500
Wildlife and Fish		CFR 219.19 CFR 219.27
Threatened and Endangered Species	Narrative	
Wildlife Habitat Diversity	State wildlife comprehensive plan goals and narrative	
Management Indicator Species	Populations and narrative	
State Comprehensive Planning Objectives	Narrative	
Wildlife Use	RVD	
Riparian Habitat	Acres and narrative	
Diversity	Narrative	CFR 219.26
Soil and Water		CFR 219.23
Watershed Condition	Narrative and acres	
Soil Loss	Narrative	
Soil and Water Improvement	Narrative	
Minerals		CFR 219.22 Minerals Protection, Issue
Withdrawals and Lease Recommendations	Acres and narrative	
Abandoned Mines	Narrative	
Lands and Use		Lands Issue
Ownership Adjustment	Narrative	
Rights-of-Way	Narrative and miles	
Research Natural Areas	Narrative and acres	

Table 1. Reader's Guide (con't)

Headings and Evaluation Items Used In Chapters 2, 3, & 4	Unit of Measure	Connection to ICO's & 36 CFR 219, 40 CFR 1500
Protection		
Fire Management	Narrative	Fire Issue
Unauthorized Use Theft and Vandalism	Narrative	Law Enforcement Issue
Insects and Diseases	Narrative	Insect and Diseases Issue
Transportation System Management	Narrative and miles	Jurisdiction not established, lack of standards and guides for road managaement issue
Economic and Social Consideration	Narrative, PNV, budget cost, receipts	

2. Alternatives Including the Proposed Action

OVERVIEW

This chapter is the heart of the environmental impact statement (EIS). The Proposed Action, alternatives considered in detail, and alternatives considered but eliminated from detailed study are described. The major environmental impacts associated with the alternatives are presented in comparative form based on information and analysis presented in Chapter 3, Chapter 4, and the Appendix. The comparisons displayed were selected because they address the issues, concerns, and opportunities (issues) described in Chapter 1, and clearly show the major differences between the Proposed Action and the alternatives considered in detail. Also included is a summary of the process used to develop alternatives.

Alternatives described and presented in this chapter address issues in varying degrees. The alternatives display different ways of managing the lands and resources of the Lincoln National Forest. They differ from each other in the land uses and management practices which would occur on different parts of the Forest and in the scheduling of management activities.

Each alternative is a unique combination of management prescriptions and activity schedules applied to the land. As a result, each alternative would generate a different mix of goods and services for the public and a different combination of resource outputs, land uses, and environmental effects.

Space is conserved in tables by abbreviating units of 1,000 with "M". A number such as 1,500 may be displayed as 1.5 M. To calculate the actual number, multiply the number by 1,000 where the "M" notation is used. One million is designated "MM".

REGULATORY REQUIREMENTS

The process of formulating alternatives responded to a number of regulatory requirements. Regulations (40 CFR 1502.14) for implementing the procedural provisions of the National Environmental Policy Act (NEPA) require that agencies:

- Rigorously explore and objectively evaluate all reasonable alternatives, and for alternatives that were eliminated from detailed study, briefly discuss the reasons for their having been eliminated.
- Devote substantial treatment to each alternative considered in detail including the Proposed Action so reviewers may evaluate their comparative merits.
- Include reasonable alternatives not within the jurisdiction of the lead agency.
- Formulate reasonable alternatives which may require a change in existing law or policy to implement, if necessary, to address a major public issue, management concern, or resource opportunity identified during the planning process.
- Include a No Action Alternative.

- Identify the agency's preferred alternative--Proposed Action.

- Include appropriate mitigation measures not already included in the Proposed Action or other alternatives.

In addition, the National Forest Management Act (NFMA) implementing regulations [36 CFR 219.12(f)] provide the following requirements for formulating alternatives:

- Alternatives shall be distributed between the minimum resource potential and the maximum resource potential to reflect to the extent practicable the full range of major commodity and environmental resource uses and values that could be produced from the Forest. Alternatives shall reflect a range of resource outputs and expenditure levels.

- Alternatives shall be formulated to facilitate analysis of opportunity costs and of resource use and environmental tradeoffs among alternatives and between benchmarks and alternatives.

- Alternatives shall be formulated to facilitate evaluation of the effects on present net value, benefits, and costs of achieving various outputs and values that are not assigned monetary values but that are provided at specified levels.

- Alternatives shall provide different ways to address and respond to the major public issues, management concerns, and resource opportunities identified during the planning process.

- At least one alternative shall be developed which responds to and incorporates the RPA Program tentative resource objectives for each forest displayed in the regional guide.

- At least one alternative shall reflect the current level of goods and services provided by the unit and the most likely amount of goods and services expected to be provided in the future if current management direction continues. Pursuant to NEPA procedures, this alternative shall be deemed the "no action" alternative.

- Each alternative shall represent to the extent practicable the most cost efficient combination of management prescriptions examined that can meet the objectives established in the alternative.

- Each alternative shall state at least--the condition and uses that will result from long-term application of the alternative; the goods and services to be produced, the timing and flow of these resource outputs together with associated costs and benefits; resource management standards and guidelines; and the purposes of the management direction proposed.

ALTERNATIVE DEVELOPMENT PROCESS

A broad range of alternatives was formulated by the Interdisciplinary Team (ID Team) using a specific and structured analytical process as required in the planning regulations [36 CFR 219.12(e) and (f)].

Analysis Areas

For analysis purposes the Forest was subdivided into units of land called analysis areas. Analysis areas were identified based on public issues, management concerns, resource development opportunities, biological capability, suitability for management practices, and economic factors. Analysis areas on the Lincoln were defined as two types: 1) contiguous areas to represent the nontimber resource capabilities and 2) noncontiguous areas to represent homogeneous timber resource potentials. The noncontiguous timber areas overlay the contiguous areas and, as such, do not represent separate or additional acres on the Forest.

Analysis areas may contain lands that are subject to laws committing them to specific uses. These prior committments were not changed in any alternative.

These areas are:	Capitan Mountains Wilderness	34,513 acres
	White Mountain Wilderness	48,366 acres

Management Prescriptions

Management prescriptions are combinations of management practices, activities, and standards and guidelines designed to achieve specific multiple-use goals and objectives. Management prescriptions include all the necessary mitigation and resource coordination measures required by laws, regulations, and policies. Different management prescriptions were developed to emphasize individual resource potentials, continue current management, manage at a reduced intensity, and address public issues and management concerns in a variety of ways. A number of possible management prescriptions were developed for each analysis area and are discussed in more detail in Appendix B.

Benefits and Costs

Resource outputs and costs of implementation for all management activities and practices were estimated for each combination of management prescriptions and analysis areas. Refer to Appendix B for a complete listing of the resource outputs and cost categories which were used in the analysis.

Cost estimates for each management prescription were developed from historical records of Forest Service costs. Non-Forest Service costs for private permittee investment necessary to carry out range allotment agreements, and estimated additional timber purchaser costs to harvest timber from steep slopes, were also included in the analysis because of the potentially significant impacts.

The resource outputs that have an existing market and are sold, as well as those resource outputs which could potentially be sold, were assigned benefit values and are called "priced benefits." Timber; firewood; dispersed, developed, wildlife and wilderness recreation; livestock grazing; and water yield were assigned benefit values. All benefit values were based on the point in the production process when the output is removed from the Forest. Refer to Appendix B for a complete listing of the values used.

No attempt was made to assign benefit values to many other outputs such as visual quality, threatened and endangered species, quality of recreation experience, changes in income and employment, or community lifestyles. Outputs of this type produce "nonpriced" benefits that were also considered in the analysis. Some of the nonpriced benefits were considered as constraints or restrictions on the production of priced benefits. The purpose for this was to insure that certain minimum levels of nonpriced benefits were met before production of priced benefits began.

Present Net Value

The priced benefits and the costs of all management practices and activities were used to calculate the present net value (PNV) of each alternative considered in the analysis. PNV is the difference between the present value of the priced benefits and the present value of all costs discounted at a 4 percent interest rate.

Analysis of PNV's is a way to compare several different investment opportunities to see which would provide the best return for the dollar. PNV is calculated from the sum of all of the benefits--the quantity of priced outputs multiplied by the benefit value--minus the sum of all costs necessary to produce the priced and nonpriced outputs. The mechanical process by which all of these dollars are adjusted back to the present year so they can be compared is called "discounting." The discount rate (4 percent) used in forest planning was established by the Chief of the Forest Service.

PNV is a relative indicator of economic efficiency and was used as a means to develop and compare alternatives. The objective in development of each alternative was to maximize PNV; thus, each alternative is the most economically efficient combination of management prescriptions that will achieve a given set of priced and nonpriced goals and objectives.

Net Public Benefits

The NFMA Regulations (36 CFR 219.1) describe the objective of land and resource management planning on National Forest System lands:

> The resulting plans shall provide for multiple use and sustained yield of goods and services from the National Forest System in a way that maximizes long-term net public benefits in an environmentally sound manner.

Since not all costs and benefits can be priced in the analysis, PNV was not the only index used to develop, compare, and evaluate alternatives. Alternatives were evaluated to determine how well they maximized net public benefits. Net public benefits (NPB) is an overall expression of the value to the nation of all outputs and positive effects (benefits) less all associated inputs and negative effects (costs) whether they can be quantitatively valued or not. Net public benefits are measured by both quantitative and qualitative criteria rather than a single measure or index such as PNV. Alternatives having the highest PNV may not always provide the highest net public benefits when nonpriced benefits and costs are considered.

Computer Model

The goal in alternative development was to find the most economically efficient combination of management prescriptions that would achieve a given set of priced and nonpriced goals and objectives. Since there were 33 contiguous analysis areas - each having an average of 8 possible prescription levels, and 36 noncontiguous timber analysis areas - each having an average of 13 possible prescription levels, millions of possible combinations had to be analyzed. This was an impossible job without computer assistance.

A linear programming model called FORPLAN was used as a tool to do the millions of calculations to test possible combinations of areas, prescriptions, and schedules that would maximize economic efficiency (PNV) while meeting the priced and nonpriced goals and objectives specified for a given alternative. Goals and objectives for each alternative were determined on the basis of legal requirements, policies, issues, management concerns, and desired levels of priced and nonpriced benefits and costs.

In some cases, the FORPLAN model indicated the Forest could not be managed to meet some combinations of objectives. The limitations of land and resources, an impact on environmental quality, or the practical limits of budgets often caused an infeasibility. The ID Team then modified the objectives and made other "runs" of the computer model to find the particular combination of lands, activities, and schedules which would best meet the goals of that alternative. FORPLAN solutions were validated by the ID Team to insure that solutions represented implementable options. Because FORPLAN is only an aid for analysis that does not model all components of net public benefits, adjustments in final solutions were made by the ID Team based on professional expertise and prior experience. While the alternatives may not exactly match final FORPLAN solutions, relative differences between alternatives have not been affected. Refer to Appendix B for more detailed discussion of the FORPLAN model, constraints used, and adjustments made to FORPLAN results.

Benchmark Formulation

One phase of the analysis leading to formulation of alternatives was development of benchmarks. A benchmark is an alternative which defines the limits of feasibility for the management and utilization of Forest resources. Benchmarks were designed to emphasize the production of individual resource outputs, to maximize economic efficiency, and to define the least intensive level of management. Benchmarks encompass the range of possibility from which alternatives can be developed.

Many of the first planning actions involved the creation of benchmarks and the inspection of their outputs, costs, and assumptions. Benchmarks are similar to alternatives. They are a combination of land capability, management practices, and schedules to achieve certain objectives for the Forest as a whole. Unlike alternatives, they are usually not fully implementable, because they lack consideration of likely budgets, specific geographic location, and other details. They do provide significant information about the maximum biological and economic production opportunities, and they assist in evaluating the compatabilities and conflicts between market and nonmarket objectives. Benchmarks define the range within which integrated alternatives will be developed.

Some benchmarks are economically based, while others indicate the maximum physical productivity of land for various resources. In these benchmark analyses, each option must include meeting minimum management requirements of 36 CFR 219.27, such as protecting the productivity of the land and meeting minimum air and water quality standards. Benchmarks are further described in Appendix B.

Analysis of the Management Situation

During the Analysis of the Management Situation (AMS), the Forest's current management situation was compared and evaluated against the Forest's potential to supply goods and services as demonstrated by the maximum benchmarks. The Forest's supply potentials are displayed in Chapter 3. The analysis provided a basis for evaluating the need for management changes and developing alternatives. The AMS contains much of the documentation for procedural requirements specified in 36 CFR 219, particularly the requirements to be covered in the planning process.

Alternative Formulation

Appendix B contains greater detail concerning the formulation of alternatives. In brief, the ID Team formulated alternatives by:

- Developing a broad range of prescriptions representing minimum to maximum resource production potentials and expenditures within management requirements designed to protect and enhance long term productivity.

- Formulating benchmark alternatives to define the feasible decision space within which alternatives considered in detail would be developed.

- Defining goals and objectives for tentative alternatives considered in detail based upon the range of outputs determined by benchmarks; issues and concerns to be addressed and opportunities presented; cost efficiency; financial feasibility and nonpriced public benefits.

- Refining tentative alternatives into alternatives considered in detail by analyzing results for achievement of goals and objectives, optimum integration and production, cost efficiency, financial feasibility, and production of public benefits.

ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

This section deals with those alternatives considered and subsequently eliminated from further study. These alternatives were generated as benchmarks, departures from nondeclining timber yield, or as other alternatives considered but not evaluated in detail in the EIS. The reasons they were not considered in detail are presented.

Benchmarks

Because benchmarks define the limits of feasibility, they were considered as potential alternatives and were used as a basis for developing other alternatives. Except for the "no action" benchmark, none of the benchmarks were evaluated in detail in the EIS. The Maximize PNV Assigned Values Benchmark was used as a standard in a number of comparisons between alternatives. Three other benchmarks - the Minimum Level, the Maximum Timber and the Maximum Range Benchmarks, were used for comparisons of the costs and outputs of the alternatives considered in detail. Refer to Appendix B for additional detail on benchmarks and the range of alternatives established by benchmarks.

Minimum Level

The purpose of the minimum level benchmark is to estimate naturally occurring outputs and unavoidable costs of maintaining the Forest as part of the National Forest System. This benchmark enables controllable outputs and discretionary costs to be identified. The minimum level is a Forest-wide management strategy that would meet the following statutory requirements: 1) administration of unavoidable, nondiscretionary land uses; 2) prevention of impairment of the productivity of the land; and 3) protection of the life, health, and safety of incidental users. The sum of these activities defines the long-term fixed costs of public ownership.

The minimum level benchmark was eliminated from further study because it did not conform to existing legislation governing management and use of the Forest, nor did it address issues and concerns. Although eliminated from further study, the benchmark does provide a basis for comparing base costs and benefits with those alternatives considered in detail.

The minimum level was not modeled in FORPLAN. Outputs and costs were estimated by resource specialists outside the model.

Low Budget

The purpose of this benchmark is to determine outputs and costs associated with managing the Forest at a reduced budget level. This alternative was not considered in detail because the level of management does not respond to the issues and concerns. Timber production is reduced to the level needed to maintain a minimum salvage operation. Grazing capacity comes into balance with permitted grazing use at the end of the fifth period, and improvements needed for increasing grazing capacity deteriorate. Recreation developments and wildlife habitat improvements are favored in areas where there is a high return on investments. In other areas, the recreation and wildlife resources are managed at a low intensity level, i.e., recreation facilities are managed at a reduced service level and are closed when they deteriorate below safety standards; wildlife habitat management is limited to that needed to maintain minimum viable populations.

Maximize Single Resources

These benchmarks maximize production of a single resource while maximizing present net value. They were developed for timber, range grazing capacity, recreation, and wildlife habitats. As each single resource was maximized, the other resources generally occurred at low intensity levels or maximum PNV levels. The benchmarks were developed to determine the Forest's potential to produce goods and services and to evaluate the Forest's potential to resolve issues, concerns, and opportunities. They were utilized to guide the formulation and analysis of all alternatives.

Single resource benchmarks were eliminated from detailed analysis because each alternative responded to only a few public issues. Few constraints were placed on the model during the analyses, therefore, combinations of budgets and prescriptions assigned by the model for each of these benchmarks may not represent implementable solutions. NFMA requires that the Forest Plan provide for multiple use and sustained yield of products and services in accordance with the Multiple Use Sustained Yield Act of 1960. Maximizing a single resource does not satisfy this requirement.

Maximize Present Net Value

Three benchmarks were modeled which maximize PNV. The first maximized PNV for resources with market values (timber products, fuelwood, permitted livestock use and developed recreation RVD's)--Max PNV Market. The second benchmark, Max PNV Assigned Values, maximized PNV for resources with market values as well as those with assigned values for dispersed, wildlife, and wilderness recreation visitor days (RVD's). The third PNV benchmark, Max PNV Assigned Values with Sequential Lower and Upper Bounds (SLUB) on timber harvest volume, was determined the same as the second PNV benchmark except for the addition of the SLUB constraint. The purpose of the SLUB constraint was to allow a 25 percent decrease in timber harvest volume between decades.

The Max PNV Assigned Values Benchmark without the SLUB constraint is used as a comparison in the Economic Factors and Present Net Value Tradeoff sections of this chapter.

The Max PNV benchmarks were not considered in detail because these alternatives met only the cost efficiency criteria. The Max PNV Assigned Values benchmarks emphasize recreation and wildlife outputs to the detriment of the timber and grazing resources because of the high assigned value for wildlife recreation and the high rate of return on recreation investments. Timber insect and disease problems receive no attention, and grazing capacities are not balanced with

permitted use until the fourth period. The Max PNV Market benchmark emphasized developed recreation only. Other resources were managed at the least intensive levels. Soil and watershed conditions are not addressed.

Woodland Commodity Emphasis

The objective of this alternative was to develop the pinyon-juniper (PJ) woodland areas for fuelwood production to meet the growing demand for fuelwood. After reviewing the benchmarks it was determined that the demand for fuelwood could be more efficiently met by selling the residual wood from commercial timber harvest and thinning activities.

Increased Water Yield

The demand for water in surrounding communities is expected to increase with the growth in population. Increasing water yield from the Forest was considered and modeled, but analysis revealed that although water yield could be increased by about 39 percent above the current level, the management strategies that would be required to do so were considered to have significant and unjustified adverse environmental impacts. Over half of the timber land acres would have to receive large patch cuts or be heavily cut (to growing stock levels of 30 or 40) every decade in order to provide additional water yields. The ground-disturbance from this activity would cause excessive soil erosion and reduced water quality from siltation and debris-clogged streams. Productivity of soil for timber or forage growth would be decreased and visual quality of the forested lands would be severely impaired. These adverse environmental effects could be reduced by limiting the watersheds where clear cutting and patch cutting would be permitted, and by limiting the extent of clear cuts to no more than 15 percent of the watershed. Management constraints to reduce environmental effects to acceptable levels, however, result in only small increases in water yield. These increases are estimated to be approximately 8,000 to 10,000 acre-feet. This increase would be spread over many watersheds and not result in detectable increases to groundwater or surface water supplies. Because of the limited opportunities to produce increased water in environmentally sound ways, prescriptions for water yield increases were not considered further.

High Recreation Quality Emphasis

Costs required to provide all of the desired recreation facilities and improvements to existing sites would be prohibitive and other forest resource opportunities would have to be foregone in order to manage the recreation resource for highest quality. This alternative was considered but eliminated from detailed study. A few of the alternatives considered in detail offer increased emphasis on recreation management while providing for the timber and range resource as well.

Uneven-aged Timber Management

An uneven-aged management alternative was considered, but not in detail. Both even-aged and uneven-aged management systems were evaluated for Southwestern Forest types in the Southwestern Regional Guide. Silvicultural characteristics, shade tolerance, reproductive characteristics, existing stand structure, and incidence and susceptiblity to insects, disease and windthrow were all considered in determining appropriate management systems for each forest type. After all factors were considered, even-aged management systems were selected as most appropriate for forest types in the Southwestern Region. Even-aged management is especially needed for treatment of the heavily infected dwarf mistletoe stands and stands susceptible to spruce budworm outbreaks on the Lincoln National Forest. Uneven-aged management was determined to be most appropriate for use in special management areas to meet certain Forest objectives, e.g., for providing and perpetuating old growth conditions for wildlife.

Departure Alternative

A departure from a non-declining yield of timber harvests over time was considered unbeneficial, primarily because it would not improve the age-class imbalance problem on the Forest and would not allow adequate treatment of timber stands for insect and disease control while meeting other resource objectives. Further discussion of this alternative is provided in the Departure Analysis section of Appendix B.

ALTERNATIVES CONSIDERED IN DETAIL

Each of the alternatives considered in detail meets the requirements of the NFMA regulations and provides goods and services at a level responsive to all or part of the issues while maximizing present net value. Some issues include nonpriced resource management problems. Each of the alternatives addresses these problems in ways that are consistent with the management emphasis of the alternative and also provide positive net public benefits. Appendix B describes the model constraints used in formulating the alternatives considered in detail and the benchmarks. Not all of the public benefits could be modeled, but are described at the end of the Comparison of Alternatives section of this chapter.

The following objectives are common to all alternatives:

- The minimum legal management requirements specified in 36 CFR 219.27 were met in accomplishing goals and objectives of the alternative and include:1) protection of the soil and water resource, 2) maintenance of wildlife habitat to assure viable wildlife and fish populations, and 3) maintenance of the T&E species habitat.

- The timber harvest requirements specified in 36 CFR 219.16(a)(1), (a)(2)(iii), and (a)(2)(iv), i.e., nondeclining yields on harvest volume with sales not greater than the long-term sustained-yield capacity, harvest of even-aged stands at or beyond the culmination of mean annual increment, and sale schedules that provide for perpetual timber harvests (ending inventory constraint), were met in all alternatives.

- All alternatives recommend the establishment of three Research Natural Areas: 1) William G. Telfer Area near the Sierra Blanca Ski Area is 727 acres and features the corkbark fir ecosystem, 2) Upper McKittrick Area in the Guadalupe Mountains is 827 acres and features the mountain mahogany ecosystem, and 3) Haynes Canyon Area in the former Cloudcroft Experimental Forest is 610 acres and features the white fir timber type.

- All alternatives provide for a sustained regeneration of aspen stands by clearcutting 710 acres of aspen per decade. This allows for an average rotation age of 60 years.

- All alternatives provide for maintenance of wilderness quality in the wilderness study area until Congress acts on the recommendation.

- All alternatives provide for continuation of existing electronic sites and power corridors.

Issues developed during the scoping process and the response to objectives assigned in the Regional Guide are addressed differently in each alternative. These differing emphases are reflected in the varying mix of management

prescription assignments among alternatives. The Proposed Action, RPA, and the No Action alternatives are identified.

The location of prescription assignments for the Proposed Action and other alternatives is illustrated on maps in the packet which accompanies this document. Appendix B describes the management areas (analysis areas).

Range of Alternatives Considered

The alternatives considered were developed within the resource production levels, both minimum and maximum, established by the benchmarks. The base levels for the nontimber resources were established from the Max Timber-Minimum Cost Benchmark, which applied low intensity prescriptions to all analysis areas. The minimum level for timber production was established from the Max PNV-Assigned Value Benchmark, which produced timber only to meet a minimum wildlife requirement. The requirement was for perpetuation of old growth conditions on a certain area of the Forest, and the management strategy called for selective cutting to promote growth of large trees. Subsequent alternatives provided outputs at or above these base levels. The maximum single resource benchmarks provided the upper limits of the decision space for resource outputs. As objectives for alternatives were formulated, output levels for each resource were determined by consulting the range of outputs established by the benchmarks. Limits for each resource were specified by alternative to insure outputs fell within the range of decision space established by benchmarks. The alternatives considered represent a broad range of reasonable alternatives.

PROPOSED ACTION (PREFERRED) ALTERNATIVE

The Proposed Action was designed to resolve major issues and management concerns with a mix of both market and nonmarket uses and outputs. Emphasis is on developed recreation, Wilderness land and trail management, and wildlife habitat improvements in high-use areas of the Forest. Timber in high-use areas is managed to protect resource values from losses caused by insects and diseases. Overall, timber is produced at higher than current levels to apply better silvicultural tehcniques to large portions of the timber lands. Other resources are produced at moderate levels.

Recreation and Trails

Forest-wide, the recreation opportunity (ROS) spectrum is 0 percent primitive, 17 percent semiprimitive nonmotorized, 63 percent semiprimitive motorized, and 20 percent roaded. These ROS proportions will be maintained. Vehicle use will be permitted on Forest roads and trails only. Standard service level maintenance will be provided for all but two of the developed recreation sites and for about 75 percent of the widely-used dispersed areas. About 15 percent of the Forest maintained trails will receive low level maintenance and the rest will receive moderate to high maintenance depending on use levels and trail condition. Trails in the two existing Wildernesses and the Wilderness Study Area will be maintained at a moderate level to provide a semiprimitive recreation opportunity. The RIM and OSHA trails will be maintained at high trail standards. Expansion of the Ski Apache and Ski Cloudcroft areas is planned. One new ski area, two new winter sports areas, eight new campgrounds of which five are group campgrounds, two campground reconstructions, eight trailhead improvements and about four facility rehabilitations or improvements are scheduled. About 120 miles of trail can be added to the maintained trail system through the volunteer 'Adopt-A-Trail' program. Visitor information programs will be expanded and access to the Forest improved.

Wilderness

The Guadalupe Wilderness Study Area (WSA) is recommended for nonwilderness. Withdrawal of the area from mineral leasing will be recommended to provide for inventory, protection and interpretation of the cave resource. The PA provides for increased use and enjoyment of the cave resources along with increased management and protection.

Visual Quality

Visual quality objectives are maintained at current levels. Visual quality objectives are for 40 percent retention or partial retention, 50 percent modification or maximum modification and the remaining 10 percent preservation. The latter is on existing wildernesses and the WSA. Forest management activities that have the greatest impact on the visual resource, such as road construction and timber harvesting, will occur primarily on areas classified as modification or maximum modification.

Cultural Resources

Cultural resource inventory will be directly related to the number of project acres involving ground disturbance. In addition, an average of 375 acres per year of non-project related surveys will be conducted. Annual objectives include approximately 5550 acres to be surveyed and two sites to receive direct protective measures. In each of the first five years, two sites will be nominated to the National Register, and one site will be nominated in each of the following years. During each decade, a minimum of one site will receive interpretive efforts and a minimum of one site will be stabilized to prevent deterioration.

Wildlife & Fish

Present elk range contains 43 percent forage and 57 percent cover, Forest-wide. After 50 years, the Forest-wide forage/cover ratio does not approach the optimal ratio of 60/40. Forage decreases 7 percent and cover increases 20 percent to provide a ratio of 37/63. Most of the intensive timber management activity, however, occurs on the Sacramento Division in an area that provides the majority of the Forest's elk range. The intensive timber harvesting may provide increased forage and more optimal forage/cover ratios in this area during the next 30 years. The effect of these localized management activities on the primary elk range is expected to offset the unfavorable Forest-wide change in the forage/cover ratio. Part of the elk winter forage is in the mountain grasslands. Range management of the grasslands in poor condition provides improvement and a doubling of the grassland forage base after 20 years.

Presently, mule deer summer range has a forage/cover ratio of 61/39. Timber growth over the next 50 years causes the ratio to shift from optimal to 44/56 as cover increases and forage decreases. Mule deer winter range does not improve due to the low proportion of PJ in suitable cover condition. Squirrel and turkey habitat in mature mixed conifer stands increases 38 percent. Habitat for pygmy nuthatch in mature ponderosa pine areas increases 3.5 times. Habitat capability for Mexican vole increases about 120 percent.

Old growth conditions are promoted on about 17,400 acres through silvicultural prescriptions. By the end of the fifth period about 32,000 acres of mixed conifer will have old growth characteristics. Overall, direct habitat improvement and maintenance expenditures are scheduled to be about 45 percent of the maximum wildlife benchmark level. This allows intensive wildlife management to be applied to 27 percent of the Forest.

Range

Permitted livestock grazing use is brought into balance with grazing capacity during the third period. This is accomplished by reducing current use 8 percent over two decades and increasing capacity 20 percent. Intensive management is applied to only 2 percent of the suitable range land and moderately intensive management to 9 percent. Overall, the total maintenance and improvement expenditures are scheduled to be lower than current management levels. Allowable grazing use should be about 3 percent above present levels by the end of the fifth period.

Timber

Timber lands near high-use recreation areas of the Sacramento Mountains are managed to protect resources from losses caused by dwarf mistletoes and spruce budworm infestations. Budget and soil protection constraints limit intensive treatment to 18 percent of the mixed conifer acres in the Sacramento Division, however, additional acres of mixed conifer and ponderosa pine receive silvicultural treatments to provide more disease resistant stands and improve the age-class distribution.

Approximately 47 percent of the tentatively suitable timber land is allocated to even-aged management, of which 3 percent is in the aspen type. Seven percent is allocated to uneven-aged management for the purpose of providing old growth conditions for wildlife. About 76 percent of the aspen is managed to perpetuate the aspen ecosystem.

The allowable sale quantity for the first period is 16.0 MMBF per year, which includes sawtimber and wood products. This is 90 percent above the sale level of the past 10 years. Sawtimber production remains constant through the fifth period. The cable logging method is scheduled to provide 1.5 MMBF/yr of sawtimber from steep slopes. No timber will be harvested from the Lincoln Division in the first period. Removal cuts, intermediate cuts and selection cuts account for 35, 56 and 8 percent, respectively, of the acreage harvested in the first period. There is also a small acreage of clear cuts.

Fuelwood provided from the managed timber land is about 2 1/2 times the amount currently sold. Fuelwood from the PJ woodland type is provided at levels 20 percent below the present level sold, and the allowable harvest volumes are distributed to areas of the Forest that can sustain the harvest level with the present road access.

Economic Values

The Proposed Action includes a budget constraint of $5.33 million per year for the first decade. Annual expenditures in the first decade are approximately $5.3 million (12 percent above current level) and $5.4 million in the second decade. Annual receipts are $1.3 million in the first decade. When assigned values for recreation, wildlife and livestock grazing are included, the total annual benefits in the first decade are $16.4 million.

Discounted costs are $181 million and discounted benefits are $541 million. The distribution of discounted costs is:

Administration/Other	19 percent
Timber management	18 percent
Recreation/wildlife	14 percent
Range management	6 percent
Protection	35 percent
Roads/FA & O	8 percent

The distribution of discounted benefits is:

Timber Sales	4 percent
Recreation/wildlife/water	88 percent
Livestock grazing	8 percent

The net value of the Forest is $360 million or 87 percent of the potential value. The primary reasons for the foregone investment opportunities are objectives to manage the timber in the high-use recreation areas of the Sacramento Mountains to protect the resource from losses due to present insect and disease infestations; provide better fire protection; and provide additional services to recreation visitors through expanded public information and law enforcement programs, increased trail maintenance, and more rapid resolution of Forest access problems.

ALTERNATIVE A (NO ACTION)

This alternative was designed to continue the current program consistent with existing management plans, policies, standards and guidelines; and provide resource outputs consistent with current budget levels. Timber production increases slightly. Most of the recreation facilities are maintained at less than standard level, exceptions being the user fee sites. Several other programs are managed at a less than standard service level. These include direct wildlife habitat improvements, ROW acquisitions, land exchanges, and wilderness management.

Recreation and Trails

Forest-wide the recreation opportunity spectrum is 0 percent primitive, 17 percent semiprimitive nonmotorized, 63 percent semiprimitive motorized, and 20 percent roaded. The ROS will be maintained in those proportions. Vehicle use will be permitted in all areas of the Forest, except areas signed closed. Standard service level maintenance will be provided for the developed recreation fee sites. All other sites will receive less than standard service level. All trails will receive low level maintenance. Expansion of Ski Apache and Ski Cloudcroft is planned. One new campground, one new picnic area and one campground reconstruction are scheduled. No new trails will be added to the existing system.

Wilderness

The Guadalupe Escarpment Wilderness Study Area is recommended for nonwilderness designation. No additional land is recommended for wilderness.

Visual Quality

Visual quality objectives are maintained at current levels. Visual quality objectives are for 40 percent retention or partial retention, 50 percent modification or maximum modification and the remaining 10 percent preservation. The latter is on existing wildernesses and the WSA. Forest management activities that have the greatest impact on the visual resource, such as road construction and timber harvesting, will occur primarily on areas classified as modification or maximum modification.

Cultural Resources

Cultural resources inventory will continue at its current level. All project acres involving ground disturbance will be surveyed. In addition, an average of 375 acres per year of non-project related surveys will be conducted. Annual objectives include approximately 4775 acres to be surveyed and two sites to receive direct protective measures. In each of the first five years, two sites

will be nominated to the National Register, and one site will be nominated in each of the following years. During each decade, interpretive efforts will be conducted at a minimum of one site, and at least one site will be stabilized to prevent deterioration.

Wildlife & Fish

Elk forage decreases, except in the mountain grassland which doubles in two decades. Elk cover increases about 25 percent, but the forage/cover ratio does not improve Forest-wide. Elk calving cover increases slightly. Squirrel and turkey habitat in mature mixed conifer stands increases about 30 percent. Old growth conditions are promoted on about 19,000 acres through silvicultural prescriptions. By the end of the fifth decade about 26,000 acres in mixed conifer will have old growth characteristics. Mexican vole and pygmy nuthatch habitat capability will be increased about 120 percent and 130 percent respectively over existing conditions. Riparian habitat improves slightly due to the moderate reduction of grazing use on unsatisfactory areas. All areas of the Forest receive the current management level of direct habitat improvements. Total expenditures are scheduled to be about 19 percent of the maximum wildlife habitat benchmark level.

Range

The objective is to continue range management at current levels, raising grazing capacities where possible through permit reductions and providing moderate levels of range improvements. All areas of the Forest receive maintenance at current levels, which are about 20 percent of the optimal level. Range improvements are provided at about half the maximum range benchmark level. Permitted grazing use is brought into balance with grazing capacity during the third period. By the end of the fifth period grazing capacity is increased 36 percent and permitted use is increased 7 percent from present levels.

Timber

The objective is to maintain timber production at the current level and use intensive or moderately intensive management practices to regenerate even-aged conifer stands. Of all the tentatively suitable timber land, 34 percent is allocated to even-aged management, of which 4 percent is in the aspen type, and 7 percent is allocated to uneven-aged management for the purpose of providing old growth conditions for wildlife. Seventy-six percent of the aspen type is managed to perpetuate the aspen ecosystem.

The first period allowable sale quantity is 13.1 MMBF per year, which is 56 percent above the average sale level of the past 10 years. The first period sawtimber level is 28 percent above the RPA target. Two MMBF per year is scheduled to be harvested with the cable logging method. No timber will be harvested from the Lincoln Division in the first decade. Removal cuts, intermediate cuts, selection cuts and clear cuts account for 27, 46, 26 and 1 percent, respectively, of the acreage harvested in the first decade.

Fuelwood provided by the managed sawtimber land is about twice the level currently sold. Fuelwood from the PJ woodland is provided at a level that exceeds the estimated long-run-sustained-yield on certain areas of the Forest, given present road access. The PJ volume is about 40 percent higher than that currently sold.

Economic Values

Alternative A (No Action) includes a budget constraint of $4.965 million per year for the first and second decades. Annual expenditures are approximately $4.7 million (the present level) in the first decade and $4.9 million in the second decade. Annual receipts are $1.1 million in the first decade. When

assigned values for recreation, wildlife and livestock grazing are included, the total annual benefits in the first decade are $15.6 million.

Discounted costs are $183 million and benefits are $456 million. The distribution of discounted costs is:

Administration/Other	18 percent
Timber management	15 percent
Recreation/wildlife	6 percent
Range management	7 percent
Protection	46 percent
Roads/FA & O	8 percent

The distribution of discounted benefits is:

Timber sales	4 percent
Recreation/wildlife/water	86 percent
Livestock grazing	10 percent

The net value of the Forest is $273 million or 66 percent of the potential value. The primary reasons for the foregone investment opportunities are objectives to harvest the present level of sawtimber at intensive and moderate management levels; provide two MMBF of sawtimber per year for cable logging; provide not less than current levels of range management on all areas of the Forest; and provide better fire protection than the Max PNV Benchmark.

ALTERNATIVE B (RPA)

Alternative B is designed to provide outputs at levels that meet or exceed the targets assigned to the Forest in the Regional Guide. These targets were developed for the 1980 RPA Program. The targets that must be met by this alternative are displayed in Table 87 for the first and fifth periods. Issues, concerns and opportunities are generally comprised of local, regional and national topics. Targets were not assigned for support activities, such as acres for reforestation and timber stand improvement, in order to allow production of the primary outputs at the least cost.

Recreation and Trails

The recreation opportunity spectrum will be maintained at the present proportions and are the same as PA and A above. Vehicle use will be permitted on Forest roads and trails only. Standard service level maintenance will be provided for the developed recreation fee sites and about 1/3 of the dispersed areas. Most (87 percent) of the Forest maintained trails will receive low to moderate level maintenance. The Rim and OSHA Trails will be maintained at high maintenance levels. Expansion of Ski Apache and Ski Cloudcroft is planned. One new ski area, one new winter sports area, six new campgrounds, one campground reconstruction, four trailhead improvements and about five facility expansions or improvements are scheduled.

Wilderness

No additional land is recommended for wilderness. The Guadalupe Escarpment Wilderness Study Area and about 10,000 acres adjacent to it are recommended for designation as a Special Geologic Area. The special area designation would provide for inventory, protection, and interpretation of the cave resource. The alternative provides for use and enjoyment of the cave resource along with an increased level of protection.

Visual Quality

Visual quality objectives are the same as Alternative A.

Cultural Resources

Cultural resource inventory will be directly related to the number of project acres involving ground disturbance. In addition, an average of 375 acres per year of non-project related surveys will be conducted. Annual objectives include approximately 5000 acres to be surveyed and two sites to receive direct protective measures. During each of the first five years, two sites will be nominated to the Natinal Register, and one site will be nominated in each of the following years. During each decade, interpretive efforts will be conducted at a minimum of two sites, and at least, one site will be stabilized to prevent deterioration.

Wildlife and Fish

Elk cover increases about 15 percent. Elk forage remains the same, except for an increase in mountain grasslands. Forest-wide, the forage/cover ratio does not approach the optimal ratio of 60/40. The mule deer forage/cover ratio in conifer stands drops below the optimal ratio because of an increase in cover and a decrease in forage. Mule deer winter range does not improve because of the limited PJ cover. Squirrel and turkey habitat in mature mixed conifer stands increases slightly. Mature ponderosa pine area, habitat for the pygmy nuthatch, increases about 180 percent. Habitat capability for the Mexican vole increases about 120 percent. Old growth conditions are promoted on 14,000 acres through silvicultural prescriptions. By the end of the fifth period, about 55,500 acres of mixed conifer will have old growth characteristics. Most of these acres come from unmanaged timber lands. Overall, direct habitat improvements and maintenance expenditures are scheduled to be about 70 percent of the maximum wildlife habitat benchmark level, and intensive habitat management will be applied to 64 percent of the Forest.

Range

Permitted grazing use is balanced with grazing capacity during the third period. This is accomplished by reducing current use 5 percent over two decades and increasing capacity 32 percent. Intensive range management is applied to 10 percent of the suitable range acres. Current level management is applied to most of the remaining range acres. Overall, the total maintenance and improvement expenditures are scheduled to be the same as Alternative A. By the end of the fifth period, grazing capacity is increased 41 percent and permitted use is increased 11 percent.

Timber

The objective is to produce sawtimber at the RPA target levels in the most cost efficient manner possible. Approximately 39 percent of the tentatively suitable timber land is allocated to even-aged management, of which 4 percent is in the aspen type, and five percent of the land is allocated to uneven-aged management for the purpose of providing old growth conditions for wildlife. Seventy-six percent of the aspen type is managed to perpetuate the aspen ecosystem.

The first decade allowable sale quantity is 10.3 MMBF per year, which is 23 percent above the sale level of the past 10 years. The sawtimber portion of the allowable sale quantity is 9.0 MMBF per year in the first period, which is the average for the first period RPA target. The sawtimber volume increases to 12.0 MMBF by Period 5. No timber is harvested from the Lincoln Division in the first period. Removal cuts, intermediate cuts, selection cuts and clear cuts account for 59, 19, 20 and 2 percent, respectively, of the acreage harvested in the first period.

Fuelwood produced from the managed timber land is about twice the amount currently sold. Fuelwood from the PJ woodland type is provided at levels slightly below the current level sold. The PJ harvest is distributed around the Forest in a manner that will ensure sustained levels of PJ fuelwood within the present road access areas.

Economic Values

Alternative B includes a budget constraint of $5.194 million for the first decade. Annual expenditures in the first decade are approximately $5.2 million (9 percent above present level) and $5.1 million in the second decade. Annual receipts are $1.0 million in the first decade. When assigned values for recreation, wildlife, and livestock grazing are included, the total annual benefits are $16.1 million in the first decade.

Discounted costs are $161 million and benefits are $560 million. The distribution of discounted costs is:

Administration/Other	21 percent
Timber management	12 percent
Recreation/wildlife	14 percent
Range management	8 percent
Protection	35 percent
Roads/FA & O	10 percent

The distribution of discounted benefits is:

Timber sales	3 percent
Recreation/wildlife/water	89 percent
Livestock grazing	8 percent

The net value of the Forest is $399 million or 97 percent of the potential value. The primary reasons for the foregone investment opportunities are objectives to produce sawtimber at RPA target levels; provide range management needed to bring grazing capacity into balance with use by the third decade, partially by increasing capacity 32 percent; and provide greater opportunities for dispersed recreation use to meet RPA targets in the first decade.

ALTERNATIVE C

Alternative C emphasizes market opportunities, particularly timber. The alternative was designed to produce the highest levels of timber, grazing capacity and developed recreation possible within the budget constraint. The objective for range was to bring permitted grazing use into balance with the capacity as soon as possible. Management of other resources is maintained at levels consistent with the emphasis on commodity outputs.

Recreation and Trails

Forest-wide, the recreation opportunity spectrum is 17 percent semiprimitive nonmotorized, 63 percent semiprimitive motorized, and 20 percent roaded natural. The roaded class will increase about 13%, while the semiprimitive classes will each decrease slightly. Vehicle use will be permitted on Forest roads and trails only. Standard service level maintenance will be provided for only 1/3 of the developed sites and about 20 percent of the dispersed areas. Most of the trails will receive low level maintenance. The Rim and OSHA Trails will be maintained at high maintenance levels. Expansion of Ski Apache and Ski Cloudcroft is planned. One new ski area, two winter sports areas, two new campgrounds, two campground reconstructions, and seven facility improvements or expansions are scheduled.

Wilderness

The Guadalupe Escarpment Wilderness Study Area is recommended for nonwilderness designation. No additional land is recommended for wilderness.

Visual Quality

Visual quality objectives (VQO's) are maintained at present levels, however, temporary changes to the VQO's may occur due to the large proportion of acres going into even-aged timber management.

Cultural Resources

Cultural resource inventory will be directly related to the number of project acres involving ground disturbance. In addition, an average of 375 acres per year of non-project related surveys will be conducted. Annual objectives include 6350 acres to be surveyed. In each of the first five years, two sites will be nominated to the National Register, and one site will be nominated each following year. During each decade, five sites will receive direct protective measures. No sites are scheduled for interpretation or stabilization.

Wildlife and Fish

Elk habitat is improved by increases in both forage and cover, especially calving cover. The forage/cover ratio moves toward the optimal ratio of 60/40. The mule deer habitat in the coniferous forest is similar to that in the PA. Mule deer winter range does not improve due to the low proportion of PJ in suitable cover condition. PJ cover will not be as low as current levels, however, because the PJ fuelwood harvest levels will be reduced below current levels. Squirrel and turkey habitat in mature mixed conifer will decrease slightly, but pygmy nuthatch habitat in mature ponderosa pine areas will increase 150 percent. Habitat capability for Mexican vole is increased about 120 percent above existing levels. About 32,000 acres of suitable timber land is managed to generate old growth conditions. By the end of the fifth decade about 24,000 acres of mixed conifer will have old growth characteristics. Alternative C has the best opportunity to provide forest diversity, since it applies even-aged management to 63 percent of the tentatively suitable timber lands. Intensive wildlife management is applied to only 23 percent of the Forest, however, with total habitat improvement expenditures scheduled to be about 28 percent of the maximum wildlife habitat benchmark level.

Range

Permitted livestock grazing use balances grazing capacity during the first period. Grazing capacity is increased 8 percent over the next 10 years (60 percent over the next 50 years), and permitted grazing use is reduced 15 percent. Intensive management is applied to 41 percent of the suitable range land. The rest of the range land receives current or low level management. Overall, the Forest receives about 70 percent of the maximum range benchmark expenditure levels for range improvements. By the end of the fifth period allowable grazing use should be about 26 percent above present use levels.

Timber

The timber lands are managed to produce annual yields of sawtimber at levels that approach 90 percent of the maximum 200-year sustainable level. This will allow about 63 percent of the tentatively suitable timber land to receive silvicultural prescriptions needed to improve the age-class imbalance and provide more disease resistant stands for the future. About 2 percent of the land under even-aged management is in the aspen type (equivalent to 76 percent of the aspen land) and is managed to perpetuate the aspen ecosystem. Old growth conditions for wildlife are provided through uneven-aged management on about 12 percent of the tentatively suitable timber land.

The allowable sale quantity in the first decade is 19.6 MMBF per year. This is 133 percent above the sale level of the past 10 years. The sale quantities gradually increase to 26.6 MMBF/year in the fifth decade. Timber is harvested from the Lincoln Division in all periods. Seed cuts, removal cuts, intermediate cuts and selection cuts are used on 7, 60, 18, and 14 percent, respectively, of the acreage harvested in the first decade. There is also a small acreage of clear cuts.

Fuelwood provided from the managed timber land is about three times the level currently sold. Fuelwood from the PJ woodland is provided at a level 25 percent below the level currently sold. PJ sales are distributed around the Forest in a manner that will ensure sustained levels of PJ harvest within the present road access areas.

Economic Values

Alternative C includes a budget constraint of $5.294 million per year for the first decade. Annual expenditures in the first decade are approximately $5.3 million (12 percent above current level) and $5.8 million in the second decade. Annual receipts are $1.5 million in the first decade. When assigned values for recreation, wildlife and livestock grazing are included the total annual benefits are $16.6 million.

Discounted costs are $208 million and the benefits are $533 million. The distribution of discounted costs is:

Administration/Other	16 percent
Timber management	20 percent
Recreation/wildlife	6 percent
Range management	11 percent
Protection	40 percent
Roads/FA & O	7 percent

The distribution of discounted benefits is:

Timber sales	5 percent
Recreation/wildlife/water	86 percent
Livestock grazing	9 percent

The net value of the Forest is $325 million or 79 percent of the potential value. The primary reasons for the foregone investment opportunities are objectives to manage timber lands at near maximum allowable levels; provide range management needed to increase grazing capacity 60 percent over the next 50 years and bring capacity and use into balance within 10 years; and provide for better fire protection.

ALTERNATIVE D

Alternative D was developed to emphasize resource outputs with nonmarket values, such as recreation and wildlife, and to manage timber primarily for the protection of property values and visual quality in the areas of high recreation use in the Sacramento Mountains.

Recreation and Trails

Forest-wide, the recreation opportunity spectrum is maintained at present levels. Most of the developed recreation sites, dispersed recreation areas and wilderness trails will receive standard service level maintenance. Additional developed recreation sites will be provided to more fully satisfy the growing demand for recreation opportunities, especially in the Cloudcroft area. Vehicle

use will be permitted on Forest roads and trails only. Expansion of the Ski Apache area and Ski Cloudcroft is planned. One new ski area, two new winter sports areas, ten new campgrounds, two campground reconstructions, eight new or improved trailheads, and nine facility improvements or rehabilitations are scheduled. About 210 miles of trail will be added to the maintained trail system through the volunteer 'Adopt-A-Trail' program.

Wilderness

The Guadalupe Escarpment Wilderness Study Area is recommended for wilderness designation. No other land is recommended for wilderness.

Visual Quality

The proportions of Forest land in the various Visual Quality Objective classes are maintained at current level, however, Forest activities are designed to improve the visual quality in the "retention" and "partial retention" zones.

Cultural Resources

Cultural resource inventory will be directly related to the number of project acres involving ground disturbance. In addition, an average of 375 acres per year of non-project related surveys will be conducted. Annual objectives include 4750 acres to be surveyed and four sites to receive direct protective measures. In each of the first five years, two sites will be nominated to the National Register, and one site will be nominated in each of the following years. During each decade, at least five sites will be stabilized to prevent deterioration and interpretative efforts will be conducted at a minimum of five sites.

Wildlife and Fish

Elk forage and cover increase slightly. Forest-wide, the forage/cover ratio does not approach the optimal ratio after 50 years, but maintains a moderate level. The short-term effect of intensive timber harvesting in primary elk habitat in the Sacramento Division is expected to be the same as in the PA. The mule deer summer and winter ranges are similar to those in the PA. Squirrel and turkey habitat in mature mixed conifer stands increases about 15 percent. Habitat capability for pygmy nuthatch and Mexican vole increases about 80 percent and 130 percent respectively. Old growth conditions are promoted on about 14,000 acres through silvicultural prescriptions. At the end of the fifth period about 40,600 acres of mixed conifer will provide old growth characteristics. About 50 percent of the Forest receives intensive management for direct habitat improvements. Total expenditures for improvements and maintenance are about 60 percent of maximum wildlife benchmark level.

Range

Permitted grazing use is balanced with grazing capacity during the third period. This is accomplished by reducing current use 8 percent over two decades and increasing capacity 25 percent. Intensive management is applied to only 3 percent of the suitable range land. The rest receives current or lower level management. Overall, the total expenditures for maintenance and improvements are scheduled to be lower than the current level. By the end of the fifth period, allowable grazing use should be about 4 percent above present use levels.

Timber

Timber is intensively managed only near the high-use recreation areas of the Sacramento Mountains in order to protect the resource from losses due to western spruce budworm and dwarf mistletoe infestations. Budget and soil protection constraints limit the treatment to 30 percent of the mixed conifer acres in this Division. Sawtimber production levels are the result of the management strategies needed to control the insect and disease outbreaks and to ensure that

the initial intensive harvest levels do not exceed the long-term sustained-yield capacity of the lands allocated to timber management.

The first decade allowable sale quantity is 11.2 MMBF per year, which is 33 percent above the sale level of the past 10 years. Sawtimber production over the next 50 years averages 10.9 MMBF, which is slightly above RPA target levels. Two MMBF per year is scheduled to be harvested with the cable logging method. No timber is harvested from the Lincoln Division in the first period. Removal cuts, intermediate cuts, selection cuts and clear cuts account for 40, 45, 13, and 2 percent, respectively, of the acreage harvested in the first decade.

Approximately 36 percent of the tentatively suitable timber land is allocated to even-aged management, of which 4 percent is in the aspen type, and five percent is allocated to uneven-aged management for the purpose of providing old growth conditions for wildlife. About 76 percent of the aspen land is managed to perpetuate the aspen ecosystem.

Fuelwood provided from the managed timber land is about twice the level currently sold. Fuelwood provided from the PJ woodland is slightly less than the level currently sold. The PJ sales are distributed around the Forest in a manner that will ensure sustained levels of PJ harvest within the present road access areas.

Economic Values

Alternative D includes a budget constraint of $5.194 million per year for the first decade. Annual expenditures in the first decade are approximately $5.2 million (9 percent above current level) and $5.2 million in the second decade. Annual receipts in the first decade are $1.0 million. When assigned values for recreation, wildlife and livestock grazing are included, the total annual benefits are $16.9 million.

Discounted costs are $174 million and the benefits are $571 million. The distribution of discounted costs is:

Administration/Other	19 percent
Timber management	15 percent
Recreation/wildlife	15 percent
Range management	5 percent
Protection	36 percent
Roads/FA & O	10 percent

The distribution of discounted benefits is:

Timber sales	3 percent
Recreation/wildlife/water	89 percent
Livestock grazing	8 percent

The net value of the Forest is $397 million or 96 percent of the potential value. The primary reasons for the foregone investment opportunities are objectives to intensively manage the timber in the high use recreation area of the Sacramento Division in order to control insect and disease problems; provide two MMBF per year of timber for cable logging; provide range management needed to bring grazing capacity into balance with use by the third decade, partially

by increasing capacity 25 percent; and provide for higher level recreation management of the wildernesses and facilities on the Smokey Bear Range District.

ALTERNATIVE E

Alternative E was developed to emphasize treatment of the current insect and disease problem on the timber resource of the Sacramento Mountains. Large portions of the mixed conifer type near high-use recreation areas and in the best timber production areas are intensively managed to control losses due to western spruce budworm and dwarf mistletoes. Secondary emphasis is on developed recreation and wildlife habitat improvements in and adjacent to the same areas. Other resources are managed at levels that can be accomplished within budgetary limits.

Recreation and Trails

The recreation opportunity spectrum will be maintained at current levels. Vehicle use will be permitted on Forest roads and trails only. High-use developed recreation sites and about 1/3 of the dispersed areas will receive standard service level maintenance. Others will receive less than standard level maintenance. Only the Rim and OSHA Trails will be maintained at high level. Expansion of the two existing ski areas is not planned, but one new ski area is planned for the Cloudcroft Ranger District. Two new winter sports areas, seven new campgrounds, two campground reconstructions, three trailhead improvements, and about eight facility rehabilitations or improvements are scheduled.

Wilderness

No additional land is recommended for wilderness. The Guadalupe Escarpment Wilderness Study Area is recommended for nonwilderness designation.

Visual Quality

Visual quality objectives are the same as Alternative A.

Cultural Resources

Cultural resource inventory will be directly related to the number of project acres involving ground disturbance. In addition, an average of 375 acres per year of non-project related surveys will be conducted. Annual objectives include 5425 acres to be surveyed and one site to receive direct protective measures. In each of the first five years, two sites will be nominated to the National Register, and one site will be nominated in each of the following years. During each decade, at least one site will be stabilized to prevent deterioration. No sites are planned for interpretation.

Wildlife and Fish

Elk and mule deer habitats are similar to the PA. Squirrel and turkey habitat in mature mixed conifer decreases slightly. Habitat for Pygmy nuthatch increases 80 percent. Habitat capability for Mexican vole increases about 120 percent. Old growth conditions are promoted on about 11,000 acres through silvicultural prescriptions. About 32,700 acres of mixed conifer will have old growth characteristics at the end of the fifth period. Intensive management for direct habitat improvements will be applied to about 46 percent of the Forest, and total expenditures for improvements and maintenance are about 50 percent of the maximum wildlife benchmark level.

Range

Permitted grazing use is balanced with grazing capacity during the third period. This is accomplished by reducing current use 8 percent over two decades and increasing capacity 25 percent. Intensive range management is applied to 5 percent of the suitable range land and moderately intensive management to 21 percent. The rest receives current level management. Overall, the total maintenance and improvement expenditures are lower than current level. By the

end of the fifth period, allowable grazing use should be about 4 percent above current levels.

Timber

Timber is intensively managed to prevent resource losses from western spruce budworm and control dwarf mistletoe infestations. Budget and other resource objective constraints limit the treatment to about 44 percent of the mixed conifer lands in areas that have good timber potential or that are near high-use recreation sites. Sawtimber production levels are the result of the silvicultural prescriptions needed to control further losses from the present insect and disease problem and to ensure that the initial intensive harvest levels do not exceed the long-term sustained-yield capacity of the lands allocated to timber managment.

The first decade allowable sale quantity is 15.2 MMBF per year, which is 81 percent greater than the sale level of the last 10 years. Two MMBF of sawtimber per year is provided for cable logging. No timber is harvested from the Lincoln Division in the first decade. Removal cuts, intermediate cuts and selection cuts account for 40, 53 and 6 percent, respectively, of the acreage harvested in the first decade. There is also a small acreage of clear cuts.

About 48 percent of the tentatively suitable timber land is allocated to even-aged management, of which 3 percent is in the aspen type, and 4 percent of the land is allocated to uneven-aged management for the purpose of providing old growth conditions for wildlife. About 76 percent of the aspen type is managed to perpetuate the aspen ecosystem.

Fuelwood produced on the managed timber land is about twice the current level sold. PJ sales are distributed around the Forest in a manner that will ensure sustained levels of PJ harvests within the present road access areas. Fuelwood from the PJ woodland type is provided at levels slightly below the current sale level.

Economic Values

Alternative E includes a budget constraint of $5.373 million per year for the first decade. Annual expenditures in the first decade are approximately $5.4 million (13 percent above present level) and $5.1 million in the second decade. Annual receipts are $1.2 million in the first decade. When assigned values for recreation, wildlife and livestock grazing are included, the total annual benefits in the first decade are $16.4 million.

Discounted costs are $178 million and benefits are $547 million. The distribution of discounted costs is:

Administration/Other	19 percent
Timber management	19 percent
Recreation/wildlife	12 percent
Range management	7 percent
Protection	35 percent
Roads/FA & O	8 percent

The distribution of discounted benefits is:

Timber sales	4 percent
Recreation/wildlife/water	88 percent
Livestock grazing	8 percent

The net value of the Forest is $370 million or 90 percent of the potential value. The primary reasons for the foregone investment opportunities are objectives to manage 44 percent of the mixed conifer land in the Sacramento Division to control losses from the present insect and disease problems; provide range management needed to bring grazing capacity into balance with use within 30 years, partially by increasing capacity about 25 percent; and provide better fire protection.

ALTERNATIVE F

Alternative F is designed to reflect the management emphases in the PA but at a level provided by a 30 percent lower budget. Primary emphasis is on the protection of the natural resources, especially from fire and visitor misuse. Emphasis on developed and dispersed recreation and wildlife habitat improvement is maintained, but at a reduced level. Timber is managed only on the most productive timber areas to control losses due to insects and diseases. Other resources are managed at levels that can be accomplished within the reduced budget.

Recreation and Trails

The recreation opportunity spectrum will be maintained at current levels. Vehicle use will be permitted on Forest roads and trails only. Standard service level maintenance will be provided for about 60 percent of the developed recreation sites and for about half of the widely used dispersed areas. About 30 percent of the Forest maintained trails will receive low level maintenance and the rest will receive moderate to high maintenance depending on use levels and trail condition. Trails in the White Mountain Wilderness and the WSA will receive moderate level maintenance to provide a semi-primitive recreation opportunity. The RIM and OSHA trails will be maintained at high trail standards. Expansion of Ski Apache and Ski Cloudcroft is planned. One new ski area, one new winter sports area, six new campgrounds of which three are group campgrounds, two campground reconstructions, and seven trailhead improvements are scheduled. Visitor information programs will be expanded to about one-fourth the level in the PA and access to the Forest will be moderately improved.

Wilderness

The Guadalupe Escarpment Wilderness Study Area is recommended for nonwilderness designation. No additional land is recommended for wilderness.

Visual Quality

Visual quality objectives are the same as the PA.

Cultural Resources

Cultural resource inventory will be directly related to the number of project acres involving ground disturbance. In addition, an average of 375 acres per year of non-project related surveys will be conducted. Annual objectives include 3675 acres to be surveyed and an average of 1.5 sites to receive direct protective measures. In each of the first five years, two sites will be nominated to the National Register, and one site will be nominated in each of the following years. Over the 50 year period, at least three sites will receive interpretive efforts and at least seven sites will be stabilized to prevent deterioration.

Wildlife & Fish

After 50 years elk forage decreases 12 percent and cover increases 23 percent to provide a Forest-wide forage/cover ratio of 35/65. Most of the intensive timber management activity, however, occurs on the Sacramento Division in an area that provides the majority of the Forest's elk range. The short-term effect of this on elk habitat is expected to be similar to that in the PA. In addition, part

of the elk winter forage is in the mountain grasslands. Range management of the grasslands in poor condition provides improvement and a doubling of the grassland forage base after 20 years.

Presently, the forage/cover ratio of the mule deer summer range is 61/39. Timber growth over the next 50 years causes the ratio to shift from optimal to 43/57 as cover increases and forage decreases. Mule deer winter range does not improve due to the low proportion of PJ in suitable cover condition. Squirrel and turkey habitat in mature mixed conifer stands increases about 100 percent. Pygmy nuthatch habitat in mature ponderosa pine stands increases 3.5 times. Mexican vole habitat increases about 120 percent.

Old growth conditions are promoted on about 11,000 acres through silvicultural prescriptions. By the end of the fifth period about 48,000 acres of mixed conifer will have old growth characteristics. Overall, direct habitat improvement and maintenance expenditures are scheduled to be about 32 percent of the maximum wildlife benchmark level. Intensive wildlife management is applied to about 22 percent of the Forest.

Range

Range objectives of the reduced budget alternative are to maintain the existing range improvements and allow grazing capacities to increase where possible through gradual permit reductions. About 2 percent of the suitable range land receives intensive management and 12 percent receives current level management. Overall, the total maintenance and improvement expenditures are scheduled to be about half of current management levels. Permitted livestock grazing use is brought into balance with grazing capacity during the fourth period by reducing current use 5 percent over two decades and allowing capacity to increase 22 percent. By the end of the fifth period, grazing capacity is increased 25 percent and permitted use is about 1 percent above present levels.

Timber

Timber is managed only on the most productive areas of the Sacramento Mountains near high-use recreation areas to protect the resource from losses due to dwarf mistletoes and spruce budworm infestations. About 21 percent of the mixed conifer acres in the Sacramento Division are treated, with about one-fourth of those acres managed intensively. Sawtimber production levels are the result of the management practices needed to control the insect and disease infestations and to provide nondeclining yields of timber volume after the initial intensive harvest levels for insect and disease control.

Approximately 23 percent of the tentatively suitable timber land is allocated to even-aged management, of which 6 percent is in the aspen type. Four percent is allocated to uneven-aged management for the purpose of providing old growth conditions for wildlife. About 76 percent of the aspen is managed to perpetuate the aspen ecosystem.

The first decade allowable sale quantity is 8.1 MMBF per year, which is 4 percent below the sale level of the last 10 years. The average annual sawtimber production in the first period is about 10 percent below the RPA target. Sawtimber production gradually decreases to 6.4 MMBF/year by the fifth period and is below RPA targets in all periods. The cable logging method is scheduled to provide 1.5 MMBF/yr of sawtimber from steep slopes. No timber will be harvested from the Lincoln Division before the fourth period. Removal cuts, intermediate cuts, selection cuts and clear cuts account for 56, 32, 8 and 4 percent, respectively, of the acreage harvested in the first decade.

Fuelwood provided from the managed timber land is slightly more than the amount currently sold. Fuelwood from the PJ woodland type is provided at half the present level sold.

Economic Values

Alternative F includes a budget constraint of $3.69 million per year for the first decade. Annual expenditures in the first decade are approximately $3.7 million (30 percent below the PA budget) and $3.7 million in the second decade. Annual receipts are $0.9 million in the first decade. When assigned values for recreation, wildlife and livestock grazing are included, the total annual benefits in the first decade are $15.9 million.

Discounted costs are $187 million and discounted benefits are $513 million. The distribution of discounted costs is:

Administration/Other	13 percent
Timber management	9 percent
Recreation/wildlife	9 percent
Range management	4 percent
Protection	58 percent
Roads/FA & O	7 percent

The distribution of discounted benefits is:

Timber Sales	2 percent
Recreation/wildlife/water	90 percent
Livestock grazing	8 percent

The net value of the Forest is $326 million or 79 percent of the potential value. The primary reasons for the foregone investment opportunities are the greater need for additional fire fighting protection and law enforcement programs; objectives to manage the timber in the most productive areas of the Sacramento Mountains to control losses from present insect and disease infestations; and the need to maintain existing roads and facilities which leaves less budget for new recreation and wildlife improvements.

COMPARISON OF ALTERNATIVES

The following tables are provided to facilitate comparison of the alternatives.

Issues, Concerns, And Opportunities

Table 2 shows in quantitative and qualitative terms how each alternative addresses the issues, concerns, and opportunities (ICO).

There are quantity and quality aspects of each ICO. Those quantities affecting the ICO are listed for the end of the first 10 years and at the end of 50 years so that the reader can get the feel of the short-term and long-term effects.

The quality aspects are dealt with in a short text under the non-quantifiable column. Some of these evaluations are subjective and are based on professional expertise and experience of the ID Team. Each ICO is addressed separately in the table.

Table 2. Comparison of Issue Resolution by Alternative

Issue: Recreation supply and range of opportunity

Alternative/ Period	Quantifiable Comparison		Non-quantifiable Comparison
	Percent of Projected Demand Provided For		
	Developed (incl. skiing)	Dispersed (incl. wildlife)	
PA			
1	100	98	A large number of developed sites will be constructed, most in Periods 1 and 2. Emphasis is on group campgrounds, ski areas, and winter sports areas. Most sites will be managed at standard service level, so that quality of experience will be high. Dispersed recreation construction is limited to trailheads. Most of the trails, including those in Wilderness, will be maintained at moderate or higher standards. Only 24 percent of the trail miles receive low level maintenance. Access to dispersed recreation areas will be improved. Adopt-A-Trail program will provide a moderate number of trails in heavily used areas mainly in the Sacramento Mountains. Caves will be heavily used with high degree of protection and satisfaction. Recreation supply is adequate for projected use during the first period, but falls below projected demand during the next 40 years. Overuse will be reduced by providing standard service levels in fee sites but will not be eliminated because of inadequate supply. Damage from ORV use is eliminated. This alternative is second best in addressing the issue.
5	72	69	
A			
1	92	95	Only one group campground and one group picnic ground will be constructed and the existing ski areas will be expanded. About half of the developed sites will be managed at less than standard service levels, so that many users will notice some inconveniences. Overcrowding of sites will continue with resultant degradation. Quality of experience will be low. There will be no construction of dispersed facilities. Trail maintenance in wilderness will be at low levels and some deterioration will occur. The Adopt-A-Trail program will maintain relatively few trails. Cave use will be moderate, but user satisfaction will decrease due to inadequate cave protection. Recreation supply falls far short of projected developed and dispersed use, and conditions are much worse than present by the the end of Period 5. Damage from ORV use will continue as present policy on ORV is continued into the future. This alternative is worst in addressing this issue.
5	47	61	

Table 2. Comparison of Issue Resolution by Alternative (con't)

Issue: Recreation supply and range of opportunity

Alternative/ Period	Quantifiable Comparison		Non-quantifiable Comparison
	Percent of Projected Demand Provided For		
	Developed (incl. skiing)	Dispersed (incl. wildlife)	
B			
1	100	99	A moderate number of sites will be constructed, distributed fairly evenly between group and family sites. About half of the sites will be managed at standard service levels, so that quality of experience will be moderate. Several trailheads and other dispersed facilities will be constructed and maintained, mainly at less than standard service levels. Wilderness trails will receive low level maintenance. The Adopt-A-Trail program will be used to maintain relatively few miles of trail. Cave use will be restricted to moderately low levels and, caves will receive a high level of protection from damage. Overall emphasis is on providing more dispersed recreation opportunities, but at less than standard maintenance levels. Dispersed and developed recreation supply is adequate for projected use during the first period, but falls below projected demand during the following 40 years. Overuse will not be controlled because management will be at less than standard service level. Damage from ORV use will be eliminated as use is restricted to roads. This alternative ranks fourth in adressing this issue.
5	67	76	
C			
1	100	97	A moderate number of sites of all kinds will be constructed, with emphasis on group facilities. About half of the developed sites will be maintained at standard service level. Accordingly, quality of experience will be moderate with some visitors noticing inconveniences. No dispersed facilities will be constructed. Trail maintenance in wilderness will be minimal, and relatively few trails will be maintained through the Adopt-A-Trail program. Cave use will remain moderately low and a very low level of cave protection may result in significant damage to the resource. Overall, this alternative favors developed over dispersed recreation. Dispersed and developed recreation supply is adequate for projected use in the first period, but falls below demand in subsequent periods. Overuse will occur with resultant degradation of sites. Damage from ORV use will be eliminated as use is restricted to roads. This alternative ranks sixth in addressing this issue.
5	60	67	

Table 2. Comparison of Issue Resolution by Alternative (con't)

Issue: Recreation supply and range of opportunity

Alternative/ Period	Quantifiable Comparison		Non-quantifiable Comparison
	Percent of Projected Demand Provided For		
	Developed (incl. skiing)	Dispersed (incl. wildlife)	
D			
1	100	100	A large number of sites of all kinds will be constructed in the first three periods. Level of service and maintenance will be high for most of the sites. Trailheads and some other dispersed facilities will be constructed and about 85 percent will be maintained at standard service levels. Miles of trail maintained and level of maintenance will be higher than in other alternatives, to provide a high level of user satisfaction. The Adopt-A-Trail program will be used to maintain all available trails not maintained by the Forest. Cave use will be high, and damage will be minimized by the use of protective devices. Supply of dispersed and developed recreation opportunities is adequate for projected use in the first period, but becomes increasingly inadequate by the end of Period 5. Overuse will be reduced through standard service level. Damage from ORV use will be eliminated as use is restricted to roads. This alternative ranks first in addressing the issue but does not totally satisfy it.
5	76	72	

Table 2. Comparison of Issue Resolution by Alternative (con't)

Issue: Recreation supply and range of opportunity

Alternative/ Period	Quantifiable Comparison		Non-quantifiable Comparison
	Percent of Projected Use Provided For		
	Developed (incl. skiing)	Dispersed (incl. wildlife)	
E			
1	100	98	Similar to the PA in numbers of facilities constructed, except
5	70	70	that no ski area expansion will be allowed. Level of maintenance is high, offering a corresponding high quality opportunity. A few trailheads will be constructed and most trails in wilderness will be maintained at low levels. The Adopt-A-Trail program will be used to maintain a moderate number of trails in non-wilderness, but some users will be dissatisfied. Cave use will be moderate but damage to caves will occur due to low levels of protection. Developed and dispersed supply opportunities fall short of projected future use by the end of Period 5. Overuse will be reduced through standard service levels. ORV damage is eliminated as use is restricted to roads. This alternative ranks fifth in addressing this issue.
F			
1	100	97	A moderate number of sites of all kinds will be constructed
5	69	66	with emphasis on group facilities. More than half of the sites are managed at standard service level. Several trailheads are constructed and over half of the trails are maintained at moderate or higher standards. Access to dispersed recreation areas is improved. Adopt-A-Trail program will provide a moderate number of trails in heavily used areas. Cave use will be restricted to less than current levels to protect the cave resource from damage. Developed and dispersed recreation supply is inadequate to meet projected use at the end of Period 5. Some overuse will occur with resultant degradation of sites. Damage from ORV use will be eliminated as use is restricted to roads. This alternative ranks third in addressing this issue.

Table 2. Comparison of Issue Resolution by Alternative (con't)

Issue: Wilderness designation for the Guadalupe Escarpment Wilderness Study Area (WSA)

Alternative/ Period	Non-quantifiable Comparison
All	The WSA was so designated by Congress to allow time to determine its oil and gas potential. Wilderness designation would prevent exploration for gas and oil, and would preserve wilderness values. Alternative D resolves the issue by recommending wilderness designation. Alternative B recommends designation as a special geologic area without wilderness designation and withdraws the area from mineral leasing in order to protect the caves. All other alternatives resolve the issue by recommending non-wilderness designation. All alternatives provide for preservation of existing conditions (wilderness values) until Congress acts.

Issue: Range use and capacity

Alternative/ Period	Quantifiable Comparison		Non-quantifiable Comparison
	Period of Balance	Percent Maximum Capacity at end of Period 5	
PA	3	72	Reduces use at a rate of 6.0 MAUMs per period for two periods and provides a moderate level of investment to balance use with capacity in Period 3. Grazing allotments will be combined and management improved as opportunity offers. Unsatisfactory range condition declines from 107,000 to 62,000 acres by the end of Period 5. Situations causing competition between wildlife and livestock will be minimal in Period 3 when livestock use and capacity balance. Watershed condition will improve at a moderate rate, but the number of acres remaining in unsatisfactory condition after 50 years will be high relative to other alternatives. This alternative ranks sixth in addressing the issue.
A	3	75	Reduces use at a rate of 3.6 MAUMs per period for two periods. Provides a higher level of investment than the PA. Unsatisfactory range condition declines from 82,000 acres to 48,000 acres. Capacity and use balance by the end of Period 3, and situations producing competition between wildlife and livestock will be minimal at that time. Watershed condition will improve at a low rate relative to other alternatives. This alternative ranks third in addressing the issue.

Table 2. Comparison of Issue Resolution by Alternative (con't)

Issue: Range use and capacity

Alternative/ Period	Quantifiable Comparison		Non-quantifiable Comparison
	Period of Balance	Percent Maximum Capacity at End of Period 5	
B	3	78	Similar to Alternative A. Reduces use at a rate of 3.6 MAUMs per period for two periods and balances use with capacity in Period 3 by providing a high level of investment to produce more capacity. Unsatisfactory range condition declines from 83,000 to 43,000 acres by the end of Period 5. Situations causing competition between wildlife and livestock will be minimal when grazing capacity and livestock use are brought into balance. Watershed condition will improve at a moderate rate relative to other alternatives. This alternative ranks second in addressing the issue.
C	1	89	Reduces use 23.4 MAUMs in the first period and provides a very high level of investment to balance use and capacity in Period 1. Use is allowed to increase after Period 1. Emphasizes utilization of the range resource by improving management. Unsatisfactory acres decline from 85,000 to 37,000 acres by the end of Period 5. Situations causing competition between wildlife and livestock will be rapidly resolved when livestock grazing is reduced to capacity. Watershed condition will improve at a moderately high rate relative to other alternatives. This alternative best addresses the issue.
D	3	73	Reduces use at a rate of 6.0 MAUMs per period for two periods and provides a slightly lower level of investment than the PA, but balances use and capacity in the third period. Grazing allotments will be combined and management improved as opportunity offers. Unsatisfactory acres decline from 94,000 to 49,000 acres by the end of Period 5. Situations producing competition between wildlife and livestock will be minimal when livestock use and capacity balance. Watershed condition will improve at a moderate rate relative to other alternatives. This alternative ranks fifth in addressing the issue.

Table 2. Comparison of Issue Resolution by Alternative (con't)

Issue: Range use and capacity

Alternative/ Period	Quantifiable Comparison		Non-quantifiable Comparison
	Period of Balance	Percent Maximum Capacity at End of Period 5	
E	3	73	Similar to the PA in levels of permitted use reductions and investments to improve grazing lands. Compared to the PA, this alternative applies intensive management practices to three times as many acres and low intensity to fewer acres in order to provide more rapid improvement in range and watershed condition. Unsatisfactory range condition declines from 84,000 to 47,000 acres by the end of Period 5. This alternative ranks fourth in addressing the issue.
F	4	69	Reduces use at the slowest rate of 2.4 MAUMs per period for three periods and provides the lowest level of investment in rangeland. Grazing capacity and use balance in the fourth period. Very few acres receive intensive range management and unsatisfactory range condition declines from 124,000 to 78,000 acres by the end of Period 5. Situations causing competition between wildlife and livestock will not be resolved until the end of Period 4. Watershed condition will improve at a moderate rate, but the number of acres remaining in unsatisfactory condition will be higher than in any other alternative. This alternative ranks last in addressing the issue.

Table 2. Comparison of Issue Resolution by Alternative (con't)

Issue: Timber

Alternative/ Period	Quantifiable Comparison			Non-quantifiable Comparison
	Annual ASQ (MMBF) 1/	Percent of Maximum Volume	Percent of Maximum LTSYC 2/	
PA			37	The current allowable sale quantity is 16.7 MMBF per year.
1	16	41		The PA would lower this ceiling 4 percent in Period 1. Local
5	16	41		sawmills could operate at efficient levels and would remain open to provide the opportunity to manage timber. Size class distribution is stable by the end of Period 6 (100 years), but retains more immature sawtimber than is desirable. This alternative ranks second in providing a balanced size class distribution.
A			33	The allowable sale quantity in the first period would be 22
1	13	37		percent lower than the current ceiling. Local sawmills could
5	14	37		remain open, but would operate at less than efficient levels. Size class distribution is very unstable through Period 8 (200 years) and distribution is poor. There are more acres in the seedling-sapling size class than are optimal. This alternative ranks last in providing a balanced size class distribution.
B			28	The allowable sale quantity in the first period would be 40
1	10	31		percent lower than the current level. Local sawmills could
5	13	31		not operate at efficient levels and some would close, reducing the Forest's opportunity to manage timber. Size class distribution is very poor and unstable at first, but steadily improves until it stabilizes in about 175 years. At that time, there is more immature sawtimber than is desirable. This alternative ranks third in providing a balanced size class distribution.
C			56	This alternative would raise the allowable sale quantity by
1	20	56		20 percent in Period 1. Local sawmills could operate at very
5	27	62		efficient levels and would remain open, providing the oppotunity to manage timber. Size class distribution is stable by Period 5, but variation after 200 years is higher than desirable. There is more immature sawtimber than is optimal. This alternative ranks fifth in providing a balanced size class distribution.

Table 2. Comparison of Issue Resolution by Alternative (con't)

Issue: Timber

Alternative/ Period	Quantifiable Comparison			Non-quantifiable Comparison
	Annual ASQ (MMBF)	Percent of Maximum Volume	Percent of Maximum LTSYC	
D			29	The allowable sale quantity in Period 1 would be 34 percent lower than the current ceiling. Local sawmills could not operate at efficient levels and some would close, reducing the Forest's opportunity to manage timber. Size class distribution is unbalanced to the end of Period 8, and there are no indications of improvement at that time. There is an excess of immature sawtimber at 200 years. This alternative ranks sixth in providing a balanced size class distribution.
1	11	32		
5	11	33		
E			38	The allowable sale quantity in Period 1 would be 10 percent lower than the current ceiling. Local sawmills could operate efficiently and would remain open. The size class distribution after 200 years is slightly better than in Alternative D. This alternative ranks fourth in addressing this issue.
1	15	42		
5	14	42		
F			18	The allowable sale quantity in Period 1 would be 52 percent lower than the current level. Local sawmills could not operate at efficient levels and most would close, depriving the Forest of the opportunity to manage timber. Size class distribution is stable after 100 years and after 200 years this alternative provides the most even distribution of size classes. There are, however, more acres of seedling-sapling size class than are optimal. This alternative ranks first in providing a balanced size class distribution.
1	8	20		
5	7	20		

1/ Allowable sale quantities include sawtimber and wood products, and are normally expressed in cubic feet, but are referenced here in board feet. Nondeclining yield is based on volume in cubic feet and occurs in all alternatives.

2/ The maximum potential harvestable volume is based on the benchmark that maximizes timber volume in the first period; The maximum LTSYC is based on the benchmark that maximizes timber volume over 200 years.

Table 2. Comparison of Issue Resolution by Alternative (con't)

Issue: Fuelwood

Alternative/ Period	Quantifiable Comparison		Non-quantifiable Comparison
	Percent Maximum Volume	Percent Projected Future Need	
PA			Overall, fuelwood production is stable. Production from pinyon/juniper (PJ) woodlands is about two-thirds of the estimated LTSYC for the PJ type for the five periods. Production is limited due to a lack of access. Woodland inventory will be completed. Commercial forest land (CFL) fuelwood production is near the maximum in Period 5. CFL fuelwood is not a traditional source and is less liked by the public, but is readily accessible. This alternative ranks fourth in addressing this issue. The capability to meet the future demand for fuelwood declines after Period 4.
1	55	92	
5	86	52	
A			Fuelwood production is stable over the five periods, but PJ fuelwood is produced above LTSYC, resulting in long-term damage to it and to other resources. Uncontrolled access allows high production, at levels exceeding demand in Period 1, but increases risk of damage to the resource. CFL fuelwood production is low, about 41 to 74 percent of maximum. Woodland inventory will not be completed. This alternative ranks third in addressing this issue, but does so in an unsatisfactory way.
1	68	113	
5	88	54	
B			Fuelwood production is stable but low over the five periods. The PJ type produces about three-fourths of the maximum LTSYC for the type. CFL fuelwood production is low, 42 to 70 percent of maximum for the type, because there is relatively little timber produced. Woodland inventory will be completed. This alternative ranks fifth in addressing this issue.
1	57	94	
5	72	44	
C			Fuelwood production is high but declines in Periods 4 and 5. Supply potential exceeds demand in Period 1, but falls below projected demand by Period 5. Production from the PJ type is low, about 60 percent of maximum LTSYC for the type. CFL fuelwood production, however, is high at about 80 percent of maximum, reflecting an emphasis on timber production. Woodland inventory will be completed. This alternative ranks first in addressing this issue.
1	76	126	
5	92	56	

Table 2. Comparison of Issue Resolution by Alternative (con't)

Issue: Fuelwood

Alternative/ Period	Quantifiable Comparison: Percent Maximum Volume	Quantifiable Comparison: Percent Projected Future Need	Non-quantifiable Comparison
D			Produces slightly less PJ fuelwood, otherwise same as
1	52	87	Alternative B. Woodland inventory will be completed. This
5	70	43	alternative ranks sixth in addressing this issue.
E			Production is moderately high but variable over the five
1	61	102	periods. Fuelwood needs are met in Period 1, but only
5	88	54	half met by Period 5. PJ fuelwood production is slightly higher than the PA. CFL fuelwood produced is about 57 percent of maximum until Period 5, when it increases to 96 percent. Woodland inventory will be completed. This alternative ranks second in addressing this issue.
F			Fuelwood production is stable, but very low over the five
1	29	48	periods. Less than half of the fuelwood needs for Period 1
5	53	32	are met by the available supply. Production from the PJ type is very low, about 42 percent of maximum LTSYC. CFL fuelwood production is very low, corresponding to the low timber production levels. Woodland inventory will not be completed. This alternative ranks last in addressing this issue.

Issue: Minerals - elimination of hazards at abandoned mines.

Alternative/ Period	Non-quantifiable Comparison
PA	Provides for an inventory of abandoned mines, a plan to eliminate hazards, and the elimination of most dangerous hazards.
A	No provision for elimination of hazards.
B	Same as PA.
C	Same as A.
D	Provides for an inventory of abandoned mines and a plan to eliminate hazards.
E	Same as A.

Table 2. Comparison of Issue Resolution by Alternative (con't)

Issue: Minerals - elimination of hazards at abandoned mines.

F	Same as A.

Issue: Landownership adjustments and rights-of-way (ROW)

Alternative/ Period	Quantifiable Comparison		Non-quantifiable Comparison
	Adjustment - Percent Maximum Budget	ROW - Percent Maximum Budget	
PA	92	100	All alternatives respond to the issue in the same way, but the rate of adjustment is directly related to funding provided. This alternative emphasizes landownership management, especially ROW acquisition, more than any other alternative. ROWs will be acquired for a variety of purposes. This alternative ranks first in addressing this issue.
A	100	50	Emphasizes landownership adjustment more than any other alternative, but applies only about half as much emphasis on ROW acquisition as the PA. Acquires ROWs for a variety of purposes. This alternative ranks third in addressing this issue.
B	100	52	Similar to Alternative A except that emphasis will be on acquiring ROWs for recreation uses. This alternative ranks second in addressing this issue.
C	87	22	Little emphasis on landownership management. A limited acquisition of ROWs will be for commodity production. This alternative ranks last in addressing this issue.
D	95	29	Moderate emphasis on landownership management. ROW acquisitions will be for recreation purposes. This alternative ranks fifth in addresssing this issue.
E	96	44	Moderate emphasis on landownership management. Acquisition of ROWs will be for a variety of purposes. This alternative ranks fourth in addressing this issue.
F	83	75	Moderate emphasis on landownership management with special emphasis on ROW acquisition for recreation purposes. This alternative ranks sixth in addressing this issue.

Table 2. Comparison of Issue Resolution by Alternative (con't)

Issue: Fire management

Alternative/ Period	Non-quantifiable Comparison
PA	Risk and hazard are both high because of a high level of human activity and generation of large amounts of temporary fuels through management practices. Efficient allocation of fire suppression resources will offset the increase in probability of fires. As a result, the moderate level of funding will be used to suppress fires in areas and situations having a high probability of causing damage to Forest resources and developments and of spreading to adjacent private land. This alternative ranks first in addressing this issue.
A	Risk and hazard are low, reflecting slight increases in use and in management activities. Budget is high and resources are inefficiently allocated because all fires are suppressed regardless of cost of suppression or the value of the resource affected. This alternative ranks sixth in addressing this issue.
B	Increase in probability of disastrous fires is associated with large increases in human activity. Overall, level of funding is low but will be partially offset by efficient allocation of resources as in the PA. This alternative ranks third in addressing this issue.
C	Increase in probability of fires is mainly due to increased hazard associated with management activities, although slight increases in human use will contribute. Otherwise, same as Alternative A. This alternative ranks fifth in addressing this issue.
D	Increased risk of fires is associated mainly with large increases in human activities, rather than increased management activities. The fire prevention budget is higher than in the PA, but the probability of fire is lower. The less efficient allocation of funds places this alternative fourth in addressing this issue.
E	Same as PA, except the fire prevention budget is slightly higher. This alternative ranks second in addressing this issue.

Table 2. Comparison of Issue Resolution by Alternative (con't)

Issue: Fire management

Alternative/ Period	Non-quantifiable Comparison
F	Increase in probability of fires is due to increases in human activity. The funding level for fire prevention is very low and must be offset by a high fire suppression budget. The inefficient allocation of funds places this alternative last in addressing this issue.

Issue: Insects and diseases

Alternative/ Period	Quantifiable Comparison: Percent of tentatively suitable acres under intensive management 1/	Non-quantifiable Comparison
PA	35	Prescriptions designed to prevent significant losses caused by western spruce budworm and to control dwarf mistletoes are applied to a high proportion of mixed conifer stands in areas having high value for developed recreation and timber. High intensity prescriptions are also applied to ponderosa pine stands to control heavy infestations of dwarf mistletoes. This alternative ranks second in addressing this issue.
A	29	I&D prescriptions are applied to a moderate proportion of timber land, but are not targeted for stands near highly valued recreation areas. This alternative ranks fourth in addressing this issue.
B	14	I&D prescriptions are applied to a small proportion of timber land, primarily for dwarf mistletoe control in ponderosa pine stands located in areas not highly valued for recreation. This alternative ranks last in addressing this issue.
C	25	Similar to Alternative A. This alternative ranks fifth in addressing this issue.
D	25	Applies I&D prescriptions to mixed conifer stands as in the PA, but with more high intensity prescriptions on fewer acres. No other emphasis on insects and diseases. This alternative ranks third in addressing this issue.

1/ Intensive management for I&D control includes three types of even-aged management prescriptions: 1) high intensity, 2) moderate intensity, and 3) spruce budworm control.

Table 2. Comparison of Issue Resolution by Alternative (con't)

Issue: Insects and diseases

Alternative/ Period	Quantifiable Comparison Percent of tentatively suitable acres under intensive management	Non-quantifiable Comparison
E	34	Applies I&D prescriptions as in the PA, but provides high intensity management on more acres of mixed conifer and fewer acres of ponderosa pine. Overall, the total acres receiving I&D management is slightly less than the PA. This alternative ranks first in addressing this issue.
F	8	I&D prescriptions are applied to a small proportion of timber land, primarily to control losses from spruce budworm and dwarf mistletoes in the mixed conifer stands in highly valued recreation and timber areas. This alternative ranks sixth in addressing this issue.

Issue: Inconsistent law enforcement

Alternative/ Period	Quantifiable Comparison Percent increase over current funding	Non-quantifiable Comparison
PA	170	Relies heavily on enforcement by Forest Service personnel (Level 4), with a moderate level of funding for local law enforcement agencies. Enforcement emphasis is evenly distributed among all resources. This alternative ranks first in addressing this issue but does not resolve it completely.
A	0	Maintains current mix of enforcement methods, with low level of funding for both types. This alternative ranks last in addressing this issue.
B	116	Provides moderate level of funding for Level 4 and a high level for cooperative enforcement. Enforcement emphasis is on public safety and prevention of theft. This alternative ranks second in addressing this issue.
C	46	Provides low level of funding for Level 4 and a high level for cooperative enforcement. Emphasis is on protection of commodity-producing resources. This alternative ranks fourth in addressing this issue.

Table 2. Comparison of Issue Resolution by Alternative (con't)

Issue: Inconsistent law enforcement

Alternative/ Period	Quantifiable Comparison: Percent increase over current funding	Non-quantifiable Comparison
D	116	Same as Alternative B.
E	116	Same as Alternative B.
F	84	Provides a moderate level of funding for both Level 4 and local law enforcement agencies. Enforcement emphasis is similar to Alternative B. This alternative ranks third in addressing this issue.

Issue: Jurisdiction and management of the transportation system.

Alternative/ Period	Non-quantifiable Comparison
PA	Jurisdiction of roads will be resolved as opportunity offers. Transportation system will be maintained at specified levels. (see Table 79). Damage to facilities and resource degradation will be minimized. This alternative ranks first in addressing this issue.
A	Jurisdiction of roads will be resolved as opportunity offers. Transportation system will be maintained at levels lower than in the PA. Degradation of facilities and resources will occur. This alternative ranks second in addressing this issue.
B	Same as PA.
C	Same as PA.
D	Same as PA.
E	Same as PA.
F	Similar to Alternative A. This alternative ranks last in addressing this issue.

Table 2. Comparison of Issue Resolution by Alternative (con't)

Issue: Local residents and regional users

Alternative/ Period	Non-quantifiable Comparison
PA	Satisfies the needs specific to local residents and regional users at a moderate level.
A	Provides a moderate level of satisfaction to local residents and a low level to regional users.
B	Provides for the specific needs of both groups at a moderate level.
C	Highly satisfactory to local users, but meets regional users' needs at a moderately low level.
D	Provides for a moderately low level of satisfaction to local residents, except for those engaged in the tourist trade. Satisfies regional users' needs at a high level.
E	Satisfies the needs of local residents at a moderate level, and those of regional users at a high level, except for downhill skiers.
F	Provides for a low level of satisfaction to local residents, except for those engaged in the tourist trade. Satisfies regional users' needs at a moderate level.

All of the alternatives will provide multiple use products and benefits to the public while protecting or enhancing basic environmental quality. However, the degree of issue resolution varies with the mix of outputs generated under each alternative. Seven issues were determined to be major issues, based on the risk or resource damage involved in failure to solve them or because of the degree of public interest. They are the recreation, range, timber production, size class distribution, fuelwood, fire, and insect and disease issues.

Although the PA and Alternative E provide the best overall resolution of major issues, they respond well to different ones. The PA is highly responsive to the recreation, timber production, size class distribution, fire, and insect and disease issues, but responds poorly to the range issue. Alternative E responds well to the insect and disease, fuelwood, and fire issues, but only moderately well to recreation and size class distribution. Alternative C satisfies the range, timber production, and fuelwood issues, but responds poorly to the recreation, and insect and disease issues.

Alternatives B, D, and F are highly responsive to certain issues, but overall do not respond well to most. Alternative B is responsive to the range issue, but responds poorly to the fuelwood, and insect and disease issues. Alternative D provides the most for recreation of any other alternative and responds well to the insect and disease issue, but responds poorly to both timber issues and the fuelwood issue. Alternative F provides the least overall resolution of issues, although it satisfies the recreation and size-class distribution issues moderately well. Alternative A does not respond very well to any issue, but satisfies the range, timber and fuelwood production issues at acceptable levels.

Alternative Acreage Distribution

Each alternative results in different combinations of management prescriptions and different acreages assigned to various management prescriptions. Management prescriptions have been grouped into management emphasis categories. The nontimber prescriptions provide current management intensities to all the nontimber resources not emphasized in the prescription. Only the low intensity prescription provides less than current management. The acres managed under the nontimber prescriptions for a given alternative add up to the total number of acres on the Forest. The acres managed under the timber prescriptions are contained within the total Forest acres, but were allocated separately to unique timber strata areas. One way to evaluate the effects of the alternatives is to compare the acreages assigned to the management emphasis categories in each alternative. Table 3 shows the acres assigned to each category by alternative. Additional detail on prescriptions and acreage assignments for the benchmarks can be found in Appendix B.

Table 3. Acreage Assignments by Prescription for Each Alternative (M/Acres)

	Alternative						
Prescription	PA	A	B	C	D	E	F
Nontimber Prescriptions							
1. Low	236.9	---	17.6	198.6	214.6	151.8	390.0
2. Current	326.2	1091.5	237.0	290.5	65.6	70.4	324.0
3. Range	54.2	---	111.3	310.9	51.2	164.2	14.5
4. PJ Fuelwood	---	---	---	---	---	18.9	---
5. Wildlife	198.6	---	534.6	232.6	276.2	425.5	157.2
6. Recreation	109.6	1.2	22.5	41.7	96.5	190.7	100.3
7. Wilderness Recreation	82.9	---	---	---	104.1	---	48.4
8. Multiple Use: Fuelwood/Recreation/ Wildlife	11.6	---	46.1	---	71.7	11.6	5.8

Table 3. Acreage Assignments by Prescription for Each Alternative (M/Acres)

Prescription	Alternative PA	A	B	C	D	E	F
9. Multiple Use: Recreation/Wildlife	72.7	---	123.6	18.4	212.9	59.7	52.5
10. Multiple Use: Range/Wildlife	---	---	---	---	---	---	---
Timber Prescriptions							
11. Even-aged Management:							
Low intensity	31.9	0	40.7	73.1	27.4	32.5	18.5
Mod.-low intensity	0	13.5	20.7	25.3	0	4.7	21.3
Moderate intensity	40.6	9.6	0	8.9	1.7	1.5	8.1
High intensity	49.5	64.6	35.2	55.6	39.1	49.4	11.5
I&D control	0	0	0	0	24.6	36.0	0
Total	122.0	87.7	96.6	162.9	92.8	124.1	59.4
12. Uneven-aged Management	17.4	19.0	12.2	31.8	13.7	10.8	11.1

Based on total Forest acres - 1092.7 M/acres

Alternative A is constrained to use the current management prescriptions for all areas of the Forest, except the area that contains the Ski Apache expansion location. In all other alternatives many areas are allocated to more intensive management for recreation, wildlife or range. In order to do this with budget constraints, some areas have to receive low intensity management. Alternative F assigns more acres (about 36 percent) to low intensity prescriptions than any other alternative. Alternative B allocates about 64 percent of the Forest to wildlife emphasis prescriptions, while Alternative C assigns 28 percent of the Forest to range emphasis prescriptions and a large portion of the timber land to timber management. Alternative D assigns a significant portion (70 percent) of the Forest to wildlife or recreation emphasis prescriptions. The Proposed Action assigns about 52 percent of the land to low or current management and distributes the rest among the intensive range, wildlife and recreation prescriptions in proportions needed to meet the multiple-use objectives of the alternative. The timber prescription allocations are discussed under the harvest method section.

Acres Available

Because alternatives result in different combinations of management prescriptions and different assignments of acreage to management prescriptions, there are differences between alternatives in total acreage available for timber harvest, livestock grazing, developed recreation sites, and minerals exploration and development. Table 4 displays the acreage available for timber harvest, livestock grazing, developed recreation and minerals exploration and development by alternative.

Table 4. Acreage Available by Alternative

Alternative	Timber Harvest (suitable)	Livestock Grazing	Developed Recreation	Minerals Exploration and Development	
				Locatable	Leasable
PA	139,420	605,600	1,871	982,789	993,696
A	106,801	581,000	1,265	1,007,852	1,020,256
B	108,790	581,200	1,852	976,203	988,700
C	194,687	589,000	1,748	1,007,132	1,020,256
D	106,479	592,200	1,946	986,428	999,005
E	134,849	587,800	1,802	1,007,435	1,020,256
F	70,499	647,200	1,839	1,007,483	1,020,256

Forest Total = 1,103,495 acres

There are significant differences among alternatives in the acreage of land selected for timber harvest and developed recreation. Alternative C allocates about 76 percent of the timber land to timber management activities, while only 27 percent of the land is allocated to timber management under Alternative F. Alternative D, which provides the most acres for developed recreation sites, allocates about 54 percent more acres than Alternative A for developed recreation. The Forest has about 700,000 acres suitable for livestock grazing, but not all of those acres are in satisfactory condition and not all will be grazed. In general, the alternatives that have more land allocated to low intensity management use more acres for grazing.

The differences in acreages available for locatable minerals are due primarily to variations in lands being assigned to recreation developments. The PA and Alternatives B and D have fewer acres available for mineral leasing because of the management objectives for the WSA. In Alternative D, the area is recommended for wilderness designation and would be unavailable for leasing. In Alternative B, the WSA and about 10,000 acres adjacent to it is designated a Special Geologic Area for inventory and protection of the cave resource. To adequately protect the cave resource the area would be recommended for withdrawal from oil and gas leasing. In the PA, the area encompassing the wilderness study area and about 5,600 acres adjacent to it having known cave resources would be recommended for withdrawal from leasing.

Harvest Method Acreage

While Table 4 shows the total acreage selected for timber harvest in each alternative, the method of timber harvest is often of more interest than the total acreage available. The influence on the environment often varies more between methods of harvest than between harvesting and not harvesting. Table 5 displays the distribution of total suitable timber acres among the three types of harvest methods that will be used over the next 200 years.

Table 5. Distribution of Suitable Timber Acres by Harvest System

	Shelterwood		Clear Cut		Selection	
Alternative	Tractor	Cable	Tractor	Cable	Tractor	Cable
PA	106,741	11,703	2,053	1,497	14,527	2,899
A	70,668	13,535	2,208	1,342	17,708	1,340
B	95,968	630	2,300	1,250	12,192	0
C	130,395	28,948	2,208	1,342	20,806	10,988
D	77,210	11,969	2,208	1,342	8,077	5,673
E	103,522	16,977	2,208	1,342	9,286	1,514
F	46,225	9,662	2,300	1,250	7,748	3,314

The shelterwood harvest method is applied to the acres under even-aged management. Five levels of management intensity, shown in Table 3, were available for the shelterwood harvest method. Clear cutting is another method for even-aged management, but is used on the Forest almost exclusively for the regeneration of aspen stands. The selection harvest method is applied to acres under uneven-aged management and is used to create and maintain stands with old growth characteristics. Sawtimber is harvested by tractor logging on slopes less than 40 percent and by the cable logging method on steeper slopes.

The Proposed Action and Alternative C produce the greatest amounts of sawtimber of all the alternatives and, therefore, show more acres allocated to the shelterwood harvest system. In the first two decades the Proposed Action has about 5000 acres per year scheduled for harvest in order to quickly control the insect and disease problem. Alternatives D and E also have several more acres scheduled for harvest in the first two decades than in later decades for the same reason. Alternative A provides more timber volume than Alternative B, but does so on fewer acres since no low intensity prescription allocations were allowed in this alternative.

All alternatives, except Alternative B, are required to produce a small portion of sawtimber for cable logging. The PA and Alternative F are required to provide at least 1.5 MMBF per year and Alternatives A, C, D and E are required to provide at least 2 MMBF per year. Most of the alternatives do not provide more than the minimum requirement due to the low benefit:cost ratios for timber production, especially on steep slopes. Alternative C, however, produces more than the minimum needed in the fifth decade and, consequently, shows more acres allocated to cable logging under the shelterwood system. Alternative C was required to produce more total volume than the other alternatives and part of the fifth period volume could be more efficiently harvested from steep slopes.

There is no variation in the number of acres allocated to clear cutting methods since all the alternatives manage the aspen in the same way. An average of 71 acres per year of aspen, or 3550 acres in 50 years, are harvested in each alternative.

Alternative C requires more acres to be managed for old growth conditions than in the other alternative. In the other alternatives fewer acres are allocated to even-aged management and some of the unmanaged acres should provide old growth characteristics over time without management intervention. In the first decade Alternative A has about 1800 acres per year scehduled for harvest under the selection cut method in order to promote old growth timber conditions. The other alternatives harvest less than this in the first decade.

Wilderness Study Areas

The Forest contains one Wilderness Study Area of 21,251 acres. Table 6 displays the acres of the WSA assigned by prescription for each alternative. The table specifically shows how the acres assigned to non-wilderness would be managed under each alternative. Appendix B provides additional details on the prescriptions.

Table 6. WSA Acreage Assignments by Prescription for Each Alternative (M/Acres)

	Alternative						
Prescription	PA	A	B	C	D	E	F
Low Intensity	---	---	---	21,251	---	---	---
Current	---	21,251	---	---	---	---	21,251
Range Emphasis	---	---	---	---	---	10,625	---
Dispersed Recreation Emphasis	21,251	---	21,251	---	---	---	---
Wilderness Recreation	---	---	---	---	21,251	---	---
Wildlife Emphasis	---	---	---	---	---	10,626	---
Total Wilderness	---	---	---	---	21,251	---	---
Total Non-Wilderness	21,251	21,251	21,251	21,251	---	21,251	21,251

Alternative D is the only alternative that recommends the WSA for statutory Wilderness. Under that status the area would be managed primarily for dispersed recreation with emphasis on cave resource protection. Funding for cave protection would be much higher than current levels, but not as high as in the PA and Alternative B, which would provide the most intensive management for cave protection. All of the alternatives, except Alternative C, would provide funding for resource protection at levels at least as high as the area presently receives. In Alternative D, cave visitor use would be allowed to increase gradually to 18 percent above current levels by the end of Period 5. In the PA

and Alternative B, visitor use would be expected to increase 28 and 11 percent, respectively, by the end of Period 5.

Resource Outputs

Table 7 displays the alternative and benchmark outputs for five ten-year time periods. The units of measure are indicated by each output. The benchmarks are included so the alternatives can be viewed in perspective with the minimum level and maximum single resource benchmark outputs. The benchmarks do not contain all the constraints that were applied to the alternatives to make them financially and legally feasible. The four benchmarks displayed in the table cover the significant range of the Forest's supply potential. Results of all the benchmarks are shown in Appendix B.

Table 7. Resource Outputs by Alternative and Selected Benchmarks.

		Alternative						Benchmark			
Output/Activity	PA	A	B	C	D	E	F	Min Level	Max PNV Assigned	Max Timber	Max Range
RECREATION	Thousand recreation visitor days per year (MRVD)										
Developed											
Period 1	373	315	346	339	363	412	356	0	433	433	389
2	518	340	450	393	501	543	481	0	618	618	530
3	614	386	548	474	636	643	570	0	742	742	630
4	680	425	613	528	732	722	635	0	833	833	706
5	731	453	667	566	796	772	684	0	896	896	773
Downhill Skiing	Thousand recreation visitor days per year (MRVD)										
Period 1	196	176	196	196	196	163	196	143	196	196	176
2	240	212	240	240	240	186	240	158	240	240	212
3	271	232	271	271	271	207	271	168	271	271	232
4	295	238	295	295	295	231	295	173	295	295	238
5	315	238	315	315	315	250	315	173	315	315	238
Dispersed	Thousand recreation visitor days per year (MRVD)										
Period 1	596	577	606	587	593	591	582	265	593	593	596
2	674	653	696	662	678	665	657	265	680	680	680
3	731	728	757	720	732	722	713	265	740	740	742
4	776	779	796	771	775	769	758	265	779	779	783
5	811	816	831	809	810	806	792	265	814	814	817
WILDERNESS RECREATION	Thousand recreation visitor days per year (MRVD)										
Period 1	23	21	23	21	31	22	22	10	30	30	25
2	27	24	26	24	36	25	27	10	35	35	30
3	31	26	28	26	42	27	31	10	38	38	34
4	35	28	30	28	47	29	35	10	40	40	38
5	36	30	32	30	49	31	36	10	44	44	39

Table 7. Resource Outputs by Alternative and Selected Benchmarks (con't)

Output/Activity		Alternative							Benchmark		
		PA	A	B	C	D	E	F	Min Level	Max PNV Assigned	Max Timber	Max Range
WILDLIFE AND FISH MGMT.		Thousand wildlife/fish user days per year (MWFUD)										
All WFUD's												
Period	1	386	370	386	386	418	386	386	348	386	386	386
	2	466	392	466	466	505	466	466	235	466	466	466
	3	538	377	550	503	593	550	503	219	550	550	550
	4	521	361	626	486	611	579	489	204	626	626	553
	5	538	379	652	504	593	563	504	190	639	639	568
RANGE MANAGEMENT		Thousand animal unit months per year (MAUM)										
Permitted Use												
Period	1	147	150	150	130	147	147	151	0	150	150	150
	2	141	146	146	131	141	141	148	0	146	146	146
	3	145	156	159	175	150	151	146	0	142	142	190
	4	158	166	172	191	162	162	149	0	146	146	210
	5	157	164	171	193	160	159	151	0	147	147	217
Grazing Capacity		Thousand animal unit month per year (MAUM)										
Period	1	118	121	122	130	119	120	118	0	119	119	139
	2	117	124	125	131	119	121	111	0	110	110	145
	3	145	156	159	175	150	151	133	0	134	134	190
	4	158	166	172	191	162	162	148	0	146	146	210
	5	157	164	170	193	160	159	151	0	147	147	217
Satisfactory Capacity Acres		Thousand acres per year (M/ACRE)										
Period	1	499	499	498	504	498	504	523	0	499	499	498
	2	507	504	506	512	506	511	531	0	506	506	509
	3	516	511	516	523	516	519	540	0	516	516	522
	4	530	521	526	536	528	529	554	0	530	530	535
	5	544	533	538	552	543	541	569	0	547	547	551
Less Than Satisfactory Capacity Acres		Thousand acres per year (M/ACRE)										
Period	1	107	82	83	85	94	84	124	0	98	98	83
	2	99	77	75	77	86	77	116	0	91	91	72
	3	90	70	65	66	76	69	107	0	81	81	59
	4	76	60	55	53	64	59	93	0	67	67	46
	5	62	48	43	37	49	47	78	0	50	50	30

Table 7. Resource Outputs by Alternative and Selected Benchmarks (con't)

Output/Activity		Alternative							Benchmark			
		PA	A	B	C	D	E	F	Min Level	Max PNV Assigned	Max Timber	Max Range
TIMBER MANAGEMENT												
Net Sawtimber (ASQ)		Thousand board feet per year (MBF)										
Period	1	15,000	11,500	9,000	17,500	9,941	13,805	7,970	0	1,336	37,337	6,000
	2	15,000	13,000	10,000	22,000	10,030	12,981	7,034	0	883	30,908	6,000
	3	15,000	13,000	10,000	22,000	11,802	15,162	6,767	0	823	36,891	6,000
	4	15,000	13,000	10,000	24,000	14,090	18,629	6,371	0	399	38,281	6,000
	5	15,000	13,000	12,000	26,000	8,783	11,392	6,431	0	1,448	39,347	6,000
Net Products (ASQ)		Thousand board feet per year (MBF)										
Period	1	1,024	1,601	1,330	2,143	1,311	1,392	144	0	562	3,135	551
	2	1,169	1,002	1,467	1,589	1,582	2,052	575	0	806	4,676	1,442
	3	1,159	1,252	1,517	2,423	1,358	1,860	750	0	867	3,310	2,813
	4	1,474	2,211	1,530	3,096	828	1,039	750	0	1,083	4,781	1,592
	5	1,202	1,365	753	646	1,794	2,333	750	0	654	2,475	1,352
Fuelwood PJ		Thousand board feet per year (MBF)										
Period	1	2,016	3,463	2,484	1,909	2,054	2,163	1,263	0	1,458	1,458	2,568
	2	2,016	3,421	2,484	1,909	2,054	2,163	1,263	0	1,273	1,273	2,568
	3	2,016	3,394	2,484	1,909	2,054	2,163	1,263	0	1,295	1,295	2,568
	4	2,016	3,647	2,484	1,909	2,054	2,163	1,263	0	1,211	1,211	2,568
	5	2,016	3,821	2,484	1,909	2,054	2,163	1,263	0	1,211	1,211	2,568
Fuelwood Other		Thousand board feet per year (MBF)										
Period	1	5,701	6,082	5,425	8,680	5,179	6,442	2,684	0	1,488	12,317	3,329
	2	5,886	4,773	4,841	8,456	4,921	6,558	2,574	0	1,461	13,877	3,751
	3	6,020	5,098	4,783	8,932	4,606	5,958	2,738	0	1,388	10,608	5,431
	4	5,532	4,351	4,633	5,648	3,490	4,524	3,139	0	1,406	9,242	3,524
	5	6,871	5,289	5,050	7,603	5,212	6,906	4,194	0	1,750	8,252	5,618
Net Merch. Timber Vol. (ASQ)		Thousand cubic feet per year (MCF)										
Period	1	3,864	3,484	2,934	5,274	3,072	4,003	1,860	0	636	9,493	1,647
	2	3,888	3,484	2,979	5,874	3,092	4,029	1,867	0	636	9,493	2,141
	3	3,888	3,484	2,979	5,875	3,092	4,029	1,867	0	636	9,493	2,783
	4	3,888	3,484	2,979	5,874	3,092	4,029	1,867	0	636	9,493	2,143
	5	3,888	3,484	2,979	5,875	3,092	4,029	1,867	0	636	9,493	2,134
LTSYC		Thousand cubic feet per year (MCF)										
Years												
1-200		3,888	3,484	2,979	5,875	3,092	4,029	1,867	0	636	9,493	2,335

Table 7. Resource Outputs by Alternative and Selected Benchmarks (con't)

		Alternative						Benchmark			
Output/Activity		PA	A	B	C	D	E	F	Min Level	Max PNV Assigned	Max Timber	Max Range
SOIL AND WATER MGMT.				Thousand acres per year (M/ACRE)								
Unsatisfactory Watershed Condition												
Period	1	107	107	107	107	107	107	107	107	107	107	107
	2	99	101	96	97	98	98	101	88	99	99	93
	3	90	92	84	83	87	88	93	70	88	88	76
	4	76	79	71	66	73	76	81	52	73	73	59
	5	62	63	55	46	56	61	68	36	55	55	38
Water Yield				Thousand acre feet per year								
Period	1	123	123	123	123	123	123	123	123	123	123	123
	2	123	123	123	123	123	123	123	123	123	123	123
	3	123	123	123	123	123	123	123	123	123	123	123
	4	123	123	123	123	123	123	123	123	123	123	123
	5	123	123	123	123	123	123	123	123	123	123	123

ASQ - Allowable Sale Quantity
LTSYC - Long-Term Sustained Yield Capacity

Four benchmarks are included in Tables 7 to 10 for comparative purposes. The Minimum Level Benchmark defines the least cost program for keeping the Forest in public ownership. It provides for protection of soil and water resources and productivity of the land. In addition, it provides for the protection of life, health, and safety of the incidental visitor; the prevention of environmental damage to adjoining lands; and the administration of established special uses and mineral rights. The outputs of this program are those that would be provided without direct management activities or direct costs.

The Maximum PNV Assigned Values Benchmark indicates the most cost effective way to manage the Forest based on resources having established market or assigned values and the costs associated with producing those resources. The Max PNV Benchmark favors recreation and wildlife investments over timber or range. The costs to produce timber or increase grazing capacities exceed the dollar benefits from those resources. The opposite is true for recreation and wildlife.

The Maximum Timber and Maximum Range Benchmarks display the highest levels of timber and range outputs, respectively, that can be produced if no other resource objectives are defined. Both benchmarks produce other resources at maximum efficiency levels. The Maximum Timber Benchmark figures shown in this table are for the benchmark that maximizes timber volume in the first period.

Alternative A, the No Action Alternative, displays the consequences of continuing the current management program. This establishes a baseline from which to compare the effects of a change in management direction.

The projected dispersed recreation, wilderness and wildlife outputs (visitor days) do not vary significantly between alternatives, although costs for providing the opportunities do vary. The outputs were based on expected future use of available recreation areas and do not measure the quality of the resource. Most of the alternatives provide enough dispersed recreation and wildlife habitat opportunity to meet the expected future use over the next 10 years, but after 50 years the alternatives meet only about 70 percent of the projected demand.

Variations in the projected developed recreation use levels are due to variations in the number and size of facilities provided for developed recreation. Alternative A provides the least opportunity for new or expanded facilities, while Alternative D provides the most. The PA and Alternative E come close to Alternative D in providing increased opportunities for developed recreation. Downhill skiing use is expected to increase with additional ski area developments. The PA and Alternatives B, C, D and F provide for expansion of the two existing ski areas and development of a new area.

Grazing capacities vary primarily by the rate at which they increase over time. The most rapid rate of increase is shown in the Maximum Range Benchmark. The costs to provide this rapid rate are significantly higher than the other alternatives and consume a large portion of the budget. All the alternatives, except Alternative A, were constrained to bring permitted livestock grazing use into balance with grazing capacity. Alternative C balances use and capacity by the end of the first period. This is accomplished by reducing use at a rapid rate during the first period and applying intensive range management to provide a large increase in grazing capacities. All the other alternatives, except Alternative F, balance use and capacity in the third period using less expensive methods. Permitted use is gradually reduced for two periods and capacities are increased only to levels that can sustain present use. In Alternative F, balance is achieved by the end of the fourth period.

Satisfactory capacity rangeland is land in fair or better range condition. Rangeland of less than satisfactory capacity is land in poor or very poor range condition. In all alternatives, the number of suitable grazing acres with satisfactory capacity increases over time due to continued improvement in management and construction of range improvements.

The net merchantable timber volume represents the allowable sale quantity and is comprised of sawtimber and wood products. The 'fuelwood other' represents the residual material from timber sales and thinning activities. Half of the wood products volume was shifted to 'fuelwood other' to reflect the higher demand for fuelwood than for wood products. The PJ fuelwood does not come from the timber production lands and is not affected by timber sales. The Max Timber Benchmark, therefore, does not show the highest level of PJ fuelwood production. This benchmark emphasizes sawtimber production only. Sawtimber and related byproducts are produced at high levels in Alternative C due to the objective to emphasize timber management. The other alternatives provide less timber and the volumes are consistent with their multiple use objectives.

The acres of unsatisfactory watershed condition are located primarily on rangelands. Range management objectives are to reduce the impacts of poor grazing practices, especially in poor watershed condition areas. The number of acres improved in each alternative depends on the areas on the Forest that receive intensive range management. The greatest improvement in watershed condition occurs in Alternative C because of the large investment in range improvements. The slowest improvement in watershed condition occurs in Alternative F where permitted grazing use is not balanced with range capacity until the fourth period.

Costs

Tables 8 and 9 display the costs of implementing the alternatives and some of the benchmarks for five ten-year time periods. They are expressed as average annual figures in thousands of dollars. The benchmarks were included so the alternatives can be viewed in perspective. The benchmarks do not contain all the constraints that were applied to the alternatives to make them financially and legally feasible.

Table 8. Average Annual Maintenance and Investment Costs by Alternatives and Selected Benchmarks--M Dollars per Year

		Alternative							Benchmark			
Activity		PA	A	B	C	D	E	F	Min Level	Max PNV Assigned	Max Timber	Max Range
O&M, Except Roads												
Period	1	4346	3975	3955	4460	4032	4264	2938	805	3701	5825	4666
	2	4382	4124	4084	4974	4052	4103	2860	805	3715	5918	4684
	3	4064	3825	3996	4658	3807	3914	2795	805	3544	5915	4557
	4	4089	3784	4023	4467	3844	3857	2838	805	3520	5156	4595
	5	4312	3916	4024	4741	3613	3669	2729	805	3527	5132	4803
O&M, Roads												
Period	1	453	423	506	436	517	477	400	0	489	489	487
	2	468	423	512	442	532	483	414	0	503	503	501
	3	473	423	519	446	542	492	418	0	513	513	510
	4	473	423	519	446	542	492	418	0	513	513	510
	5	473	423	519	446	542	492	418	0	513	513	510
Capital Invest., Except Roads & FAO Facilities												
Period	1	402	217	570	270	512	501	268	0	658	658	566
	2	387	204	410	286	414	404	276	0	438	438	457
	3	398	225	526	384	531	407	264	0	452	452	391
	4	275	207	443	370	350	319	185	0	293	293	524
	5	336	236	494	297	385	377	230	0	424	424	504
Capital Invest., Roads & FAO Facilities Const./ Reconst.												
Period	1	132	128	128	128	133	131	84	0	128	128	128
	2	157	128	132	132	158	132	109	0	150	150	145
	3	138	128	133	133	143	136	90	0	134	134	128
	4	128	128	128	128	128	128	80	0	128	128	128
	5	128	128	128	128	128	128	80	0	128	128	128

Table 8. Average Annual Maintenance and Investment Costs by Alternatives and Selected Benchmarks--M Dollars per Year (con't)

		Alternative							Benchmark		
Activity		PA	A	B	C	D	E	F	Min Level	Max PNV Assigned	Max Timber	Max Range
Constrained Budget												
Total												
Period	1	5333	4743	5159	5294	5194	5373	3690	805	4976	7100	5847
	2	5394	4879	5138	5834	5156	5122	3659	805	4806	7009	5787
	3	5073	4601	5174	5621	5023	4949	3567	805	4643	7014	5586
	4	4965	4542	5113	5411	4864	4796	3521	805	4454	6090	5757
	5	5248	4703	5165	5612	4668	4666	3457	805	4592	6197	5645
Purchaser Credit												
Period	1	390	299	234	456	259	359	207	0	35	971	156
	2	390	338	260	571	261	338	183	0	23	804	156
	3	390	338	260	572	307	394	176	0	21	959	156
	4	390	338	260	624	366	484	166	0	10	995	156
	5	390	338	312	676	228	296	167	0	38	1,023	156
Firefighting Fund												
Period	1	1513	2100	920	2100	1513	1513	3600	3600	920	920	920
	2	1513	2100	920	2100	1513	1513	3600	3600	920	920	920
	3	1513	2100	920	2100	1513	1513	3600	3600	920	920	920
	4	1513	2100	920	2100	1513	1513	3600	3600	920	920	920
	5	1513	2100	920	2100	1513	1513	3600	3600	920	920	920
Total F.S. Costs												
Period	1	7236	7142	6313	7850	6966	7245	7497	4405	5931	8991	6923
	2	7297	7317	6318	8505	6930	6973	7442	4405	5749	8733	6863
	3	6976	7039	6354	8293	6843	6856	7343	4405	5584	8893	6662
	4	6868	6980	6293	8135	6743	6793	7287	4405	5384	8005	6833
	5	7151	7141	6397	8388	6409	6475	7224	4405	5550	8140	6721
Non F.S. Costs												
Period	1	147	209	142	180	152	181	125	0	100	323	220
	2	145	209	154	235	169	175	118	0	98	390	248
	3	152	214	155	227	162	174	113	0	79	553	200
	4	165	196	167	283	172	202	128	0	69	206	358
	5	151	208	165	309	158	179	124	0	107	285	249
Total Costs												
Period	1	7383	7351	6455	8030	7118	7426	7622	4405	6031	9314	7143
	2	7442	7526	6472	8740	7099	7148	7560	4405	5847	9123	7111
	3	7128	7253	6509	8520	7005	7030	7456	4405	5663	9446	6862
	4	7033	7176	6460	8418	6915	6995	7415	4405	5453	8211	7191
	5	7302	7349	6562	8697	6567	6654	7348	4405	5657	8425	6970

O&M - Operation and maintenance

FAO - Fire, Administration & Other

The first five sets of costs cover Forest Service budget costs which were included in the budget constraint. Total Forest Service (F.S.) costs include the total budget costs, timber purchaser credit for logging roads and the firefighting funds. Non F.S. costs include grazing permittees' investment dollars and timber purchasers' additional costs for cable logging. Total cost is the total F.S. cost and non F.S. costs. PNV is based on total costs.

Total budgets to implement most of the alternatives vary only slightly due to the budget constraints imposed on all alternatives. Alternative F has the lowest budget as it was constrained to stay at or below 70 percent of the PA budget. Alternative A has the next lowest budget as it was constrained to reflect current funding levels. The PA was allowed to exceed the budget constraint by $360,000 in Period 1 in order to have additional monies for insect and disease control activities and for protection of the cave resources in and around the Guadalupe Escarpment Wilderness Study Area. Alternative E exceeds the budget constraint by about $180,000 in Period 1 to allow more intensive insect and disease control activities. Alternative C exceeds the first period budget constraint by $100,000 in order to have funds for processing the numerous grazing permit reductions.

Operation and maintenance costs are higher for Alternative C which harvests more timber than any other alternative. Capital investment costs are highest in Alternatives B and D because of the emphasis on improving and adding developed recreation facilities and wildlife habitat improvements. There is little variation in capital costs for roads and administrative facilities. Logging roads are built by the timber purchaser, but are paid in part through purchaser credit dollars. Purchaser credit can be viewed as unreceived revenues from timber sales or as Forest Service costs for roads, in which case Alternative C has higher road costs than any other alternative. The total costs for Alternative F, the alternative with the lowest Forest budget costs, are high because of the projected need for higher firefighting funds.

Additional detail on costs by alternative and selected benchmarks is displayed in Table 9.

Table 9. Resource Costs by Alternatives and Benchmarks--M Dollars per Year

		Alternative							Benchmark			
Activity		PA	A	B	C	D	E	F	Min Level	Max PNV Assigned	Max Timber	Max Range
Timber Costs												
Period	1	1321	1116	696	1321	1116	1494	708	0	212	3495	518
	2	1298	1276	763	2001	1051	1335	580	0	153	3429	492
	3	1189	1029	820	1806	1041	1302	627	0	150	3934	490
	4	1178	1030	820	1670	1071	1353	633	0	123	2881	546
	5	1476	1167	966	2090	796	963	609	0	190	2958	515
Range Costs												
Period	1	442	527	500	935	379	485	297	0	363	363	1470
	2	450	525	531	922	421	470	274	0	343	343	1521
	3	459	534	516	865	389	466	255	0	294	294	1410
	4	479	506	557	1002	424	527	310	0	284	284	1743
	5	464	524	509	884	389	476	297	0	375	375	1515

Table 9. Resource Costs by Alternatives and Benchmarks--M Dollars per Year (con't)

		Alternative							Benchmark		
Activity		PA	A	B	C	D	E	F	Min Level	Max PNV Assigned	Max Timber	Max Range
Recreation Costs												
Period	1	729	276	497	318	685	562	500	0	726	726	577
	2	711	293	400	326	603	493	524	0	595	595	471
	3	652	325	451	414	671	470	510	0	525	525	414
	4	572	315	391	341	536	379	434	0	411	411	358
	5	572	312	398	302	498	396	414	0	444	444	393
Wildlife Costs												
Period	1	288	120	474	189	409	377	208	0	480	480	307
	2	339	123	480	179	434	333	222	0	467	467	344
	3	321	133	493	199	406	346	224	0	501	501	332
	4	343	133	508	212	430	331	247	0	472	472	369
	5	329	156	505	228	430	415	238	0	487	487	373
Protection Costs												
Period	1	2573	3365	2261	3365	2520	2520	4405	3974	2261	2261	2261
	2	2573	3365	2261	3365	2520	2520	4405	3974	2261	2261	2261
	3	2573	3365	2261	3365	2520	2520	4405	3974	2261	2261	2261
	4	2573	3365	2261	3365	2520	2520	4405	3974	2261	2261	2261
	5	2573	3365	2261	3365	2520	2520	4405	3974	2261	2261	2261
Roads/FAO Facilities Costs												
Period	1	585	551	634	564	650	608	484	0	617	617	615
	2	625	551	644	574	690	615	523	0	653	653	629
	3	611	551	652	579	685	629	508	0	647	647	638
	4	600	551	647	574	670	620	498	0	641	641	638
	5	600	551	647	574	670	620	498	0	641	641	638
Other Costs												
Period	1	1446	1395	1393	1338	1359	1380	1021	431	1373	1373	1395
	2	1445	1394	1393	1373	1381	1382	1033	431	1375	1375	1394
	3	1323	1318	1318	1292	1293	1299	928	431	1285	1285	1318
	4	1288	1277	1276	1256	1264	1265	888	431	1260	1261	1277
	5	1288	1276	1276	1255	1264	1265	888	431	1260	1260	1276
Total Costs												
Period	1	7383	7350	6455	8029	7118	7425	7623	4405	6031	9314	7143
	2	7442	7526	6472	8740	7099	7148	7560	4405	5847	9123	7111
	3	7127	7253	6509	8520	7005	7031	7456	4405	5663	9446	6862
	4	7033	7176	6460	8418	6915	6996	7415	4405	5453	8211	7191
	5	7302	7349	6562	8697	6567	6654	7348	4405	5657	8425	6970

The resource costs in Table 9 include Forest Service and non F.S. costs for providing the goods and services. The total of all the costs is shown at the bottom of the table.

Benefits

Table 10 shows the average annual resource benefits for the major resources having benefit values for the alternatives and benchmarks. The values displayed are undiscounted benefits for each of the first five ten-year time periods. This data is useful to evaluate trends over time in resource production and value. Table 10 also contains data on receipts to the U.S. Government, the distribution of revenues to the states, and employment and income generated by each alternative.

The benchmarks are included so the alternatives can be viewed in perspective. The benchmarks do not contain all the constraints that were applied to the alternatives to make them financially and legally feasible.

Table 10. Resource Benefits by Alternatives and Benchmarks.

	Alternative							Benchmark			
Benefits	PA	A	B	C	D	E	F	Min Level	Max PNV Assigned	Max Timber	Max Range
Total Benefits				Thousands of dollars per year							
Period 1	16,423	15,596	16,138	16,571	16,943	16,414	15,909	10,298	16,027	17,876	16,214
2	19,347	16,784	19,040	19,353	20,073	19,180	18,630	7,800	19,011	20,639	19,232
3	24,312	19,144	24,392	23,545	25,847	24,497	22,571	8,329	24,325	26,148	24,753
4	25,993	20,333	28,654	25,215	28,801	27,605	24,264	8,474	28,675	30,577	26,996
5	29,578	23,160	32,988	28,756	31,501	30,090	27,701	9,007	32,672	34,518	30,780
Timber Benefits				Thousands of dollars per year							
Period 1	831	719	571	1,013	600	799	427	0	125	1,973	388
2	836	753	608	1,199	604	775	396	0	104	1,733	411
3	838	762	608	1,222	675	860	390	0	102	1,924	463
4	835	771	606	1,268	750	977	379	0	85	1,987	410
5	854	776	689	1,349	557	714	399	0	131	1,978	441
Recreation Benefits				Thousands of dollars per year							
Period 1	4,657	4,174	4,590	4,480	4,688	4,653	4,545	1,653	4,951	4,951	4,638
2	5,715	4,824	5,527	5,169	5,761	5,552	5,511	1,711	6,191	6,191	5,662
3	6,891	5,803	6,709	6,252	7,099	6,672	6,654	1,904	7,488	7,488	6,807
4	7,765	6,501	7,537	7,070	8,101	7,576	7,514	2,023	8,429	8,429	7,605
5	8,801	7,387	8,596	8,068	9,222	8,611	8,525	2,214	9,547	9,547	8,629
Wildlife Benefits				Thousands of dollars per year							
Period 1	8,730	8,366	8,730	8,730	9,438	8,730	8,730	7,865	8,730	8,730	8,730
2	10,539	8,853	10,539	10,539	11,420	10,539	10,539	5,309	10,539	10,539	10,539
3	13,884	9,732	14,186	12,967	15,299	14,186	12,984	5,645	14,186	14,186	14,186
4	14,481	10,040	17,414	13,522	16,982	16,084	13,589	5,671	17,414	17,414	15,374
5	16,993	11,971	20,593	15,914	18,751	17,798	15,928	6,013	20,192	20,192	17,946

Table 10. Resource Benefits by Alternatives and Benchmarks (con't)

	Alternative							Benchmark			
Benefits	PA	A	B	C	D	E	F	Min Level	Max PNV Assigned	Max Timber	Max Range
Range Benefits			Thousands of dollars per year								
Period 1	1,425	1,457	1,468	1,568	1,437	1,452	1,427	0	1,442	1,442	1,678
2	1,477	1,574	1,586	1,666	1,508	1,534	1,404	0	1,396	1,396	1,840
3	1,919	2,067	2,109	2,324	1,994	1,999	1,763	0	1,770	1,770	2,517
4	2,132	2,241	2,318	2,575	2,188	2,188	2,003	0	1,967	1,967	2,828
5	2,151	2,246	2,339	2,645	2,191	2,187	2,069	0	2,021	2,021	2,984
Water Yield Benefits			Thousands of dollars per year								
Period 1	780	780	780	780	780	780	780	780	780	780	780
2	780	780	780	780	780	780	780	780	780	780	780
3	780	780	780	780	780	780	780	780	780	780	780
4	780	780	780	780	780	780	780	780	780	780	780
5	780	780	780	780	780	780	780	780	780	780	780
Receipts to U.S. Govt.			Thousands of dollars per year								
Period 1	1,272	1,141	1,009	1,466	1,039	1,246	868	51	688	2,439	871
2	1,342	1,200	1,106	1,690	1,109	1,279	878	57	773	2,262	969
3	1,447	1,298	1,221	1,842	1,301	1,467	959	60	883	2,555	1,152
4	1,502	1,342	1,277	1,946	1,443	1,644	1,011	62	970	2,685	1,168
5	1,545	1,353	1,384	2,052	1,276	1,401	1,061	62	975	2,710	1,239
Distribution to States			Thousands of dollars per year								
Period 1	318	285	252	366	260	312	217	13	172	610	218
2	336	300	276	423	277	320	220	14	193	566	242
3	362	325	305	461	325	367	240	15	221	639	288
4	376	336	319	487	361	411	253	16	243	671	292
5	386	338	346	513	319	350	265	16	244	678	310
Employment			Number of Jobs, at the end of Period 1 [1/]						NF Base		Total
Period 1	+285	+163	+232	+279	+238	+280	+201		1,046		31,532
Income			Millions of dollars (in 1980 4th quarter dollars)								
Period 1	+5.0	+3.0	+3.9	+5.1	+4.0	+4.9	+3.3		18.0		1,058.8

1/ Employment and income are shown as the change from the existing situation. The existing employment and income are shown under the Total column. See text for further explanation.

Recreation benefits include wilderness benefits. Wildlife benefits are displayed separately. The range benefits are based on permitted livestock use until use exceeds grazing capacity. Use in excess of capacity is not valued.

Total benefits and the mix of resource benefits vary between alternatives because of different management objectives to address issues. The timber benefits increase most in the alternatives that emphasize timber management:

Alternatives C, E and the PA. Range benefits increase most in Alternative C, which provides the most management for increasing grazing capacities. The amenity emphasis alternatives, Alternatives B and D, show less timber benefits, but higher recreation and wildlife benefits and higher total benefits than the other alternatives. The PA provides slightly lower recreation benefits than Alternative D. Water yield benefits reflect current yields and are the same for all alternatives, since no alternative produces additional water yields.

Receipts to the U.S. Government are generated from market goods and are, therefore, greatest in the commodity emphasis alternatives. Distribution to States represents 25 percent of the total returns to the government. The local employment and income in 1977 for Lincoln, Otero and Eddy counties, the three counties most affected by forest activities, are shown under the total in the far right column. The employment and income shown under the National Forest Base are estimates of the number of jobs and income attributable to 1980 activities on the Lincoln National Forest. The jobs and income represent the direct, indirect and induced effects in the private and public sectors. The alternatives show projections for changes in employment and income for the end of the first period as a result of changes in Forest activities.

Present Net Value Analysis

Present net value (PNV) is the criterion used to maximize net priced benefits in planning benchmarks and alternatives. The priced outputs are those that are or can be exchanged in the market place or are based on data used to estimate possible visitor days (wildlife, wilderness, developed, and dispersed recreation use), permitted livestock use, timber products, firewood and water yield.

The alternatives are designed and analyzed to achieve goals and objectives for priced outputs in a manner that achieves the greatest excess in the value of priced outputs in relation to cost of production while meeting all specified constraints and objectives. The alternatives are also designed to achieve any specified non-priced outputs or benefits and to meet constraints at least cost. The PNV of each alternative, therefore, estimates the value of the maximum attainable net benefits of priced outputs--PNV estimates the market value of resources after all costs of producing outputs and meeting constraints have been subtracted from the value of the expected flow of priced outputs.

Table 11 presents and compares discounted costs, discounted priced benefits, and the present net value of the alternatives, arranged in order of increasing total investment and operation costs. The intent is to display what happens to PNV as PVC increases marginally from one alternative to the next. It is important to note the alternatives were not developed in order of increasing costs but are displayed in this fashion to provide a comparative analysis. Anomalies in the table are discussed briefly in the Present Net Value Trade-offs section.

Table 11. Value Analysis from 2180 - Millions of 1980 4th Quarter Dollars Discounted at 4 Percent.

	Max. PNV Assign.	Alternative B	D	E	PA	A	F	C
PVC	144.2	160.8	174.0	177.6	180.7	182.7	186.7	208.2
Change Betw. Alt.		+16.6	+13.2	+3.6	+3.1	+2.0	+4.0	+21.5
PVB	557.2	560.0	571.4	547.3	540.8	455.6	512.8	532.9
Change Betw. Alt.		+2.8	+11.4	-24.1	-6.5	-85.2	+57.2	+20.1
PNV	413.0	399.2	397.3	369.7	360.1	273.0	326.1	324.7
Change Betw. Alt.		-13.8	-1.9	-27.6	-9.6	-87.1	+53.1	-1.4
PVB by Resource Category								
Timber	2.85	15.02	15.74	20.44	20.84	18.73	10.12	28.77
Recreation	170.10	153.99	161.77	154.43	157.78	135.71	152.91	145.66
Wildlife	323.98	325.82	330.82	309.16	300.08	236.97	289.37	289.05
Range	40.88	45.83	43.67	43.94	42.79	44.87	41.09	50.01
Water Yield	19.36	19.36	19.36	19.36	19.36	19.36	19.36	19.36
PVC by Major Cost Category								
Timber	4.50	19.34	26.07	33.51	31.71	28.24	16.00	41.94
Recreation	14.32	10.79	15.27	11.95	16.61	7.34	12.05	8.32
Wildlife	11.92	12.11	10.43	9.05	7.89	3.23	5.53	4.91
Range	8.48	12.82	9.83	11.94	11.27	13.01	7.10	22.51
Protection	56.13	56.13	62.56	62.56	63.89	83.54	109.38	83.54
Roads	15.93	16.14	16.95	15.45	15.10	13.83	12.55	14.34
Other	32.95	33.45	32.93	33.13	34.28	33.47	24.09	32.65

Recreation benefits include developed, dispersed and wilderness benefits. Wildlife benefits are for both current visitor use levels and projected increases over current level. Benefits for water yield are based on the assigned value of an acre-foot of water and are shown for the current water yields only. Fuelwood is included with timber costs and benefits. Protection costs include costs for fire prevention, fire fighting and law enforcement. "Other" costs include administrative and support costs. The majority of these costs are fixed overhead costs, and therefore, do not change significantly between alternatives, with the exception of Alternative F.

The primary determinants of the magnitude of costs are the timber harvest level and the fire protection and suppression levels. The Max PNV Benchmark has the lowest costs because it produces very little timber. All the other alternatives produce more timber. Timber management costs on the Forest are higher than the timber priced benefits. As the level of timber production increases, timber costs increase, net timber benefits decrease, and total PNV's decrease. The costs to provide recreation and wildlife opportunities are much lower than the costs to manage timber lands for commercial harvests. In all alternatives, the priced benefits from recreation and wildlife are much greater than the priced benefits from timber and range. The net positive benefits from recreation and wildlife are usually not enough to offset the net negative benefits from timber production.

The alternatives are arranged in Table 11 in order by increasing costs. In general, this is the same order in which timber yields increase, amenity outputs decrease and PNV's decrease. The exceptions to this are between the PA and Alternative A and between Alternatives A and F. The cost increases between these alternatives are due primarily to increased fire protection. The PNV increases between Alternative A and F, despite an increase in protection costs, because there is a large increase in net benefits for recreation and wildlife and a reduction in administrative and support costs.

Total discounted costs range from a low of $144 million for the Max PNV Benchmark, with its dominant emphasis on amenity outputs, to $208 million for Alternative C which provides the highest amounts of commodity outputs. The greatest increase in costs between two alternatives is $22 million which is the increase between Alternatives F and C. This is due primarily to the difference between a low budget alternative and an alternative designed to provide more intense utilization of all Forest resources, especially commodities. Alternative C has the highest range costs and benefits of any other alternative, however, the net benefits for range are lower because the high investments yield a small increase in grazing capacities.

The lowest total discounted benefits, $456 million, are from Alternative A which is constrained to manage all resources at current management intensities, usually with corresponding lower output levels. The highest total benefits come from Alternative D which produces the highest level of recreation and wildlife benefits. The primary determinant of the magnitude of priced benefits is wildlife RVD outputs.

Non-Priced Benefits

Nonpriced benefits are those benefits for which no monetary value or price can be determined. Nonpriced benefits include on-site and off-site effects, such as water quality condition, visual quality, quality of recreation experience, protection of threatened and endangered species, and impacts on local employment. Nonpriced benefits do not significantly affect the priced benefits of the resource outputs modeled for the alternatives. The majority of the changes in costs in the alternatives can be tied to priced benefits, however, the nonpriced benefits play an important role in determining management direction on the Lincoln National Forest. Net public benefits are affected by both the net priced benefits and the nonpriced benefits.

Timber management on the Forest produces priced benefits in the sawtimber and fuelwood that can be sold. However, the cost to produce the outputs generally exceeds the priced benefits. There are several nonpriced benefits that accrue as the result of applying silvicultural techniques to the timber lands: 1) the present insect and disease problem on the Forest can be controlled and more disease-resistant stands can be provided for future generations, 2) the present predominance of timber stands in similar uneven-age classes can be adjusted to provide a good distribution of even-age class stands, which is beneficial to wildlife, diversity and visual quality, and 3) the long-term sustained-yield capability of the timber lands can be improved. The nonpriced benefits are complementary to the priced benefits since increased timber management leads to increased sawtimber harvests. Due to the negative net priced benefits from timber, however, the present net value decreases in almost all alternatives that produce more timber volume.

Fire and law enforcement protection costs money but does not produce any priced benefits directly. The effect of increased expenditures is to reduce potential losses of timber land, recreation sites, and adjacent private property values from fire or vandalism. The present net value decreases in all alternatives where protection costs increase, except in Alternative F.

Investments in range management provide protection for riparian areas and rehabilitation of disturbed grasslands, as well as adjustments in grazing use to match grazing capacities. There are both priced and nonpriced benefits from these costs. The priced benefits are from the permitted grazing use. Nonpriced benefits from range management include improved ecological condition of the riparian lands for wildlife, improved soil and watershed condition around over-grazed lands, and improved visual quality of the grasslands. As grazing use increases and exceeds the capacity of the land, the nonpriced benefits tend to decrease and are thus competitive with the priced benefits. Increases in range management costs lower the net priced benefits in range, as can be seen when going from Alternative F to any of the other alternatives, but add to the nonpriced benefits.

In comparing the trade-offs among alternatives, it is necessary to consider the entire array of nonpriced benefits, the relationships between priced and nonpriced benefit output levels, and the qualitative values associated with nonpriced benefits as they relate to the quantitative measure of economic efficiency represented by PNV. The judgmental comparisons of alternatives performed within this framework form the principal indicator of the net public benefits associated with each alternative.

Present Net Value Trade-offs

Table 12 displays the ranking of the alternatives compared to the Max PNV Assigned Values Benchmark. Alternatives are ranked in order of decreasing present net value from left to right. Comparisons are in millions of 1980 4th quarter dollars discounted at 4 percent.

Table 12. Comparison of Alternatives with Max PNV Assigned Benchmark.

	Max PNV Assigned	Alternative						
		B	D	E	PA	F	C	A
MM$	413.0	399.2	397.3	369.7	360.1	326.1	324.7	273.0
Percent of Max PNV Assigned		97	96	90	87	79	79	66

The difference in PNV between alternatives is called the trade-off or opportunity cost between each alternative. The opportunity cost is a measure of the investmant opportunity foregone by implementing the alternative instead of the next highest ranking alternative. The following discussion summarizes the major opportunity costs between the alternatives.

Max PNV Assigned Values Benchmark

The PNV of this benchmark alternative is used as a reference point for evaluating opportunity costs. This benchmark produces the highest PNV of all benchmarks and alternatives because the only objective of this benchmark is to maximize economic efficiency with the least number of constraints. The only constraints were those needed to meet minimum policy and legal requirements which were common to all benchmarks and alternatives. See Appendix B for a complete discussion of constraints.

Alternative B

Alternative B was designed to produce the Forest's share of the national RPA targets assigned in the Regional Guide. The opportunity cost between Alternative B and the Max PNV Assigned Benchmark is about $14 million. The opportunity cost is all due to changes in priced benefits. The level of timber harvest is increased, the level of developed recreation is reduced, and the level of dispersed recreation is increased to produce the RPA target levels. In order to produce the targeted levels of timber and dispersed recreation, costs of production increase at a faster rate than the benefits, and net benefits from timber and dispersed recreation are reduced. The reduction in developed recreation to achieve the target level also reduces the net benefits because developed recreation benefits increase faster than costs. The increased grazing costs in Alternative B provide increased grazing capacities having priced benefits, but also a nonpriced benefit of improved watershed conditions.

Alternative D

Alternative D was developed to emphasize resource outputs with nonmarket values, such as recreation and wildlife, and to manage timber primarily for the protection of property values and visual quality in the areas of high recreation use in the Sacramento Mountains. There is little opportunity cost between Alternative D and Alternative B. Although the PNV of the two alternatives is nearly equal, there is a difference in the mix of costs and benefits between them. Net benefits in recreation, wildlife, and range are increased in Alternative D. However, these increases are offset by decreased net timber benefits to protect the high value recreation areas from insect and disease and maintain the visual quality of the Forest in these areas. Alternative D

provides a more intensive level of fire protection and law enforcement to maintain the recreation values consistent with the objectives of the alternative. This is an increased cost with no increase in priced benefits. Therefore the protection provided is a nonpriced benefit.

Alternative E

Alternative E was designed to emphasize treatment of present insect and disease incidence in the Sacramento Mountains. Large portions of the mixed conifer type near high-use recreation areas and in the most productive timber areas are intensively managed to control losses due to western spruce budworm and dwarf mistletoes. The opportunity cost between Alternative E and Alternative D is about $28 million. The opportunity cost is all due to changes in priced benefits. The emphasis on timber management for insect and disease control results in increased timber costs which are not matched by increased priced benefits. The largest opportunity costs, however, are caused by reduced net benefits in wildlife and recreation, which are managed at a lower emphasis with less available budget. Increased timber management produces nonpriced benefits because all alternatives depend on timber harvest to meet visual, wildlife habitat, and insect and disease prevention objectives as well as silvicultural objectives.

Proposed Action

The Proposed Action was designed to resolve major issues and management concerns with a mix of both market and nonmarket uses and outputs. The opportunity cost between the Proposed Action and Alternative E is about $10 million. The opportunity cost is due primarily to changes in priced benefits. A reduction in net wildlife benefits accounts for most of the opportunity cost. The wildlife budget is reduced due to the increased emphasis on recreation management and programs that support additional recreation opportunities, such as law enforcement, public information services and Forest access. The increased protection and support costs produce nonpriced benefits of higher quality recreation and improved access, but do not increase priced benefits.

Alternative F

Alternative F is a low budget alternative to the Proposed Action. The resource emphases in the PA are maintained in Alternative F, but at a lower funding level. The opportunity cost between the PA and Alternative F is about $34 million and is due primarily to nonpriced benefits. The protection costs increase substantially due to the reduced support and fire prevention budgets. This is an increased cost with no increase in priced benefits, but a necessary cost to protect the forest resources from fire and vandalism. A small part of the opportunity cost is due to a reduction in wildlife costs, which result in decreased net priced benefits.

Alternative C

Alternative C was designed to emphasize resources having market values, particularly timber and range. The alternative was designed to produce the highest levels of timber, grazing capacity, and developed recreation possible within a realistic budget level. There is little opportunity cost between Alternative C and Alternative F, but there are differences in the mix of costs and benefits. The costs for timber, range and support functions are much higher in Alternative C. The high emphasis on timber production with corresponding high management costs result in a reduction in net timber benefits. The net benefit for range is reduced because of the high cost to produce the increased grazing capacities. Net benefits are also reduced in recreation due to the

competition for the limited budget. The reductions in net benefits are offset by lower protection costs.

Alternative A

Alternative A was designed to reflect the effects of continuing the present management programs into the future. Only current prescriptions were used to develop the alternative. More efficient prescriptions were not available for this alternative and most of the $52 million opportunity cost between Alternative A and Alternative C was because of this constraint. Timber harvest and grazing outputs decline but net benefits increase because costs decline faster than benefits. The major decrease in net benefits occurs in wildlife as current prescriptions yield the lowest level of wildlife benefits. Recreation benefits are also reduced slightly.

Net Cash Flow

In addition to PNV, each alternative may be viewed from the economic perspective of the net dollar flows which would be generated through Forest management. Table 13 shows these estimated net flows for each alternative for Periods 1 and 5. The estimated receipts (actual dollar collection from the Forest) and the total cost of operations per year are used to calculate these net cash flows. The alternatives are arranged in order of highest to lowest net cash flow in the first time period.

Table 13. Receipts, Costs, Net Cash Flow - M Dollars Per Year.

	Max PNV	B	D	PA	E	A	C	F
Time Period								
Period 1								
Receipts 1/	688	1009	1039	1272	1246	1141	1466	868
Costs 2/	5931	6313	6966	7213	7245	7142	7850	7497
Net Flow	-5243	-5304	-5927	-5941	-5999	-6001	-6384	-6629
Period 5								
Receipts	975	1384	1276	1545	1401	1353	2052	1061
Costs	5550	6397	6409	7139	6475	7141	8388	7224
Net Flow	-4575	-5013	-5133	-5594	-5074	-5788	-6336	-6163

1/ Receipts are estimated and do not include mineral royalties collected by B.L.M.

2/ Costs are total Forest Service costs from Table 8. These costs include purchaser road construction and firefighting fund.

As shown in Table 13, all alternatives produce negative net cash flows throughout both time periods. The Max PNV Benchmark provides the least negative cash flow followed by Alternative B. All alternatives considered require more dollars from the US Treasury (i.e., from all taxpayers) than are returned in the form of collected revenues. The reason for this is that many of the goods and services produced on the Forest are made available to the public at little or no direct charge. The authority to levy user charges for Forest goods and services is controlled by the laws and regulations governing the Forest Service

established by the U.S. Congress. The following section on "income transfer" shows additional detail of this subject.

Income Transfer

The difference between the dollar benefit values and the actual dollar receipts to the Government may be viewed as an "income transfer". In other words, the dollar benefit values used in the model represent the maximum potential value which consumers would be willing to pay for the opportunity to use the timber products, the recreation experiences, the wildlife, water, etc. Since no dollar charges are actually made from some valued outputs, the difference between the potential value and the actual charge made represents dollar values which are "transferred" from the taxpayers at large (i.e., the U.S. Treasury) to the individuals and groups who actually consume the goods and services from the Forest. These estimated "income transfers" from each alternative are shown in Table 14. The values represent average annual transfers for each year in time period 1. The values and procedures used for benefits and receipts are shown in Appendix B.

Table 14. Income Transfer - Period 1, M Dollars Per Year.

	Alternative						
Resources	B	D	PA	E	A	C	F
Timber Benefits 1/	571	600	831	799	719	1013	427
Timber Receipts 2/	571	600	831	799	719	1013	427
Timber Transfer	0	0	0	0	0	0	0
Range Benefits	1468	1437	1425	1452	1457	1568	1427
Range Receipts	243	238	236	240	241	260	236
Income Transfer	1225	1199	1189	1212	1216	1308	1191
Rec/Wildlife Benefits	13,320	14,126	13,387	13,383	12,540	13,210	13,275
Rec/Wildlife Receipts	195	201	205	207	178	193	199
Income Transfer	13,125	13,925	13,182	13,176	12,362	13,017	13,076
Water Benefits	780	780	780	780	780	780	780
Water Receipts	0	0	0	0	0	0	0
Income Transfer	780	780	780	780	780	780	780

1/ Benefits are taken from Table 10.

2/ Government receipts are estimated for timber, grazing, and recreation. The receipts normally account for about 98% of the total, excluding mineral royalties, and lease payments.

As shown in the table, the largest income transfers occur as a result of the very large recreation and wildlife outputs which are produced by the Forest and for which little or no actual charges are made. These income transfers alone account for between $12-14 million per year.

Income transfers associated with the range program amount to about $1 million per year in all alternatives. There is also an income transfer for water which flows from the Forest's managed watersheds. Each of the alternatives considered would provide about $0.8 million per year to downstream users. No charges are made for these outputs.

There are no income transfers associated with the timber sale program in any of the alternatives. This is because the benefit values are the estimated dollar charges (actual receipts) which would be made for all timber products sold including fuelwood.

SUMMARY OF SIGNIFICANT EFFECTS

This section summarizes the significant environmental effects of each of the alternatives that are discussed in detail in Chapter 4. Unavoidable adverse effects were found to be temporary and insignificant. Management requirements in prescriptions mitigate most adverse effects by limiting the extent and duration of impacts. Alternative formulation eliminated alternatives that would have resulted in excessive impacts. The adverse effects are summarized at the end of Chapter 4.

Dispersed Recreation

Alternatives B and D provide the most dispersed recreation opportunity meeting most of the projected future need. Alternatives PA, C, E and F provide nearly as much opportunity as B and D. Alternative A provides only about three fourths of the projected need.

All alternatives except Alternative A close the entire Forest to off-road vehicle use except on designated roads. Under Alternative A, the Forest is all open to off-road vehicle use except for a few areas which would be designated closed.

Alternative D provides the highest proportion of opportunity managed at standard service level which reflects the quality of recreation provided. Alternative D is followed in order by Alternatives PA, F, B, E, C, and A. Alternative A provides no standard service level recreation and thus provides the lowest quality opportunities.

Alternatives B and D provide the highest level of cave protection followed by the PA. Alternatives A, C, E, and F provide the lowest levels of protection and use.

Developed Recreation

Alternative D provides the most increase in developed recreation opportunities and a high quality of experience. The Proposed Action and Alternative E are next best and are followed by Alternatives F, B, C and A.

Wilderness

Alternative D provides for additional wilderness designation and the other alternatives do not.

Visual Resource

Alternative D will provide the highest level of visual quality and Alternative C will provide the lowest level. However, the effects of all the alternatives are temporary and are not a significant impact.

Cultural Resource	All alternatives will provide for cultural resource surveys of all ground disturbing activities. Alternative C has the highest risk of accidental damage to cultural resources followed by Alternatives A, PA, E, B, D and F in descending order of risk. Alternative D will provide for the most protection, interpretation and stabilization, followed by Alternatives B, PA, A, F, E and C in descending order.
Wildlife	All alternatives provide similar big game habitat conditions, although Alternatives C and E provide slightly more forage. Alternatives F, PA and A provide increased mature mixed conifer habitat for game, such as turkey and squirrel, while Alternatives C and E provide less. Alternative B provides the most acres of old growth followed by Alternatives F, D, E, PA, A, and C in descending order. Alternative B also provides the most management for direct habitat improvements and is followed by Alternatives D, E, PA, F, C, and A. Overall, Alternative B would be the best for wildlife habitat improvements, Alternative D would be second best and would be followed by Alternatives PA and E, then F, C and A.
Range	Alternative C balances permitted grazing use and capacity in the first period. Alternatives PA, A, B, D, and E balance in the third period. Alternative F balances in the fourth period. Alternative C provides the highest level of grazing capacity and use followed by Alternatives B, A, D, E, PA and F in descending order.
Timber	Alternative C uses the highest proportion of the tentatively suitable timber acres for timber harvest activities followed by Alternatives PA, E, B, A, D and F in descending order. Alternative C also results in the highest LTSY followed by Alternatives E, PA, A, D, B, and F in descending order. Alternative F provides the best size class distribution followed by Alternatives PA, B, E, C, D and A.
Fuelwood	Alternative C produces the most fuelwood followed by Alternatives A, E, PA, B, D and F.
Diversity	Alternative B provides the greatest increase in diversity due to direct wildlife habitat improvements followed by Alternatives D, PA, E, F, C, and A. Alternative C provides the greatest increase in diversity due to timber harvest followed by Alternatives E, PA, A, D, B and F. Alternative B also provides the greatest increase in diversity due to old growth followed by Alternatives F, D, E, PA, A, and C. Alternative C provides the greatest increase in diversity because of grazing activities followed by B, A, D, E, PA and F.
Soil and Water	Alternative C results in the fewest acres in unsatisfactory watershed condition by the end of the fifth period, followed by Alternatives B, D, E, PA, A and F.
Minerals	Alternatives B, D and PA increase the acreage withdrawn from all kinds of mineral entry while the remaining alternatives make little change in mineral accessibility from the current situation.

Protection

Alternative A has the lowest probability of disastrous fires while Alternatives PA, B, D and E have the highest probability. Alternatives C and F are between the others in the probability of occurrences of disastrous fires.

Alternative E provides the best management for prevention and control of damage caused by insects and disease followed by the PA, D, A, C, F and B.

Alternative PA provides the most intensive level of law enforcement followed by B, D and E, then C, F and A.

Irretrievable Commitments

Irretrievable resource commitments result from changes in resource outputs between alternatives during the first period. Irretrievable commitments represent opportunities foregone when any given alternative is implemented instead of the alternative producing the highest output. Irretrievable commitments are calculated by subtracting the output of each alternative from the output of the alternative having the highest output in Period 1. Significant irretrievable commitments are summarized in Table 15.

Table 15. Irretrievable Resource Commitments - Period 1

	Alternative						
	PA	A	B	C	D	E	F
DISPERSED REC, MRVD	280	630	180	370	0	330	420
DEVELOPED REC, MRVD	60	840	340	400	170	0	230
WILDERNESS REC, MRVD	82	95	82	95	0	90	90
GRAZING USE, MAUM	40	10	10	210	40	40	0
TIMBER HARVEST, MMBF	36.19	65.42	93.13	0	83.91	44.46	115.29
FUELWOOD HARVEST, MMBF	28.72	10.44	26.80	0	33.56	19.84	66.42

3. Affected Environment

OVERVIEW

This chapter describes the environment of the area to be affected by the implementation of the proposed action or an alternative. The Physical and Biological Setting Section of this chapter describes the general physical conditions existing in the Forest. Geology, topography, climate, and plant and animal life are discussed. The Social and Economic Setting describes the human, social, and economic environment of the Forest. The Resource Elements Section provides a detailed review of current use, management, and future trends for the Forest's resources.

Supply potential, as defined by the Benchmark Analysis, is displayed for most resource elements. Also, included under each element is a section titled "Future Trends" which projects expected future consumption through Period 5.

SECTION A PHYSICAL AND BIOLOGICAL SETTING

The Forest is part of the National Forest System in the United States. It was first set aside as a Forest Reserve in 1902 to protect and conserve the area's water supply and recreation values. Today's Forest originally consisted of five individual Forest Reserves or National Forests. In 1917, the last of these Forests were combined and the entire area became known as the Lincoln National Forest.

The Forest is composed of three separate parcels located in south-central New Mexico. It covers 1.1 million acres, and offers a variety of landforms and plant and animal habitats.

Physiography

The Forest landscape varies from rugged canyons to gently sloping alluvial fans. Elevations range from approximately 4,200 feet above sea level at the western base of the Sacramento Mountains to over 11,500 feet near Sierra Blanca Peak. The western edge of the Forest consists almost entirely of a rugged escarpment, which at one point drops over 7,000 feet to the basin floor, forming the largest relief difference in New Mexico. The bulk of the Forest, however, lies east of the escarpment and is characterized by a much more gradual slope toward the Pecos Valley.

Approximately three-quarters of the Forest drains into the Pecos Valley, while the western one-quarter drains into the Tularosa Basin. Watersheds in the upland mountain areas are characterized by rugged terrain with steep, incised canyons.

Climate

The climate of the Forest varies from semi-arid at the lower elevations to sub-humid in the high mountain areas. Climatological characteristics consist of low relative humidity, hot summers, moderate winters and wide seasonal and diurnal temperature fluctuations. Average annual temperatures vary from approximately 60°F in the lower zones to 40°F in the higher elevations. Precipitation also varies with elevation ranging from approximately 9 inches to 28 inches per year. Over 50 percent of the annual precipitation occurs during July, August and September.

Geology and Soils

The Forest encompasses three major mountain ranges, the Sacramento Mountains, Guadalupe Mountains, and the east-west running Capitan Mountains. Together these mountains form the southeastern edge of the Basin and Range geomorphic

province. The northern Sacramento and Capitan ranges consist of intrusive and extrusive rocks with sedimentary abutments while the southern Sacramento and Guadalupes are, in contrast, a sedimentary fault block range. Smaller mountain ranges within the Forest include the Jicarilla, Tucson, Patos and Vera Cruz mountains. Soils vary in depth, horizon characteristics and extent of soil loss. This variation results in differences in productivity and erodability.

Vegetation

Vegetation on the Forest is modified by influences from the Rocky Mountains, Chihuahuan Desert and the Great Plains. Distribution is primarily controlled by elevation and, to a lesser extent, by aspect, topography and soils. The highest zone encompasses the Englemann spruce and corkbark fir community followed by an Englemann spruce and white fir community. On some southerly aspects a grass community of Arizona fescue and Thurber's fescue is found on deep soils. Douglas-fir, ponderosa pine, white fir and southwestern white pine are the dominant members of the next lower community (hereafter referred to as the mixed conifer) with aspen in small stands, generally along drainages and sides of canyons. Ponderosa pine occupies the next lower zone. The pinyon-juniper woodlands are comprised of pinyon pine, alligator juniper and one-seed juniper. At the lower elevations the desert grasslands contain blue grama, galleta grass, black grama, and sideoats grama. The desert shrublands contain mesquite and creosote bush.

SECTION B
SOCIAL AND ECONOMIC SETTING

Human occupation of the area encompassed by the Forest has spanned thousands of years. During this time, the nature of man's adaptation to this mountain and valley environment changed in numerous ways. A number of these changes can be correlated with changes in the environment and in the technology and organization of peoples inhabiting the area. The earliest inhabitants of this region were migratory hunters of non-extinct big game animals. These hunters roamed throughout New Mexico as long as 10,000 years ago during what is now called the Paleo-Indian Period. Evidence of their camps has been found in the Tularosa Basin near old lake beds, and in the Guadalupe Mountains where some caves contain the remains of extinct fauna and human artifactual material.

Around 6,000 years ago there is evidence of climatic changes which led to increasingly drier conditions, alterations in the distribution of plant species, and a drastic decrease in the number of large game animals (whether because of environmental changes or intensive human hunting activities is not clear). With these environmental changes came changes in man's adaptation to the area. Hunting was supplemented by a variety of gathered resources. These resources were obtained from varying environmental zones between the basin floor and the higher mountain areas. Such an exploitation system necessitated seasonal movements of people depending upon resource availability. This type of adaptation, which endured for several thousand years is termed the Archaic Period. Sometime during the Archaic the cultivation of corn began, but agricultural products did not become an important food source until several centuries later. Archaeological sites associated with peoples, presumably used on a seasonal basis rather than as permanent residences, have been identified on the Forest. These include rock shelters where perishable remains have often been preserved, and campsites in open areas of both the basin and mountain regions.

The subsequent transition from a generalized hunting and gathering subsistence involving seasonal movements of people to a more sedentary type of existence with a greater reliance upon agriculture came about over a period of centuries. By around A.D. 700, pithouse villages were established in alluviated areas of canyon mouths such as along the eastern edge of the Tularosa Basin. These pithouse villages were built until approximately A.D. 1200 and were most common in the Lincoln area after A.D. 1000. They tended to be located near permanent streams and rivers, and good soils for growing crops. Salvage excavations near Mayhill indicate that people lived in large, deep pithouses. Similar types of pithouse villages have been uncovered further north in the Sierra Blanca region along the Bonito drainage. People who lived in these villages are part of the Jornada Mogollon Culture which includes south-central New Mexico, extreme west Texas, and northern Mexico.

By A.D. 1200 a shift from subterranean living quarters to above-ground dwellings constructed of adobe and stone took place. Towns composed of linear or square room blocks, sometimes oriented around a plaza, were constructed throughout the Sierra Blanca region (along the Bonito, Ruidoso, Hondo drainages, base of the Capitan Mountains, etc.), and in the lower elevations of the Tularosa Basin, particularly along the western escarpment of the Sacramento Mountains near Alamogordo and Three Rivers. The settlements of this time were built in locations different from pithouse ones, typically on high benches or other areas which provided good visibility, even though the distance to a water source may have been greater. Other changes also took place. The kinds of artifacts found at such sites suggests that these Jornada people traded and were in contact with other areas in the Southwest and northern Mexico. A heavy reliance on corn agriculture and upon bison from the plains is also indicated.

For unclear reasons the region encompassed by the Lincoln was abandoned between A.D. 1350 and A.D. 1400, thus ending the cultural sequence of the Jornada Mogollon. There is evidence in tree ring and pollen records of a drought period around A.D. 1300. Perhaps such a period of drier conditions severely limited the agricultural productivity of the land so that people were forced to move elsewhere.

There is, at present, no archaeological evidence of occupation of the Lincoln area between about A.D. 1400 and about A.D. 1600. Spanish accounts from the late 1500's do, however, mention the presence of nomadic peoples on the west side of the Tularosa Basin and along the Pecos River. These nomads later came to be known as the Apache, a group of Athapaskan peoples who migrated into the Southwest from Canada and Alaska sometime during the sixteenth century.

The Sacramento and Guadalupe Mountains became the heartland of the Mescalero Apache. These nomadic hunters and gatherers incorporated raiding into their economy, and their presence in southcentral New Mexico prevented Anglo occupation of much of this area until the middle of the nineteenth century. Military campaigns of the mid-1850's (including expeditions up the Penasco Valley, into the Guadalupes and the Capitan Mountains) and the establishment of Ft. Stanton led to a decline in Indian raids although the Apache offered strong resistance until they were forced onto a reservation in 1874. Their reservation lies in the midst of what is now the Lincoln National Forest.

Southcentral New Mexico then became a popular area for settlement in the late 1800's for several reasons. It was a good stock raising area with large tracts of land available. Tularosa was established in the 1860's as a ranching community on the west side of the Sacramento Mountains while communities such as Mayhill and Weed on the eastern slopes of the Sacramentos were formed in the mid-1880's. A large cattle industry developed with men involved such as Pat Garrett of Roswell, Charles Eddy of Carlsbad, and Oliver Lee in the Tularosa Basin.

Farther north in the Bonito Valley, La Placita (Lincoln) was first settled in 1849 as a cattle and sheep raising area, and because of good farm lands. The Hondo and Ruidoso valleys and the base of the Capitans were also soon settled. Range conflicts occurred, the most famous of which was the Lincoln County War which officially began in 1878.

The discovery of gold in the 1870's also had a tremendous impact on the local communities. Nogal and White Oaks were established in 1879 to mine the recently discovered gold, and numerous other mining camps soon appeared throughout the Sierra Blanca region and in the Jicarilla Mountains. Remnants of this mining era can still be found within the Forest. The end of the mining boom came around the turn of the century when the railroad being built northward from El Paso bypassed White Oaks, leading to a decline in mining development in the area. The railroad did, however, foster development in the high timber country of the Sacramento Mountains.

Alamogordo was established in 1898 as a railroad town with a line running directly into the mountains to obtain timber. High Rolls, Mountain Park, Cloudcroft and the now deserted logging settlements of Russia and Marcia all owed their existence to the railroad. By World War II increased logging costs and the construction of highways through the mountains made railroad logging uneconomical so tracks were taken up, and the railroad days came to an end in the Sacramento Mountains.

The Forest Service began to play a role in the area early in this century. The land now included in the Lincoln National Forest was once part of five national forests or forest reserves. The Lincoln National Forest was established in 1902 with an office in Capitan. In 1906 the Gallinas Forest Reserve was established, and in 1907 the Guadalupe National Forest and Sacramento National Forest were created. The Guadalupe and Sacramento Forests were then consolidated into the Alamo National Forest in 1908. In 1917 the Alamo National Forest was transferred to the Lincoln National Forest and the entire area became known as the Lincoln National Forest.

Important considerations in setting aside these lands as public domain included the recreation, timber and watershed values of the mountainous region. The Lincoln forms an integral part of the recent history of southcentral New Mexico and has played a prominent role in the growth and development of the area.

A more detailed cultural resources overview for the Lincoln National Forest has been written by Spoerl (1983). Other relevant overviews include Spoerl (1981),

Lehmer(1948), and Kelly (1966). Additional information on the cultural resources of the Lincoln National Forest and management plans for these resources will be available in fiscal year 1988 in a cultural resources supplement to the Forest Plan.

Area of Influence

The Forest's primary area of social and economic influence is located in southcentral New Mexico and consists of four counties; Chaves, Eddy, Lincoln and Otero. These counties are viewed as the area with the closest economic ties to the Forest. Approximately 154,000 people reside within this area. In addition, an estimated three million people live within a general zone of influence which includes the four counties, the El Paso-Juarez metropolitan area and west Texas. This zone is defined in terms of Forest users and developed amenity values (e.g., recreation opportunities).

Population

There is no large dominant population center within the Forest's primary area of social and economic influence. Population growth in Chaves, Eddy, Lincoln and Otero counties is concentrated in Roswell, Carlsbad, Ruidoso and Alamogordo. Other towns such as Tularosa and Carrizozo continue to grow at a slow rate, and some of the small mountain communities within the Forest are nearly static in growth. Table 16 displays population trends for the four-county area within the primary zone of influence.

Table 16. Population Trend By County

	1950	1960	1970	1980	1990 [1/]	2000 [1/]
Chaves	40,605	57,649	43,335	51,103	60,200	67,300
Eddy	40,640	50,783	41,119	47,855	52,900	57,200
Lincoln	7,409	7,744	7,560	10,997	15,300	18,700
Otero	14,909	36,976	41,097	44,665	45,600	45,300
TOTAL	103,563	153,152	133,111	154,620	174,000	188,500

1/ Population estimates from Water Quality Management Fact Sheet No. 1, January 1981, State of New Mexico.

Generally three cultural groups are represented within the Forest zone of influence. These groups are the Anglo, Hispanic and American Indian.

Employment and Income

Employment in the primary zone of influence is based mainly on farming and ranching, recreation-tourism, and the government sector. The average per capita income for the four-county area in 1977 was about $5,720. The major source of income, particularly in Lincoln and Otero counties, is from the government sector, followed by services and wholesale and retail trade. Employment relating to recreation-tourism is increasing in the Ruidoso, Alamogordo and Carlsbad areas. Employment and income figures are shown in Tables 17 and 18.

Table 17. Employment Totals (1977)

County	Total Employed (Civilian)	Total Unemployed	Rate
Chaves	18,589	1,124	5.7 %
Eddy	19,162	1,046	5.2
Lincoln	5,299	230	4.2
Otero	11,792	1,045	8.1

Table 18. Labor Force Distribution By Major Industry Sector (1977)

County	Manufacturing	Mining	Contract Const.	Trans., Comm.& Util.	Wholesale Retail Trade	F.I.R.E. 2/	Services & Misc.	Gov't
Chaves	2,152	309	799	941	3,978	759	2,283	3,465
Eddy	1,012	3,705	1,227	1,052	3,317	506	2,651	2,226
Lincoln	72	1/	360	155	742	237	676	901
Otero	1,274	1/	649	574	2,803	426	2,474	4.053

1/ Undisclosed items are included in services & miscellaneous.
2/ Finance, Insurance & Real Estate
Source: New Mexico Statistical Abstract

Lifestyle, Social and Economic Situation

El Paso is the only metropolitan area located in the Forest general zone of influence. Within the Forest primary zone of influence, Roswell, Hobbs, Carlsbad and Alamogordo can be considered to offer an urban lifestyle. Other communities, such as Cloudcroft, Mayhill, Carizozo, Capitan and Lincoln are distinctly rural in nature.

The smaller communities are all dependent to a degree upon land utilization including logging, fruit farming, farming, ranching and mining. In general, these communities are characterized by a desire to maintain established local cultural traditions and a feeling of self-reliance and independence. Because of this tie to the land, residents tend to support development and use of commodities with less emphasis on amenity values. However, they do engage in recreation activities, such as hunting, fishing, camping, hiking, off-road vehicle use and pleasure driving.

Inhabitants of these rural communities enjoy their lifestyle and appreciate the openness and freedom the Forest provides. Although there is a general acceptance of the Forest Service, they tend to resist management direction which limits their accustomed use of these lands.

These smaller communities also exhibit a desire to retain their rural atmosphere. However, this does not mean that change is not possible for the future. Some smaller communities are unable to provide all the services needed for their residents and look for opportunities to expand their services and local economies. For other communities, substantial growth is not possible. Forest lands restrict expansion and local businesses have difficulty competing with larger cities in the area.

Privately owned land is found throughout the area and in every major drainage bottom. Several large blocks of private land exist within Forest boundaries, including the resort development of Timberon. Approximately 18,000 acres of land are utilized by McGregor Guided Missile Range as a result of a Memorandum of Understanding between the Forest Service and the Army Corps of Engineers. A land use agreement also is in effect for the Sacramento Peak Solar Observatory at Sunspot.

Relatively large population centers whose inhabitants use the Forest for economic and recreational purposes are located to the south and east of the Forest. Inhabitants of cities such as Roswell, Hobbs, Lovington in southeastern New Mexico, and those of El Paso and other west Texas communities utilize the Forest more for its amenity value than for commodities. Activities include sight-seeing, picnicking, camping, hiking, nature study, hunting, fishing, motorcycling, snowmobiling, skiing and fuelwood gathering. An increasing number of Mexican residents are also using the Forest for recreational activities.

The urban dwellers' philosophy of management is somewhat different than that of the small community resident. They generally support amenity values. Some do not enjoy seeing activities which alter the wildland atmosphere.

SECTION C RESOURCE ELEMENTS

The Forest may be described in terms of its resources and support activities to protect and produce them. The following discussion portrays the management situation.

The resource elements are discussed separately only to emphasize important aspects of the current situation. Management of the Forest is carried out on an integrated resource basis because individual resources are part of a complex ecological and management situation.

RECREATION

The variety of opportunities provided by a diverse landscape and local cultural traditions have made recreation one of the major uses of the Forest. The climatic relief offered by the mountains from the surrounding desert and plains continually draws people to the Forest. In 1980 about 1333.2 thousand recreation visitor days (RVDs) were reported for the Forest as shown in Table 19.

Table 19. Recreation Use of the Forest (1980)

Activities	MRVDs	Percent
Developed Sites	267.2	20.1
Dispersed Areas	533.3	40.0
Private Development	147.5	11.1
Caves	5.9	0.4
Wilderness	20.4	1.6
Interpretive Services	10.9	0.8
Consumptive Wildlife (hunting and fishing)	174.0	13.0
Non-consumptive Wildlife (viewing)	174.0	13.0
Total	1,333.2	100.0

Some of the recreation opportunities outlined in the 1985 update of the New Mexico State Comprehensive Outdoor Recreation Plan are emphasized on the Forest. These include picnicking, developed camping, and fishing.

Dispersed Recreation

The Forest provides a multitude of dispersed recreation activities including hiking, backpacking, picnicking, camping, trail biking, hunting, fishing, and general leisure and sight-seeing. During the winter months, activities include

cross country-skiing, snowmobiling, and use of snowplay areas. Dispersed recreation use for 1980, including wildlife and caving, was estimated to be 887.2 MRVDs per year which accounts for 66.4 percent of the recreation use on the Forest.

Approximately 1,092,760 acres of Forest land are available for dispersed recreation use. These acres have been divided into six classes utilizing the Recreation Opportunity Spectrum (ROS) classification. This classification system provides a framework for defining the types of outdoor recreation opportunities (i.e. class), and estimating the number of acres in each class. Under this system there are 161,548 acres classified as semi-primitive nonmotorized (SP), however, some of the other classes (SPM, RN and R classes) overlapped parts of the wilderness boundary. To reflect the restriction on motorized use within the wilderness, the ROS acre figures were adjusted, as shown in Table 20, to bring the acres within the wilderness into the SP class.

Table 20. Recreation Opportunity Spectrum

Class	Acres	Adjusted Acres
Primitive(P)	0	0
Semi-Primitive(SP)	161,548	185,913
Semi-Primitive Motorized(SPM)	712,735	690,677
Roaded Natural(RN)	214,598	212,519
Rural(R)	3,374	3,146
Urban(U)	505	505
Total	1,092,760	1,092,760

Dispersed recreation capacities were estimated for each ROS class using the classification procedure guide for Region 3. Recreation use by ROs class was then determined from Recreation Information Management (RIM) reports. The potential capacities and current use are displayed in Table 21.

Table 21. Dispersed Recreation Capacity and Current Use (1980) by ROS, in MRVDs

ROS Class	Capacity	Current Use
Primitive (P)	---	---
Semiprimitive (SP)		
NonWilderness	23.7	9.2
Wilderness	26.1	8.7
Semiprimitive motorized (SPM)		
NonWilderness	624.4	215.9
Wilderness	26.8	12.6
Roaded natural (RN)		
NonWilderness	802.0	388.4
Wilderness	8.3	3.5
Rural (R)		
NonWilderness	83.6	55.3
Wilderness	0.4	0.5
Urban(U)	10	2.6
Totals - NonWilderness	1543.7	671.4
Wilderness	61.6	25.3

Note: The total use differs from that shown in Table 19 because some wildlife-related recreation was included in this ROS determination.

Most activities occur in semi-primitive motorized areas and roaded natural areas. None of the ROS categories show current use exceeding estimated capacities. Semi-primitive non-motorized use is at about 36 percent of capacity, and the roaded recreation areas, excluding Wilderness, are at about 44 percent of capacity.

Management emphasis for dispersed recreation has focused on caving and off-road vehicle (ORV) use. Although most of the Forest is currently open to ORV use, over 100,000 acres are closed. Areas are closed to prevent soil erosion, destruction of ground cover, and wildlife disturbances and to protect wilderness values. Motorized use of the heavily-used hiking trails and cross-country ski areas poses conflicts with the pedestrian use of those trails.

Current policy permits vehicle access to all parts of the Forest except wilderness. Approximately 1360 miles of travelways have been created and perpetuated by ORV use, and approximately 50 miles are added each year. These travelways, which are not needed for access, are often located in meadows, riparian areas, and steep slopes where they are causing vegetation and soil loss. The problem is particularly acute during the summer and fall when both vehicle use and possibility of damage are highest.

Future Trends

Factors such as population growth, amount of leisure time, and energy costs will affect the rate of increase in most types of dispersed recreation. Off-road motorized use will be reduced both because of management action needed to restrict such activities and because of the inherent incapability of the land to sustain such use. By Period 5 projected dispersed recreation demand of 1952 MRVDs, including wildlife and caving, would exceed the theoretical capacity of 1544 MRVDs by 26 percent. Supply potential identified in the benchmark analysis is 1463 MRVDs in Period 5. The current alternative would provide about 1200 MRVDs by Period 5.

Accommodating future use will require managing dispersed use areas at their capacities, shifting use away from heavily impacted areas, utilizing volunteer and manpower programs for trail maintenance and increasing public awareness of dispersed recreation activities and impacts.

Developed Recreation

Forest developed recreation sites include 12 campgrounds, 2 group campgrounds, 3 picnic grounds, 5 scenic vistas, 1 snowplay area and 7 interpretive service centers. These facilities generated approximately 267.2 thousand RVDs during the 1980 managed season. The season of use for the Forest is generally May through September with some areas open longer depending on the weather. Fees are charged at 9 developed recreation sites. Developed sites are maintained to complement the natural environment and to provide adequate roads, sanitary facilities and other user services. Most developed sites occur in roaded natural and rural recreation opportunity spectrum categories (see Glossary ROS). In addition, there are 7 private facilites on the Forest; 2 ski areas, 2 summer home sites and 3 organizational camps which generated approximately 179.1 MRVDs in 1980.

The current capacity in persons at one time (PAOT) of family-type campgrounds is 1,840, while group camping facilities have a capacity of 300 PAOT. Picnic area capacity is 230 PAOT. Campground facilities where user fees are charged are generally operated at a standard-service level, while other campgrounds are operated at a less than standard-service level depending on current funding. Demand for group facilities exceeds supply on weekends, which is the major use period for these facilities. The Forest's two group campgrounds are located on the Cloudcroft District and are available by reservation. There is also a demand for group facilities on the Smokey Bear District.

Use of existing campground facilities is high, particularly on weekends and holidays; such demands often exceed site capacity. This is indicated by use levels of 6 percent above practical capacity for South Fork Campground and use of up to 20 percent above practical capacity at some of the facilities adjacent to Cloudcroft. In these areas, users make arrangements among themselves in advance so they can retain a site for friends and relatives when their current 14-day stay limit expires. With this type of concentrated use, there is limited opportunity for site rest and rehabilitation during the peak use season.

No new facilities have been constructed on the Forest since the late 1960's, and no new construction is anticipated during the next few years. Current direction and funding for recreation construction has been solely for rehabilitation of existing sites. However, where use exceeds capacity at popular areas, resources

may be degraded. Accordingly, use seasons have been shortened at some sites, and volunteer hosts are recruited for campgrounds requiring fees. At non-fee and more remote areas, a reduced service management has been implemented rather than close any of the existing facilities.

Few privately owned campgrounds occur on or within the Forest, and the Forest-wide developed recreation site capacity far exceeds that provided by State and county governments or private businesses. The current economic viability of private sector development is limited by high land costs which are often associated with increased demand for mountain subdivisions and summer homes.

The Mescalero Apache Tribe (MAT) has two developed recreation areas in addition to the Inn of the Mountain Gods resort complex. The City of Alamogordo operates campground facilities at Bonito Lake.

Table 22 displays existing Forest developed recreation sites by district, PAOT capacity, reported RVD use and percent of theoretical capacity use. The data is generated from 1980 RIM use figures.

Table 22. 1980 Recreation Sites, PAOT Capacity, RVD Use and Percent of Practical Capacity Used.

Ranger District Site Type Name	PAOT Capacity	RVDs	Percent Use of Practical Capacity
Smokey Bear			
Campground			
Skyline	85	4,700	56
South Fork	300	62,100	106
Monjeau	20	1,700	86
Oak Grove	150	1,200[1/]	6
Three Rivers	30	7,200	164
Picnic Grounds			
Cedar Creek	115	1,500	15
Vista			
Lookout Mountain	20	200	23
Windy Point	30	300	7
Interpretive Service			
Bonito Fire	5	200	41
Ranger Station	5	600	82
Total Smokey Bear		760	79,700

Table 22. 1980 Recreation Sites, PAOT Capacity, RVD Use and Percent of Practical Capacity Used (con't)

Ranger District Site Type Name	PAOT Capacity	RVDs	Percent Use of Practical Capacity
Cloudcroft			
Campground			
Deerhead	170	19,800	73
Pines	240	25,900	67
Silver	160	26,900	114
Saddle	85	15,200	122
Apache	130	23,200	121
Sleepy Grass	445	44,600	51
Campground Group			
Fir Group	200	7,200	23
Slide Group	100	4,200	26
Picnic Grounds			
Karr Canyon	30	2,400	55
Vista			
Tunnel	50	4,100	56
Interpretive Service			
Nelson Canyon	50	300	8
La Pasada Encantada	25	600	33
Ranger Station	5	414 2/	57
Supervisor's Office	5	100	14
Other			
Silver Snow Play Area	100	3,503 2/	83
Total Cloudcroft		1,795	178,417
Guadalupe			
Picnic			
Sitting Bull Falls	85	2,600	21
Vista			
Five Points	25	100	3
Interpretive Service			
Ranger Station	5	400	55
Total Guadalupe	115		3,100
Mayhill			
Campground			
James Canyon	25	1,000	14
Interpretive Service			
Ranger Station	5	100	14
Total Mayhill	30	1,100	
Total All Districts	2,700	262,317	

1/ Oak Grove was closed for part of 1980. Use in 1978 was 6,100 RVDs which is approximately 30 percent of theoretical capacity.

2/ RVD use based on 1984 figures.

Future Trends

Developed recreation use will continue to increase during the next 50 years along with the area's expected population growth. This growth is projected to be especially high in the area encompassing the northern part of the Forest where the majority of the developed recreation areas occur. While increasing fuel costs may reduce the number of out of state visitors, the proximity and easy access to the Forest from large population centers such as El Paso and Roswell, will probably offset such declines. The recent trend has been for greater use of the Forest because people who would normally travel to other areas of the Southwest are now vacationing closer to home. Recreation development by the private sector and additional development in the public sector will be required to help alleviate these projected demands. The Forest has identified a number of areas on each District with the capability for developed recreation. Table 23 displays projected MRVDs for developed recreation use in both the public and private sector.

Table 23. Projected Future Developed Recreation Demand, in MRVDs per year

	Period				
	1	2	3	4	5
Excluding Downhill Skiing	320.6	420.0	522.6	622.0	721.4
Including Downhill Skiing	531.2	765.0	993.5	1219.0	1456.9

The potential supply for developed recreation, exclusive of downhill skiing, is 895 MRVDs per year in Period 5. The current direction alternative will provide 453 MRVDs.

Future developed recreation use can be provided by encouraging private sector involvement, increasing volunteer efforts, increasing communications between users, increasing public awareness of developed recreation opportunities and construction of additional recreation sites.

Trails

The Forest contains 240 miles of managed system trails, of which 92 miles occur in the two wildernesses. Trails are used predominantly for recreation although some receive use as stock trails or for fire access.

During 1979 and 1980 the Forest Service established two trails on the Cloudcroft District as National Recreation Trails (NRT) under the National Trails System Act. The Rim NRT is 13 miles long and runs southwesterly near the top of the western escarpment of the Sacramentos. The Dog Canyon NRT begins at Oliver Lee Memorial State Park and is 6 miles long.

Trail maintenance has been nearly equally divided between wilderness trails and NRT's. This has resulted in acceptable maintenance on wilderness trails except in areas where major tread work is necessary. The remaining 129 miles of Forest trails receive very little maintenance. Signing is often inadequate on these trails, and low-use trails are reverting to natural vegetation growth. Some special interest groups have adopted trails and maintain them on a volunteer basis as a means of preventing further deterioration. There are no Forest

priorities for trail construction during the next 5 to 10 years. There is a potential to increase the trail mileage on the extensive supply of old railroad grades and logging roads.

Conflicts between users, such as between hikers and motorcyclists, occur on trails and local roads in the more popular areas of the Forest, especially the high elevations around Cloudcroft. Currently, hikers and others are unable to get away from motorized use except in the wilderness areas and on the Dog Canyon Trail. There is also some conflict between snowmobiles and cross-country skiers in the Cloudcroft area.

Future Trends

Projected need for trails is expected to increase along with demand for dispersed recreation opportunities. The need for trails closer to population centers, particularly near Alamogordo, will exceed that in more remote areas. An increase in trail miles of at least 25 percent is needed to meet the expected future need.

Downhill Skiing

The Forest has two ski areas, Ski Apache, formerly called Sierra Blanca, and Ski Cloudcroft, operated under special use permits. Current annual use at these areas is 113,250 RVDs.

Ski Cloudcroft is the smaller of the two ski areas with one chairlift, a T-Bar lift, and two rope tows. During the 1979-1980 season, Ski Cloudcroft had 4,500 RVDs with approximately 50 percent of this use occurring on the Forest. Annual use at Ski Cloudcroft did not increase significantly prior to the installation of its double chair lift in 1983. An expansion plan for the ski area has been developed. With expansion, Ski Cloudcroft could increase its practical potential by about 20 percent.

Ski Apache is much larger than Ski Cloudcroft and is operated by the Mescalero Apache Tribe. Its six chair lifts and gondola serve approximately 25 miles of ski trails. During the 1979-1980 season 111,000 RVDs were reported. Total capacity of the ski area is about 4000 skiers per day. Skier use over the entire season averages 30 percent of capacity on weekdays and 70 percent on weekends with an estimated 70 percent of the skiers coming from western Texas and from Mexico. During holiday seasons and other heavy use weekends use may reach 135 percent of capacity.

Concern has been expressed over possible impacts from expansion on the Bonito watershed and proposed William G. Telfer RNA. A hydrologic assessment has been completed for the area. The study indicated that an increase in stream flow will occur, but that it will have no adverse impacts on the South Fork of the Bonito or reservoir capacity. In addition, the project will not significantly alter downstream flood potentials. Since no roads, skidding or hauling projects are proposed, infiltration capacities and resultant sediment yields should not be significantly altered. The area has been proportioned to accommodate both the ski expansion and proposed William G. Telfer RNA.

A visual analysis is also being prepared and will contain information relating to visual quality objectives as determined by the Forest's visual management system. The results will be used to help mitigate visual impact on the area as viewed from the White Mountain Wilderness.

Potential Ski Areas

There is interest in developing an additional alpine ski area on the Cloudcroft District. The area would require evaluations of: exposure to prevailing winds, temperature, vertical rise, steepness and length of slope, amount, quality and dependability of snowfall, capacity, utilities, aspect, and access.

Although a formal survey has not been done, 640 acres between Rice and Water Canyons and 400 acres at Russia Canyon appear to have potential for ski area developments.

The area's suitability for such developments results from its northern aspect and high elevations, which should assure adequate snowfall and snow retention, as well as its proximity to El Paso and west Texas populations.

Ski area development could occur in the first period (1980-1990) contingent upon a feasibility study and environmental analysis of the area's physical, biological, social and economic factors. The public will be invited to participate in this analysis. The area is protected from management activities which might damage its potential for skiing.

Future Trends

Future need for downhill skiing exceeds supply in the Southwest. Use by the end of Period 1 will almost double if current trends continue. Consistent need, in spite of energy shortages and higher lift ticket prices, suggests that substantial increases in capacity would be paralleled by increases in use. Thus, assessment of the amount of new capacity needed is difficult. Most of the impetus behind development proposals on the Forest comes from the Mescalero Apache Tribe and local communities seeking a broader economic base. The Tribe has requested permission to expand Ski Apache. The proposed expansion covers 433 acres and has the potential to increase the capacity of the area to 5,000 PAOT. Ski Cloudcroft has limited expansion; however, the identified additional areas in Russia Canyon or Rice Canyon could be used to help accommodate the future demand in the Cloudcroft Area. Potential supply defined by the Max Recreation Benchmark is 315 MRVDs in Period 5. The Current Alternative will provide 238 MRVDs in Period 5. Projected historical trends for downhill skiing use greatly exceed the Forest's supply potential. Projecting the trend indicates a potential need for 736 MRVDs by Period 5.

Caves

The southern Guadalupe Mountains are a massive exposure of the ancient Capitan Barrier Reef which contains some of the most scenic and unique cave formations in the world. The caves provide the caving enthusiast with numerous exploration and wild cave experiences. The management of these caves is being increased as much as limited funding permits. Emphasis is placed on resource protection by gating particularly fragile caves and through use of a permit system for exploration. Vandalism has occurred in the recent past resulting in the loss of unique cave formations. Locating new caves and inventorying known caves has

occurred only during years of higher funding levels. Some of this work is done in conjunction with the neighboring agencies. A large portion of it has also been accomplished by volunteers.

There are 120 known caves, and between 50 and 100 additional are estimated to exist. Current recreation use of caves is approximately 6000 RVDs. Based on the wild cave management philosophy, there is potential to double the current use.

Future Trends

Demand for caving experiences is expected to increase at a more rapid rate than the local region's population growth. A general deterioration of caving quality and experience may occur. Oil and gas lease applications cover much of the area occupied by caves. The Forest Service recommended to BLM that no leases be issued until the extent of the cave resource is known and effects of exploration activities on caves are assessed.

WILDERNESS

The Forest contains 82,879 acres of designated wilderness, the White Mountain and Capitan Mountains. It also has one wilderness study area, the Guadalupe Escarpment located on the southern end of the Guadalupe District. Existing wilderness covers approximately 7.5 percent of the Forest's total acreage.

The White Mountain Wilderness was designated a primitive area of 25,000 acres in 1933; it received "Wild Area" designation with an additional 6,000 acres in 1957, and became a Wilderness in 1964. The wilderness was further expanded in 1980 under the New Mexico Wilderness Act. The Capitan Wilderness was established under the same act in 1980. The Guadalupe Escarpment Wilderness Study Area (WSA) includes 21,000 acres to be studied for possible inclusion into the National Wilderness Preservation System.

Table 24 exhibits existing wilderness by gross, private and net acres.

Table 24. Wilderness Acres

Wilderness	Gross	Private	Net
White Mountain	48,797	431	48,366
Capitan Mountain	35,822	1,309	34,513
Total	84,619	1,740	82,879

The Capitan Mountains represent a geologic anomaly in the western hemisphere in that the range extends east-west rather than north-south. Elevation ranges from 5,500 feet to 10,179 feet at Capitan Summit. The area contains extremely rugged terrain with numerous talus slopes and rock slides. Twenty-nine miles of trails lie within the wilderness. Recreation use has increased slightly since the area was designated wilderness, and this trend should continue for the next decade. After that time use is expected to level off due primarily to the ruggedness of the area, difficulty of access and lack of water. In 1980, 5.6 MRVDs of recreation use were reported which included hunting, horseback riding, backpacking and day hiking. Hard rock and placer mining have occurred in the past.

The White Mountain Wilderness is composed of rugged peaks and is severely dissected in a dendritic pattern. The topography is diverse, ranging from 7,000 feet elevation along the western edge to numerous sub-alpine peaks in the interior areas. The wilderness contains virgin stands of mixed conifer and supports large grassland areas in good ecological condition. At present 63 miles of trails provide access for hunting, fishing, hiking and horseback riding. Hunting for deer, elk, bear, and turkey is one of the most popular activities. These activities generate a total of 19.7 MRVDs of use per year. Argentina and Three Rivers canyons, and the South Fork of the Bonito receive heaviest use for dispersed recreation activities. Some exploration for gold is taking place in the wilderness.

New claims for mineral exploration and development cannot be filed, but exploration and development may occur under existing claims. Grazing use is expected to remain the same in the White Mountains and in the Capitan Mountains.

Table 25 exhibits average annual dispersed and wildlife recreation use. The capacity estimates include both types of recreation use.

Table 25. Wilderness Recreation Use - Current, Projected Use and Practical Capacity, MRVDs per year

Wilderness		Current 1980	Projected Use Period 5	Practical Capacity MRVDS
White Mountain	Dispersed	16.3	39.8	39.4
	Wildlife	3.4	6.9	
Capitan Mountain	Dispersed	4.1	16.6	22.2
	Wildlife	1.5	3.0	
Total		25.3	66.3	61.6

Future Trends

Visitor use will increase in both wilderness areas; however, use has been and will be more intense in the White Mountain Wilderness because of its proximity to population centers, presence of water and easy access. Due to concentrated use of certain areas, a permit and/or quota system may be necessary in the White Mountain Wilderness after Period 2 to protect wilderness resources and values. Use of the Capitan Mountains Wilderness is expected to remain below capacity estimates because of its rugged and remote nature. The potential supply identified in the Max PNV Benchmark is 44 MRVD (the WSA is not recommended for wilderness in this benchmark).

WILDERNESS STUDY AREA

In 1977 the Forest Service began a nationwide Roadless Area Review and Evaluation (RARE II) to identify roadless and undeveloped areas within the National Forest System which were suitable candidates for inclusion in the National Wilderness Preservation System. Five areas were identified and

inventoried on the Forest, and the following administration recommendations were made in 1979:

Area	Recommended Wilderness (Acres)	Further Planning (Acres)
Capitan Mountains	36,530	--
White Mountain Wilderness Contiguous Areas	19,950	990
West Face Sacramento Mountains	--	41,650
Little Dog and Pup Canyons	--	25,920
Southern Guadalupe Mountains	21,000	--

The New Mexico Wilderness Act of 1980 expanded the White Mountain Wilderness, and established the Capitan Mountains Wilderness and the Guadalupe Escarpment Wilderness Study Area (WSA) in the southern Guadalupe Mountains. The West Face Sacramento Mountains and Little Dog and Pup Canyon areas were made available for non-wilderness management.

WSA designation was made for the Guadalupe Escarpment because it "---will allow time to determine whether the area has a high potential for oil and gas." Congress did not withdraw the WSA from oil and gas leasing, although it could have done so. Congress directed that WSAs be administered "---so as to maintain their presently existing character and potential for inclusion in the National Wilderness Preservation System."

On August 25, 1983 the Regional Forester decided to recommend to the BLM that none of the WSA be leased until a cave resource inventory was complete and adequate data collected on the mineral resources. He did so because the potential for irrevocable cave damage due to oil and gas exploratory drilling is a major concern. He also directed the Forest Supervisor to evaluate an alternative which recommends non-wilderness designation for the WSA, but which provided protection of its wilderness values until the cave inventory and mineral resource study was complete. A study indicating the area which could be leased without damage to known caves has since been completed.

Appendix C contains a full account of the history of the WSA, describes the area, and discusses its suitability for wilderness.

Future Trends

The area's current recreation use of about 8 MRVDs will increase regardless of whether the WSA is designated wilderness. The theoretical capacity of the WSA greatly exceeds projected use.

VISUAL RESOURCE

The Forest's varied and highly scenic landscape is recognized as one of its basic resources. Its mountains rise abruptly from the desert floor and pass through five life zones ending with the subalpine zone. These mountains and ridges with their diverse vegetation and climate contribute to the Forest's scenic landscape.

The Forest's visual quality has been altered by various activities such as timber harvests, road construction, farming, vegetation manipulation projects and oil, gas and mineral exploration. Mapping of the visual quality objectives (VQO) provides the necessary documentation to define the degree of acceptable

alteration to the landscape. Table 26 displays the acres of visual quality objectives.

Table 26. Acres of Visual Quality Objectives

Visual Quality Level	Forest Total Acres	Percent of Rehabilitation
Preservation	103,922	.07
Retention	112,172	.07
Partial Retention	332,744	.05
Modification	335,989	.02
Maximum Modification	207,933	.01

The degree of landscape change among objectives varies from natural ecological changes in Preservation to the domination of vegetation and landforms, by human activity in Maximum Modification. Areas in need of Rehabilitation are mining, oil and gas sites, areas of flood damage and vegetation manipulation needing restoration.

Future Trends

Forest visitors expect a high level of scenic quality, and local concern about impacts to the visual landscape is high. Under any management activity or as vegetation matures and dies, the visual resource will gradually be altered in quality and size. These alterations will be in the form of visual contrast caused by the impact of activities on the natural landscape. Mitigation measures are emphasized to help soften or enhance these alterations.

CULTURAL RESOURCES

Current management of the cultural rsources on the Lincoln National Forest is closely related to cultural resources legislation and includes five major aspects: inventory, evaluation, protection, interpretation and stabilization.

Inventory is being accomplished through reconnaissance, sample, and complete surveys to locate and record cultural resource sites. Approximately 3 percent of the Forest's acreage has been inventoried for cultural resource sites, and approximately 500 sites have been recorded. Between 12,000 to 15,000 sites are estimated to exist within the Forest.

Evaluation involves determining the eligibility of properties for nomination to the National Register of Historic Places. Four historic properties are currently listed on the National Register: the Cloudcroft Trestle; the Bonito pipeline, of which only a small portion crosses the Forest; Wizard's Roost, a prehistoric solar observatory; and the Jicarilla Schoolhouse.

Protection efforts are currently geared toward ensuring that cultural resources are not damaged through the activities of other Forest resource programs. Prior to ground-disturbing activities, project areas are surveyed for prehistoric and historic sites. Sites located are recorded and evaluated and those found to be eligible or potentially eligible for the National Register of Historic Places are protected from project impacts. Protection may involve fencing, signing, surveillance and other direct measures in addition to avoidance by project activities.

Interpretation involves conducting on-site lectures, preparing slide presentations and reports, developing interpretative displays and exhibits or other methods of providing information about cultural resources to the public. Current efforts are low, but will continue under budgetary constraints.

Stabilization is undertaken to stop erosion, decay or other forms of deterioration that threaten to damage a cultural resource. In some cases, reseeding may be sufficient. Other cases may involve excavations, backfilling, structural repairs or other major efforts to stop deterioration. Stabilization is carried out on an "as needed" basis, as funds are available.

Future Trends

Ground disturbing activities are expected to increase which will create a greater demand for clearance surveys. This greater demand will require adequate evaluations of cultural resources and more reliable predictions regarding site locations and types of information which different sites may yield. Demand for interpretive facilities, exhibits and archaeological and historical literature is expected to increase along with increased recreational use of the Forest.

WILDLIFE AND FISH

The variety in climate and topography on the Forest, in conjunction with wide vegetation community differences, provides habitat opportunities for 383 species of amphibians, birds, fish, mammals and reptiles. Table 27 presents the number of species in each class including a breakdown of game and threatened and endangered status.

Table 27. Wildlife and Fish Species of the Forest

Species Class	Total Species	Game Species	Number of T & E Species	
Amphibians	9	0	2	(State Listed)
Birds	235	22	6	(State & Federal Listed)
Fish	12	6	0	
Mammals	82	10	4	(State & Federal Listed)
Reptiles	45	0	4	(State Listed)
Totals	383	38	16	

Current Use and Management

In 1980 the Forest had an estimated 174.0 MRVDs of consumptive use (i.e. hunting) and an equal amount of nonconsumptive use. Table 28 provides a more detailed description of recreational use related to wildlife and fish.

Table 28. Recreation Visitor Days (RVDs) for 1980

Consumptive[1/]	Non-Wilderness Wildlife Use	Wilderness Wildlife Use
Big Game	161,600	2,000
Small Game	6,800	200
Fishing	2,500	100
Waterfowl	800	0
Subtotal	171,700	2,300

Total Non-wilderness and Wilderness 174,000

1/ These values are taken from RIM data. On an overall basis, many wildlife and fish related RVDs are reported or accounted for in other RIM activity categories. Non-consumptive wildlife use is estimated to be equal to consumptive use.

Both structural and non-structural developments are being used to improve wildlife habitat. These improvements include protective fencing of riparian areas, water developments, prescribed fires, and browse pruning. In addition, specific wildlife considerations are incorporated into timber management through silvicultural treatment programs.

Cooperative relations with the New Mexico Department of Game and Fish include information exchanges and jointly funded research projects, such as studies of turkeys, deer, falcons, and fish.

Integration of the New Mexico Department of Game and Fish Comprehensive Plan, (referred to as the State Comprehensive Plan), into the Forest Plan establishes goals, priorities and limitations for wildlife habitat manipulation and species management. For example, one goal is the elimination of exotic species, such as the barbary sheep from the historic Desert bighorn sheep habitat in the Guadalupe Mountains.

Habitat management is an integrated part of the Forest's objectives and current direction is adequate to maintain most species at current population levels. Table 29 provides an estimate of big game species populations, their existing occupied habitat, and the potential habitat acres. At present, no specific information exists concerning population numbers and habitats of small game and non-game species.

Table 29. Big Game Species Population and Habitat Acres

Species	Estimated Population(1981)	Existing Habitat Acres	Potential Habitat Acres
Antelope	30	9,600	96,000
Bighorn Sheep (Desert)	2	0	105,600
Elk	345	225,000	225,000
Mountain Lion	30	407,230	814,460*
Mule Deer	38,340	1,221,695	1,271,069
Whitetailed Deer	260	23,000	25,000
Javelina	10	6,400	6,400
Turkey	5,600	800,000	1,000,000
Barbary Sheep	187	225,800	0**
Black Bear	340	814,460	814,460

*Includes private land acreage within Forest boundaries.

**New Mexico Department of Game & Fish has an objective of eliminating this species from the Forest and replacing it with bighorn sheep.

Management Indicator Species

As part of the planning process, management indicator species were selected to represent relative measures of change in quality and quantity of the habitat components (see Table 30). These species and their critical habitat components may indicate the effects of management activities on a particular species or group of species. The criteria used to select indicator species are included in the Forest planning records.

Table 30. Management Indicator Species

Species	Terrestrial Ecosystem	Key Habitat Factor	Significance As Indicator
Rufous-Crowned Sparrow	Desert Shrub	Brushy mountain slopes	Habitat quality
Meadowlark	Grama Galleta Grassland	Open weedy grasslands	Habitat quality
Mule Deer	Woodland	Scrubby cover, browse species present, closed landscape	Economic importance & habitat quality
Plain Titmouse	Woodland	Trees with naturally occurring cavities	Habitat quality
Pygmy Nuthatch	Ponderosa Pine	Snags & large trees to glean	Habitat quality

Table 30. Management Indicator Species (con't)

Species	Terrestrial Ecosystem	Key Habitat Factor	Significance As Indicator
Elk	Mixed Conifer	Conifer forest, mountain meadows, area of little or no grazing	Economic importance & habitat quality
Hairy Woodpecker	Mixed Conifer	Aspen & aspen snags	Habitat quality
Mexican Vole	Mixed Conifer	Mesic mountain meadows	Habitat quality
Red Squirrel	Engleman Spruce	Mixed Conifer forest with interlocking crowns and trees of cone bearing age	Habitat quality

In addition to management indicator species, some other species have been selected for special management consideration because of unique habitat requirements, limited habitat, or threatened and endangered status. These are listed in Table 31.

Table 31. Selected Species

Species	Significant as Indicator
Peregrine Falcon	Endangered (Federal)
Bald Eagle	Endangered (Federal)
Sacramento Mountain Salamander	Endangered (State-Group II)
Desert Bighorn Sheep	Endangered (State-Group I)
Mottled Rock Rattlesnake	Endangered (State-Group II)
Trans-Pecos Ratsnake	Endangered (State-Group II)
Baird's Sparrow	Endangered (State-Group II)
McCown's Longspur	Endangered (State-Group II)

Aquatic and Riparian Habitats

Surface water and its associated riparian areas are extremely limited on the Forest. There are approximately 24 miles of small, relatively unproductive perennial streams and two shallow reservoirs. These areas provide recreational opportunities, although fishing is limited to a put-and-take program. Currently fisheries exist in only 11 miles of stream and one reservoir.

Although both the State Comprehensive Plan and Forest management acknowledge the high value and demand for a viable fishery resource, there are few significant opportunities to increase fisheries. It is estimated that only 2-3 additional miles of stream could support a viable fishery resource. In addition, the availability of reservoir sites is extremely limited due to geological factors. Fishing demand is expected to increase which will further widen the gap between supply and demand.

Riparian communities found in defined areas surrounding springs, streams, and lakes provide high-quality recreation areas, productive wildlife habitat, and water quality protection. Currently, many problems (notably overgrazing and excessive recreation use) exist in these areas. The implementation of grazing management systems is expected to help the enhancement of riparian areas, but these areas must be protected in other ways if they are to be maintained and further enhanced.

Threatened and Endangered Species

The Endangered Species Act of 1973, as amended [16 U.S.C. 1531 et seq.] requires the Forest to protect and enhance threatened and endangered species and to provide for management to enhance their habitat. A cooperative inventory of threatened and endangered animal species and their habitat use is being conducted by the Forest Service and university research units, New Mexico Department of Game and Fish, and other Federal agencies. Tables 32 and 33 display the animal and plant species listed as threatened or endangered for which habitat occurs on the Forest.

Table 32. Listed Threatened and Endangered Wildlife Species

Species	Scientific Name	Status
Federal		
Peregrine Falcon	Falco peregrinus	E
Aplomado Falcon	Falco femoralis septentriondis	E
Bald Eagle	Haliaeetus leucocephalus	E
Black-footed Ferret	Mustela nigripes	E
State		
Sacramento Mtn. Salamander	Aneides hardyi	Group II
Desert Bighorn Sheep	Ovis canadensis	Group I
Mottled Rock Rattlesnake	Crotalus lepidus lepidus	Group II
Trans-Pecos Rat Snake	Elaphe subocularis	Group II
Black-striped Chipmunk	Eutamias minimus atristriatus	Group I
Meadow Jumping Mouse	Zapus hudsonius luteus	Group II
Gray Vireo	Vireo vicinior	Group II
Baird's Sparrow	Ammodramus bairdii	Group II
McCown's Longspur	Calcarius mccownii	Group II

Table 32. Listed Threatened and Endangered Wildlife Species (con't.)

Species	Scientific Name	Status
Varied Bunting	Passerina versicolor	Group II
Spotted Owl	Strix occidentalis	Sensitive
Plain-bellied Water Snake	Nerodia erythrogaster	Group II
Western Ribbon Snake	Thamnophis proximus diabolicus	Group II
Headwater Catfish	Ictalurus lupus	Sensitive
Eastern Barking Frog	Hylactophryne augusti latrons	Group II
New Mexico Ramshorn Snail	Pecosorbis kansasensis	Group I

Table 33. Listed Threatened and Endangered or Regionally Sensitive Plant Species

Species	Scientific Name	Status
Sneed's pincushion cactus	Coryphantha sneedii var. sneedii	E
Kuenzler's hedgehog cactus	Echinocereus fendleri var. kuenzleri	E
McKittrick pennyroyal	Hedeoma apiculatum	T
Chaplin's columbine	Aquilegia chaplinei	S
Sacramento prickly poppy	Argemone pleiacantha ssp. pinnatisecta	S
Hershey's cliff daisy	Chaetopappa hersheyi	S
Texas rabbit brush	Chrysothamnus nauseosus ssp. texensis	S
Purple thistle	Cirsium vinaceum	S
Sacramento penstemon	Penstemon almosensis	S
Sierra Blanca cinquefoil	Potentilla sierra-blancae	S
Guadalupe sophora	Sophora gypsophila var. guadalupensis	S
Twist flower	Streptanthus carinatus	S
Guadalupe aster	Aster laevis var. guadalupensis	S
Tall milkvetch	Astragalus altus	S
Sierra Blanca cliff daisy	Chaetopappa elegans	S
Golden Bladderpod	Lesquerella aurea	S
Guadalupe milkwort	Polygala rimulicola	S
Supreme sage	Salvia suma	S
Gray sibara	Sibara grisea	S
Curl-leaf needlegrass	Stipa curvifolia	S
Few-leaved streptanthus	Streptanthus sparsiflorus	S
Texas valeriana	Valeriana texana	S
Lee's pincushion cactus	Coryphantha sneedii var. leei	S

T - Threatened
E - Endangered
S - On Regional Sensitive list or nominated for Federal protection

Future Trends

Habitat improvement activities may increase the carrying capacity for game species on the Forest. The demand for big game hunting is expected to increase substantially in the future. The number of hunters is not limited at this point, except for elk, although the New Mexico Department of Game and Fish has

point, except for elk, although the New Mexico Department of Game and Fish has shortened some hunting seasons. Management strategies which limit the number of users are likely to occur as hunting demand increases.

Small game is an under-utilized resource in the Forest, and the supply of small game exceeds the current demand. This relationship is expected to remain constant for a number of years.

Fishing opportunities in the Forest are limited although demand for fishing currently is very high. This gap between supply and demand is expected to widen.

Projected future use for consumptive and nonconsumptive wildlife and fish increases from 348.0 MRVDs in 1980 to 706.4 MRVDs by Period 5. Increased efforts in habitat improvement, protection of T&E species, and closer coordination with other resource activities and the State Game and Fish Departments has the potential of increasing the supply of wildlife and fish use from 348.0 MRVDs in 1980 to 686.2 MRVDs Period 5 (Max Wildlife Habitat Benchmark). The current alternative provides only 379 MRVDs by Period 5.

RANGE

Current management

The Forest currently contains 136 grazing allotments covering 1 million acres. Of this amount, 700,000 acres, or about 64 percent of the net Forest acres, are considered suitable for rangeland. Allotments are generally fenced according to physical aspects of the terrain, such as vegetation types or topography. Ranching headquarters and major range developments are generally located on private lands while supplemental improvements are on Forest land.

The majority of the allotments on the Forest are grazed on a year-long basis. Several provide only seasonal grazing, critical to rounding out ranching operations that are located on lands of other ownership adjacent to the Forest. Thirteen allotments currently are not grazed due to unsuitability, resource conflicts (i.e. soils, water, wildlife, recreation) or other priority needs. Closed allotments occur in both the pinyon-juniper and mixed conifer vegetation types.

At present, cattle graze 116 allotments. Cow-calf operations are predominant although some operators also run yearlings. Sheep use presently occurs on five Forest allotments. This use has declined in recent years due to the poor economics of sheep ranching and the resultant trend to convert from sheep to cattle operations. Two allotments have both cattle and sheep obligations.

Ranching enterprises are changing rapidly with over 50 percent of the ten year grazing permits issued in 1976 having changed hands. These shifts may affect management trends.

The Forest has 153,247 Animal Unit Months (AUMs) of grazing by cattle. Sheep and horse grazing amounts to about 6000 AUMs, or less than 4 percent of the total grazing use. Grazing by feral goats amounts to about 192 AUMs. Table 34 shows the number of cattle permitted by Term Grazing Permits and the present grazing capacity.

Table 34. Permitted Use and Grazing Capacity for Cattle on the Forest

Grazing Type	Permitted Use AUMs	Grazing Capacity AUMs
Continuous (season long)	64,115	50,637
Intensive (deferred or rest rotation)	89,132	69,927

The major objective of range management is to attain and perpetuate a satisfactory range condition on all rangeland. Presently, the numerous small permits restrict viable management opportunities. The lands under these permits are too small to manage for range condition improvement in a cost-effective manner. The cost of providing the necessary range improvements cannot be justified.

Wildlife habitat needs and livestock grazing are often in conflict on those areas where livestock over-grazing is occurring. The conflict involves cover requirements for small game and non-game species, as well as forage competition for large game species. The Forest has limited riparian and wetland areas, but where they occur, forage, desirable cover, and habitat diversity are often lacking.

Future Trends

Demand for sheep grazing is expected to remain static or decline, depending upon market values. Demand for cattle grazing is expected to increase and thus intensify conflicts between grazing and other resource uses.

Potential grazing capacity is estimated to be 217.5 MAUMs in Period 5 under the Max Grazing Capacity Benchmark management intensities. It is assumed that future permittees would use the maximum capacity if permitted by the Forest. In the Current Alternative, capacity would increase to 164 MAUMs by Period 5 and permitted use would be allowed to equal capacity.

TIMBER AND FUELWOOD

Timber

Approximately one-fifth of the Forest (257,103 acres) is tentatively suitable for timber harvest. To qualify as tentatively suitable, an area must meet certain criteria such as lying outside wilderness and being capable of being logged without causing irreversible damage to the timber or other resources. Reforestation of such areas must also be possible within five years of final harvest. Table 35 shows how the application of these criteria determined the acres judged tentatively suitable for timber production.

Table 35. Lands Capable, Available, and Tentatively Suitable for Timber Production.

Classification	Acres
Total National Forest	1,103,495
Non-forested Land	206,274
Total Forested Land	897,221
Legislatively or administratively withdrawn	82,879
Incapable of producing industrial wood 1/	557,239
Tentatively suitable for timber production	257,103

1/ Acres identified as incapable of producing industrial wood include species of trees, such as pinon pine and juniper, that are not currently utilized by the timber industry.

This analysis of tentatively suitable lands identifies 74,229 fewer acres suitable for timber production than did previous timber management plans. A reduction of 30,269 acres is due to additional areas being classified as wilderness. The remaining 43,960 acres of land not tentatively suitable is the result of a combination of two factors: (1) some areas severely burned in large fires were classified as no longer physically suited; and (2) new methods of timber typing and acreage determination resulted in some changes. The present species distribution of the tentatively suitable acres is approximately 73 percent mixed conifer, 25 percent pine, and 2 percent aspen. Table 36 shows the acreages used in previous timber management plans and the acreage identified in the 1979 inventory.

Table 36. Suitable Timber Acres From Previous Timber Management Plans and Current Timber Inventory

	Capable Forest Acres	Unavailable Forest Acres	Suitable Forest Acres
1962-72 T.M. Plan	321,035	7,881	313,154
1970-80 T.M. Plan	338,436	7,104	331,332
1979 Timber Inventory	294,476	37,373	257,103

Current Use

The primary species harvested are Douglas-fir, white fir, ponderosa pine, southwestern white pine and aspen. Productivity is average to high for the Southwest Region and mature trees average 65-75 feet in height. Currently, tree growth averages 20 to 30 cubic feet per acre per year. Intensive management has the potential to increase growth per acre to 30 to 50 cubic feet per year.

Past production of timber on the Forest is shown in Table 37.

Table 37. Timber Sold in Past 10 Years on Lincoln National Forest

Year	Sawtimber (MMBF) 2/	Other Products 1/ (MMBF)	Total (MMBF)
1976	N.A.	N.A.	15.5
1977	N.A.	N.A.	7.0
1978	4.3	0.6	4.9
1979	0.8	0.7	1.5
1980	15.8	0.4	16.2
1981	4.9	0.1	5.0
1982	13.6	0.1	13.7
1983	0.8	0.1	0.9
1984	4.2	0.2	4.4
1985	14.3	0.6	14.9
AVERAGE	7.3	0.4	8.4

1/ Products include posts, poles, etc.; not fuelwood.

2/ Data not available by type of product until 1978.

The current average annual production of 8 million board feet is not sufficient to meet the current needs of local mills. Sawlogs have been hauled to local mills from the Gila National Forest, as much as 250 miles away. Sawlogs from the Mescalero Apache Indian Reservation are also processed at the local mills, however, the MAT is building a sawmill to process logs cut on reservation lands. When this facility is built, other local mills will be almost entirely dependent upon the Forest as a source of sawlogs.

Current Management

The timber resource is being managed on a non-declining yield basis. The timber yield for any decade will not be less than the yield of the previous decade. The normal reentry period is 20 years. The rotation age under existing management is approximately 120 to 130 years; this period can be reduced by 10 or 20 years under intensive management. The average annual allowable cut can not exceed the long-term capability of the Forest to produce wood fiber. This ensures that the Forest will be managed on a sustained yield basis. The Allowable Sale Quantity is determined primarily by the number of acres allocated to timber management.

Timber harvests are designed to achieve multiple use objectives; objectives for fire protection, wildlife and insect and disease control are often achieved through the timber management program. Timber lands are managed under even-aged or uneven-aged systems. Even-age silviculture is the primary system used and is the most appropriate system of management where timber production is a primary objective. Uneven-aged methods, while useful in certain specific stands, have in general, been ineffective in controlling dwarf mistletoe and have favored conversion of ponderosa pine stands to white fir, Douglas fir, or spruce on mixed conifer sites. Uneven-aged systems are used to meet other specific objectives, such as objectives for visual quality, wildlife habitat, etc.

Timber stands on the Forest have not been converted to even aged management and not all stands will be converted. However, as more stands are converted to even-aged management with different age classes featured and planned

regeneration cuts are made, the age class distribution is expected to improve and become more evenly distributed than at present.

The present unbalanced age (size) class distribution is a matter of concern. The current excess of immature sawtimber acres has a real influence on determining the annual harvest. For most efficient timber production it is desirable to remove mature sawtimber as rapidly as possible and regenerate the stand. The existing distribution of size/age classes is shown in Table 38.

Table 38. Size/Age Class Distribution

Age Class	Acres
Seedlings and saplings	37,519
Poles, and poles with overmature sawtimber	78,585
Immature sawtimber and immature sawtimber with mature sawtimber.	136,361
Aspen	4,638
Total	257,103 acres

Under an even-aged system, the shelterwood harvest method is the primary method used for the regeneration cuts. Individual and/or group selection is the type of harvest used under uneven-aged management. Within the last five years there has been an active market for aspen on the forest; clearcutting is being used in this type, both to perpetuate the species and to favor wildlife.

Cable and tractor logging systems are acceptable harvest methods on the Forest. Cable logging, which requires suspension of one end of the log during the yarding cycle, is normally conducted on slopes greater than 40 percent. Tractor logging is allowed on most areas with slopes less than 40 percent.

Virtually all areas capable of being tractor logged have been harvested at least once. Heavy removal of available timber during the past 80 years has created a deficiency of timber in the small and large size classes. Management goals are to harvest the present stands in such a manner as to develop a relatively even distribution of age classes over the suitable forest area.

Historically, large disastrous fires have occurred periodically on the Forest. Replanting of commercial tree species is impractical in several areas due to soil and climatic conditions created by these fires. Therefore, they are no longer considered tentatively suitable for timber production.

There are now approximately 1,000 acres of young overstocked timber that would achieve a higher growth rate with precommercial thinning. Normally this thinning, as well as future thinning, is accomplished following timber sales using Knutson-Vandenberg (KV) funds generated by the sale. When the sale does not generate sufficient KV dollars to accomplish the needed work, funds are appropriated to complete the thinning.

Western spruce budworm is an endemic defoliator of the mixed conifer type on the Forest; Douglas-fir and true fir are the preferred hosts. Periodic outbreaks are prevented by applying silvicultural prescriptions that reduce stand

susceptibility. Existing outbreaks can be managed by using a combination of chemical and biological insecticides.

Dwarf mistletoes are widespread throughout the Forest and cutting of infested trees is the only control method. Ponderosa pine and Douglas-fir are the most commonly affected species. Management of dwarf mistletoes is a primary factor in the choice of a particular silvicultural system.

Future Trends

As a result of its location near large population centers in both Texas and New Mexico, the Forest faces a growing demand for timber products. Sawlogs are manufactured into dimension lumber mainly for use as building materials. Local need for sawlogs exceeds supply. All offerings of sawlogs have sold.

The MAT is constructing a sawmill on the reservation to employ tribal members. Such a mill would most likely utilize their total annual allowable cut (17.9 MMBF) plus place them in competition with other purchasers of National Forest production.

White Sands Forest Products, with a capacity of more than 18 MMBF per year, is the largest local mill. Four additional small sawmills have a combined capacity of 2 MMBF. An excelsior processing plant is located in Alamogordo which utilizes aspen only.

Local demand projections are difficult to make because of uncertainty concerning the construction of a mill by the MAT. However, this area of the southwest uses more lumber products than it manufactures. Products processed in other parts of the country make up the deficit. New mills would probably be constructed or existing mills expanded to utilize all sawlogs the Forest is capable of producing.

The maximum potential supply pf sawtimber, identified in the Benchmark Analysis (Max Timber - Period 1) is 39 MMBF in Period 5. The current alternative provides 13 MMBF in Period 5.

Posts, poles, vigas, and Christmas trees are other important products in the management of both commercial and non-commercial forest lands. With the exception of Christmas trees, demand has determined the level of harvest. For Christmas trees, demand far exceeds supply in the mixed conifer type.

Fuelwood

Personal use and commercial fuelwood sales are being used to clean up slash and debris from logging and thinning activities on the timber production lands. Currently this provides about 2 MMBF of fuelwood. In addition, approximately 6,000 cords (3.1 MMBF) of fuelwood have been cut annually under permit from lands not suitable for timber production, mostly in the pinyon-juniper (PJ) woodland type. Although fuelwood harvest levels have dropped below these levels in the last couple years, long-term demand for fuelwood is expected to increase.

Information on existing PJ inventory, growth, yields, and silvicultural requirements is lacking. Additional studies and inventories are needed to guide harvest schedules and overall management. The annual allowable sale quantity from the PJ type is 3.1 MMBF, based on present estimates of existing volume and

predicted growth rates of PJ in woodland areas on slopes under 40 percent with canopy closures greater than 40 percent. Both even-aged and uneven-aged management systems are used in the PJ type, however, the primary method is even-aged using the shelterwood harvest system. A rotation age of 220 years has been selected, which produces a desirable-size tree of approximately 12 inches DBH. Based on the existing road network, the allowable long-term sustained-yield capacity (LTSYC) is about 2.5 MMBF per year. In the past, PJ harvest volumes have exceeded the LTSYC on some areas of the Forest and on a Forest-wide basis, have been up to 24 percent more than the LTSYC.

Future Trends

The future need for fuelwood is expected to increase as population increases and/or as the cost of other fuels increases. Demand is projected to be about 8.4 MMBF/per year in Period 1 and increase to 17 MMBF in Period 5. Without additional road access to PJ woodland areas, PJ harvest levels must be reduced by approximately 1200 cords (600 MBF) per year to bring harvest down to the long-term sustained-yield level. Need for additional fuelwood can be partially met by better utilization of sawtimber harvest residues. The maximum potential supply of timber-sale fuelwood is defined in the Max Timber 1st Period Benchmark as about 13 MMBF in the first two periods and about 8 MMBF in Period 5.

DIVERSITY

Terrestrial Habitats

For planning purposes, six major terrestrial ecosystems have been recognized (Table 39). The acreages for each ecosystem are based on climax vegetation types. Specific plant communities within these terrestrial ecosystems vary considerably as do wildlife species and user/management activities.

Table 39. Terrestrial Ecosystem

Terrestrial Ecosystem	Acres	Percent of Total Acres
Grama/Galleta Grassland	46,954	4
Desert Shrub	158,742	14
Woodland	614,347	56
Ponderosa Pine	71,281	6
Mixed Conifer	212,117	20

Habitat diversity within an ecosystem can be described as the horizontal arrangement of various plant communities and the vertical stratification of habitat components. The Forest has an inherently high level of diversity (eight biotic communities, represented by six terrestrial ecosystems, comprised of 42 vegetative series and numerous seral stages) which has been further influenced by human use and management activities. There is no consensus among the scientific community regarding acceptable methods of measuring diversity. The following discussion, therefore, describes overall vertical and horizontal vegetation characteristics in general terms.

Horizontal diversity at the broad terrestrial ecosystem level is comprised of six distinct systems stratified primarily by elevation. Due to the morphological characteristics of the mountain ranges, these six ecosystems are

mixed throughout the Forest. Given the variables of topography, aspect, soil pattern, and precipitation, these six ecosystems are broken into a multitude of naturally-occurring plant communities.

Within each plant community is the dimension of vertical diversity. This is the unique vertical layering of habitats from soil to the upper canopy. This layering is relatively simple in the grama/galleta communities of the lower elevations and most complex within the old growth mixed conifer communities. In many cases, human activities have augmented natural diversity by altering vegetation within a given community. Primary activities which create seral stages influencing diversity are prescribed fire, timber harvest, vegetation type conversion, and livestock grazing.

The forested ecosystems of ponderosa pine, mixed conifer, and Englemann spruce are almost exclusively all-aged multi-storied stands; less than two percent of the identified commercial forest lands exhibit old growth characteristics. These multi-storied stands contain a high level of vertical diversity as opposed to the substantially lower levels of vertical diversity found in even-aged stands which are managed under intensive silviculture strategies.

The woodland ecosystem is relatively evenly layered with moderate vertical diversity in comparison to the higher elevation forested ecosystems. Harvest strategies remove material greater than 7 inch diameter root collar and effectively remove the upper canopy layer for several decades with an associated loss in vertical diversity and gain in horizontal diversity.

The grama/galleta grasslands and desert shrub ecosystems have moderate levels of vertical diversity. Livestock grazing has historically been excessive and has caused an overall decline in the ecological condition of these communities. Improvement in range condition is assumed to improve grassland habitat quality and vertical diversity within habitat layers created by grass species.

Aquatic and riparian communities comprise only a small portion of the Forest. Because of their productivity and species diversity, however, they play a key role in providing high quality wildlife habitat and highly aesthetic recreation areas.

SOIL AND WATER

Water basins underlying the Forest are the Tularosa, Penasco, Roswell, Hondo, and Carlsbad. Minor amounts of water are drawn from these basins by windmills for use by wildlife and domestic livestock. The Forest yields 123,000 acre feet of water per year from 16 administrative watersheds (Figure 1). Twelve of these watersheds are tributary to the Pecos River. The remaining four watersheds flow into the Tularosa Basin, which is a long narrow desert valley, closed geologically on all sides.

Past resource use and activities have created unacceptable soil erosion and reduced water quality on some watersheds. Soil productivity has been reduced on these areas and continuing erosion further reduces potential production. Average annual soil loss ranges from 0 to over 100 tons per acre. However, the higher erosion rates are from steep slopes over 40 percent and areas which already have significant gully erosion. Eight of the 16 administrative

watersheds contain acres in unsatisfactory conditions. These areas total 107,000 acres or approximately 10 percent of the Forest.

Pollution of streams, ponds, and lakes is a concern. Sediment is the major pollutant and generally follows localized heavy storms. This generally occurs during the summer months when high intensity thunderstorms are frequent. Livestock grazing, off-road vehicle use, and poorly located and/or maintained roads are the more prevalent sources contributing to nonpoint pollution. Numerous unstable channels throughout the Forest add to the sedimentation problem. There are no known point pollution sources.

Efforts are currently focused on integrating soil and water protection with current and future uses and activities through standards for livestock grazing, riparian restoration, revegetation, fire suppression activities, erosion control, and off-road vehicle use.

It is expected that water quality could be improved by: 1) treatment of land by reseeding, pitting, and water spreading; 2) balancing permitted livestock grazing with capacity; 3) rehabilitation of riparian areas; 4) channel stabilization; 5) reconstruction of system roads; and 6) closure and revegetation of nonessential roads and travelways.

Riparian areas form the transition between aquatic ecosystems and adjacent terrestrial ecosystems. The areas are identified by characteristic soils and vegetation communities that require free or unbound water and are usually located along perennial streams, intermittent drainage courses and lakes. The areas are critical ecosystems because of the importance to wildlife, domestic livestock, recreational and scenic values, species viability and diversity. Riparian areas comprise less than 1 percent of the Forest.

Riparian areas have not been inventoried on the basis of a stream type classification. Selected riparian areas have been identified, and are being improved through better range management, fencing, and vegetation planting.

Flood-prone areas of the Forest have been identified and mapped. New development and other activities are limited so that impacts on flood plains and wetland resources can be mitigated. This limitation is currently carried out on a project specific basis.

Future Trends

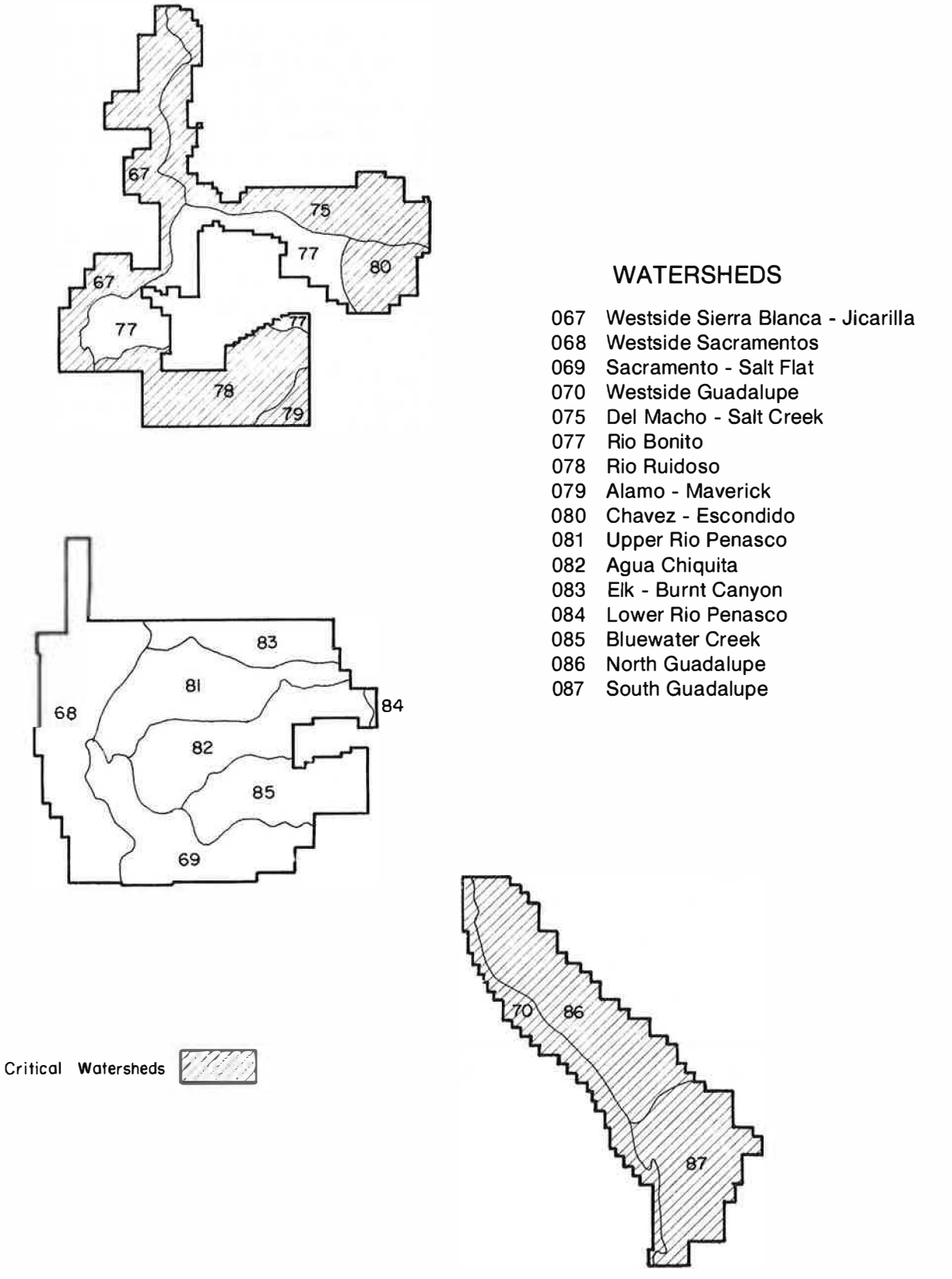
Surface water rights necessary to secure water for range and recreation developments will be difficult to acquire. Livestock water development should be possible using earth stock tanks or trick tanks. Small wells for domestic and livestock uses will be available in some locations. It may be necessary to purchase water rights or transfer water rights currently held by the Forest Service to obtain larger quantities of water if needed.

Underground water basins will not be significantly affected by wells located on the Forest in the foreseeable future. Use should remain fairly constant and will be confined to providing water for wildlife and domestic livestock. Impacts may be expected, however, if underground mines are developed on the Forest.

The current average annual water yield from the Forest is estimated to be approximately 123,000 acre feet. This yield can be increased by vegetative treatments, although the increase is limited by other resource constraints. An estimated maximum annual increase of 45,000 acre feet could be provided from the Forest. Significant environmental consequences limit the estimated average annual increase to 8 to 10 thousand acre feet. It is projected that future demand would likely exceed available supply.

The need for productive Forest rangeland soils will continue although specific uses may change. Past heavy grazing has decreased productivity, thereby necessitating the need to reverse or stabilize downward trends. Currently 107,000 acres have been identified where soil loss can be reduced to tolerance or below by improving ground cover.

Water quality and soil productivity depend on the ecological condition of the watershed. The goal is to bring unsatisfactory condition watersheds to satisfactory or better condition by Period 5 by treating directly and indirectly the 107,000 acres which have the potential for increasing ground cover.



WATERSHEDS

067	Westside Sierra Blanca - Jicarilla
068	Westside Sacramentos
069	Sacramento - Salt Flat
070	Westside Guadalupe
075	Del Macho - Salt Creek
077	Rio Bonito
078	Rio Ruidoso
079	Alamo - Maverick
080	Chavez - Escondido
081	Upper Rio Penasco
082	Agua Chiquita
083	Elk - Burnt Canyon
084	Lower Rio Penasco
085	Bluewater Creek
086	North Guadalupe
087	South Guadalupe

Figure 1. Administrative Watersheds

MINERALS

The northern part of the Forest has a long history of mineral exploration and development. Locatable mineral production began with the discovery of gold in the Nogal area during the late 1860's and reached its peak around the turn of the century in the vicinity of White Oaks. With the exception of the High Rolls-La Luz area on the Cloudcroft District, all production and potential for locatable minerals occurs on the Smokey Bear Ranger District. The most important areas include the Jicarilla Mountains area, the Nogal and Bonito drainages, the western slopes of the White Mountain Wilderness, and portions of the Capitan Mountains. Actual and potential mineral production include gold, silver, lead, copper, tungsten, uranium and iron. Molybdenum potential exists in the White Mountain Wilderness.

Gold exploration activities in the Jicarilla Mountains occur at a high level, but little of the metal has been produced. There are approximately 6 different operations at any one time. A small amount of iron is being extracted from a mine near Capitan. Rare-earth elements occur in the Capitan Mountains, but the resource potential is unknown. One lot of uranium ore was shipped from the Capitan Mountains in the 1950's.

Prospecting and limited exploration for gold and silver and core drilling for molybdenum have been conducted in and near the White Mountain Wilderness on patented and unpatented claims. These activities can be expected to continue.

Approximately 45 percent of the Forest is covered by oil and gas leases or applications for leases. There has not been any production of energy minerals. Some coal and thorium ore is also present as are common variety minerals such as sand and gravel which have a wide distribution over most of the Forest.

Interest in oil and gas is low at the present time. In 1984 and 1985, three dry holes were drilled. Most areas of the Forest have leases or applications except the southern portion of the White Mountains and the Sacramento Escarpment east and south of Alamogordo. Currently there are 266 leases and 63 applications in various stages of processing. Some of the applications have been pending for several years awaiting decisions regarding leasing in the WSA.

Common variety minerals such as sand and gravel are used primarily by the Forest and state and county agencies for road improvements. There is an adequate supply of common variety minerals in the central and southern portions of the Forest; however, transportation of these materials is sometimes costly because of long hauling distances. Over a dozen material pits are currently being used, and there is one commercial operation for flagstone in the Capitan Mountains. Permits for decorative rock and related items amount to fewer than 25 a year.

Outstanding or reserved mineral rights are displayed in Table 40. Minerals potential for the Forest is displayed in Table 41. Table 43 lists the existing withdrawals.

Past mining activity in the Jicarilla and White Mountains has left numerous abandoned adits and mine shafts, some up to 300 feet deep. Very few of these are readily visible or marked and many are obscured by vegetation, thus constituting a hazard to Forest users and livestock. This problem is especially

acute in the White Mountains because most of the hazards are located in the White Mountain Wilderness.

Conflict between minerals and other resources and activities is currently a problem only within the WSA. New conflicts may occur if oil and gas are discovered over extensive areas of the Forest, if sensitive areas are involved, or if activities change the life styles and economic base of local communities.

Table 40. Outstanding or Reserved Mineral Rights

Smokey Bear District		
Outstanding mineral rights	1,304 acres	
Reserved mineral rights	733 acres	(mostly City of Alamogordo)
Cloudcroft District		
Outstanding mineral rights	17,883 acres	(mostly State of New Mexico)
Mayhill District		
Outstanding mineral rights	7,765 acres	(mostly State of New Mexico)
Total outstanding mineral rights	26,952 acres	
Total reserved mineral rights	733 acres	

Table 41. Mineral Type and Rating for Mineral Potential

	Ranger District			
	Smokey Bear	Cloudcroft	Guadalupe	Mayhill
Locatable Minerals				
Barium	XY [1/]			
Beryllium	B3			
Copper	A0,A3	A0	XY	
Fluorspar	AY			
Gold	A0,A1,A2,A3,A4	A0		A4
Iron	A1,A3,A4			
Lead	A3	A0		
Manganese	A0			
Molybdenum	B3			
Rare Earth	B3			
Silver	A0,A1,A3,A4	A0		A4
Tungsten	A4			
Zinc	A3			
Energy Minerals				
Uranium	A0			
Thorium	A0			
Oil and Gas	B3,B4	B3,B4	B3,B4	B3,B4
Coal	A3			
Common Variety				
Clay	AY			
Flagstone	A1			
Sand, Gravel, Stone	A1	A1	A1	A1

1/ Note: Mineral Potential Ratings for Table 41.

Rating	Geologic Favorability	Expected Mining Activity in Planning Cycle (10 Years)
A0	Demonstrated Favorable	None
A1	Demonstrated Favorable	Production
A2	Demonstrated Favorable	Development
A3	Demonstrated Favorable	Exploration
A4	Demonstrated Favorable	Prospecting
AY	Demonstrated Favorable	Cannot predict
B3	Theoretically Favorable	Exploration
B4	Theoretically Favorable	Prospecting
XY	Insufficient Information	Cannot predict

Future Trends

Prospecting, exploration and production of gold will continue in the Jicarilla Mountains because of the large body of low concentration ore. The level of activity may fluctuate with variations in the price of gold and with the use of less costly procedures for extracting the fine grain gold. Activities involving both gold and silver in other areas of the Forest may fluctuate with changing

prices for these metals although production is not expected to become significant.

The amount of iron mined will vary with the local market demand for its use in the production of cement. Activities involving other locatable minerals are not expected to change substantially.

Exploration for oil and gas is expected to be at a low level for the next 10 years unless oil prices increase significantly.

The demand for common variety minerals will increase in proportion to the increase in population and private developments within and immediately adjacent to the Forest.

Maps displaying the Forest's mineral potential and known mineral occurrences are on file in the Forest Supervisor's Office.

LAND AND SPECIAL USES

Land Acquisition

The Forest was established in 1902 with numerous additions and consolidations with other Forests since that time. Included within the present boundaries are privately owned lands, as well as lands owned by the State, the Department of Defense, and local municipalities. Changes in land ownership occur through land-for-land exchanges, land-for-timber exchanges, fee purchases, and limited land sales.

There has been a very active program in ownership consolidation because of the large amount of private land within Forest boundaries. Consolidation has occurred mostly through exchanges although there have been some purchases. This program has been reduced significantly in the last decade because of lack of funds for purchases and the time consuming and expensive exchange requirements. Also, landowners have been less interested in exchange because of the time requirements and the increasing value of their land for subdivision purposes. The most active exchange program at present is in the vicinity of the rapidly expanding community of Ruidoso. Until January of 1983, the Forest could dispose of property to private parties only through exchange. The Small Tracts Act now authorizes the sale of small areas under specific conditions. The current base-in-exchange land is 10,167 acres (Table 42). Seven cases have been completed in the last decade, and four are currently under consideration.

Table 42. Land Classified as Base-in-Exchange

District	Acres
Smokey Bear	4,589
Cloudcroft	3,570
Guadalupe	0
Mayhill	2,008
Total	10,167

To improve management and benefit the administration of the Forest, certain private lands within or adjacent to the boundary of the Forest (herein after referred to as Public Land) have been classified as desirable for acquisition. Because local and physical conditions may change during the life of this plan, the lands classified in this plan, and other lands that may be considered, will meet one or more of the following criteria.

- Lands within designated wildernesses.
- Lands that contain vital threatened and endangered species habitat, or vital wildlife habitat, e.g. calving areas.
- Lands needed for developed and dispersed recreation.
- Wetlands, riparian areas, and other water oriented lands.
- Lands that contain unique, natural, or cultural values.
- Lands that will improve public land management, meet specific administrative needs, or benefit other National Forest programs.
- Lands that provide needed access, protect public lands from fire or trespass, or prevent damage to public land resources.
- Lands that need rehabilitation or stabilization to restore their productivity.
- Lands that are needed to block up public land ownership or meet research needs.
- Lands that are needed to meet programs prescribed or endorsed by acts, or reports of Congress, or the Department of Agriculture.
- Inholdings that contain needed rights-of-way and will contribute to the Forest resource management base.

The acquisition program will be achieved through purchase, exchange, and donation authorities. The purchase program centers around the Land and Water Conservation Fund Act that designates that lands within the following categories are eligible for acquisition with L&WCFA funds.

- Congressionally designated areas.
- Wilderness.
- Threatened and endangered species habitat.
- Recreation acquisition composites and inholdings.

The basic goals of the composite program are to provide:

- Lands needed for construction of public recreation facilities.
- Lands needed for dispersed recreation and open space.
- Protection of public recreation resouces.
- Prevention of private usurpation of public resources and facilities on nearby public land.

Four approved recreation land acquisition composites (Cloudcroft, Ruidoso, Bonito, and Nogal-Tortolita) identify 5,083 acres in specific tracts which are valuable for recreation and which qualify for purchase with Land and Water Conservation Fund Act monies. Only two purchases have been made in the last 10 years, although approximately 517 acres of land have been purchased since the inception of the program.

The donation authorities are applicable for any of the lands that meet the acquisition criteria.

The land exchange program operates under several authorities and is the major land adjustment program that can be employed to acquire essentially all of the lands that meet the acquisition criteria. The lands offered by the United States in a land exchange are tentatively classified as base-in-exchange. Currently, the Forest contains 10,167 acres that have been classified as base-in-exchange. Because local and physical conditions may change during the life of this plan, those lands classified in this plan and any other that may be considered will generally meet one or more of the following criteria:

- Lands needed to meet the needs of expanding communities.
- Isolated tracts or scattered parcels that cannot be efficiently managed.
- Lands needed to provide consolidation of the public lands.
- Lands needed to improve management, benefit specific resources, or increase management efficiency.
- Lands needed to meet overriding public needs.

Future Trends

Landownership adjustments are coordinated with other Federal agencies and State and local governments. Ownership adjustment is one method of resolving trespass cases. An increase in adjustment cases is expected around expanding communities.

Withdrawals

Certain lands administered by the Forest may be withdrawn from entry and appropriation under various Federal laws. A withdrawal order makes a tract of land unavailable for certain uses.

There are now 52 withdrawals (see Table 43) on the Forest comprising 9,552 acres. All but one of these withdrawals removes the land from jurisdiction of the Federal mining laws but not from mineral leasing laws. Most withdrawals are for administrative sites and recreation areas. None are for water power, and only one is for water supply.

A review and assessment of existing withdrawals is required by Section 204 of the Federal Land Policy and Management Act (FLPMA). Procedures have been established for withdrawals or the revocation of withdrawals which are coordinated with the Bureau of Land Management.

Table 43. Withdrawals

Purpose	Number of Withdrawals	Acres
Lookouts	9	450
Observation Sites	2	70
Administrative Sites	14	2329
Recreation Sites	12	1076
Winter Sports	3	1440
Experimental Forest	3	2120
Scenic Zones	2	508
Water Supply	1	360
Cave Protection	6	1199
Total	52	9552

Future Trends

There have not been any recent withdrawals and future withdrawals are expected to involve recreation or administrative sites, research natural areas, and observatory sites.

Right-of-Way

The extensive intermingling of public and private lands within the boundaries of the Forest has resulted in access problems that are becoming more critical as recreational demands for public land use increase. Many acres of Forest land are unavailable for public use because of insufficient access, especially on the Smokey Bear District.

Landowners often enjoy nearly exclusive use of public land by controlling access. On the other hand, recreationists often mistake unfenced private land for public lands. Because of the mixed ownership pattern of the Forest, the status of right-of-ways (ROWs) for roads and trails is often uncertain.

The Forest presently acquires about three to five ROWs annually. This level reflects low funding and a relatively low management priority. The current emphasis is to acquire ROWs where problems from lack of access are the greatest and where property owners are willing to grant or sell easements. Invoking the right of eminent domain has usually been avoided but may be used when a property owner is unwilling to grant a ROW that is in the public interest. An estimated 36 routes accessing the forest boundary need ROW to assure adequate access to the Forest (see Table 44).

Table 44. Right-of-Ways Needed for Access to the Forest

Area	Road	Division	Total Miles	Existing ROW Miles
Capitan Gap N.	FR 616	Lincoln	0.9	0.0
Water or Elder Canyon	FR 408	Lincoln	8.3	0.0
Benado Gap South	FR 441	Lincoln	0.1	0.0
Dry Gulch	FR 583	Lincoln	0.1	0.2
Seven Cabins	FR 256	Lincoln	0.3	0.0
Copeland	FR 163	Lincoln	0.8	0.0
Arabella	FR 5657	Lincoln	2.2	0.0
Windy Canyon	FR 5626	Lincoln	4.2	0.0
Mule Canyon N.	FR 222	Sacramento	1.4	0.0
Agua Chiquita	FR 417	Sacramento	0.4	0.0
Benado Gap North	FR 441	Lincoln	2.6	0.0
Capitan Gap S.	FR 56	Lincoln	4.9	1.5
Hale Canyon	FR 57	Lincoln	3.0	0.0
Coyote	FR 481	Lincoln	1.6	0.0
Tucson Mountain	FR 165	Lincoln	3.0	0.0
Salazar Canyon	FR 57	Lincoln	0.5	0.0
Capitan Pass-Gap	FR 142	Lincoln	2.2	0.0
Jernigan-Dunken	FR 611	Sacramento	9.0	0.0
Chimney Canyon	FR 176	Sacramento	4.4	0.0
Patos	FR 139	Lincoln	9.1	0.0
Elk/16 Springs	FR 175/46	Sacramento	6.2	0.6
McDonald Flats	FR 176	Sacramento	5.0	0.5
Miller Flats	FR 212	Sacramento	2.6	1.4
McDonald Flats	FR 222	Sacramento	4.4	0.0
Escondida Canyon	FR 608	Sacramento	2.8	0.0
To S.R. #48	FR 72A	Lincoln	17.1	0.0
Ancho	FR 72	Lincoln	3.0	1.3
Grapevine Canyon	FR 5608	Sacramento	9.2	0.0
Jacks Peak	FR 72B	Lincoln	7.1	0.0
Three Rivers	FR 579	Lincoln	2.8	2.8
Laborcita N.	FR 329B	Sacramento	4.2	0.0
Sacramento R. to Pinon	FR 537	Sacramento	13.5	0.0
Hope-Bullis	FR 67	Guadalupe	45	
Panama	FR 518	Guadalupe	17	
Pinon		Guadalupe	21	
Big Canyon Rd.		Guadalupe	12	

In addition, about 285 miles of right-of-ways within the Forest boundary are needed to complete public access.

Future Trends

Private landowners are reluctant to sell ROWs to the Forest unless there is a significant benefit to them. The public demand for access (and hence ROW) will increase as the population in nearby cities increases.

Land Line Location

The interspersion of private lands within the Forest boundary and development of private lands both within and adjacent to the boundaries is resulting in increased occupancy trespass. Land line boundaries need to be located and posted to identify and prevent trespass and protect resouces.

Table 45 provides historic information regarding miles of property boundary surveyed and posted.

Table 45. Land Line Location Program

Year	Annual Total (miles)	Grand Total (miles)
Prior to 1970	78.25	78.25
1971	0	78.25
1972	0	78.25
1973	9.00	87.25
1974	2.00	89.25
1975	26.00	115.25
1976	21.75	137.00
1977	44.00	181.00
1978	109.50	290.50
1979	78.50	368.50
1980	82.00	450.50
1981	73.00	523.50
1982	38.25	561.75
1983	61.25	623.00
1984	72.00	695.00

Future Trends

Encroachment and occupancy trespass cases will continue, some of which may be resolved under the authority of the Small Tracts Act. It is estimated that over 1040 of the 1735.5 miles of Forest boundary have not been surveyed and posted to standards.

Special Uses

Forest lands are generally available for occupancy if such occupancy is in the public interest. Occupancy is not allowed where special uses are prohibited by legislation, local zoning or administrative decisions. Occupancy is authorized through the issuance of a special use authorization.

The subdivision and development of non-Forest land within Forest boundaries are increasing demand for special uses to satisfy individual and public needs. Approximately 375 land-use documents are currently in effect for uses ranging from recreation residences to military installations.

Most county roads which pass through the Forest are not authorized by easements or permits, and some of these roads pre-date the establishment of the Forest. The counties involved currently do not have the capability to survey, plat and request easements for these roads. Over 20 permits have been issued to individuals for access roads to private land, however, these permits represent only a small portion of the private roads on the Forest serving this use.

Military use of the Forest for electronic sites and small unit training exercises is considerable because of the proximity of Holloman Air Force Base, Ft. Bliss Army Base and White Sands Missile Range. The southwestern corner of the Cloudcroft Ranger District is established as a secondary impact zone for McGregor Guided Missile Range which is operated from Ft. Bliss. In addition, the National Science Foundation administers two observatory complexes in the Forest.

Sufficient space is available at existing electronic sites for anticipated demand for several decades. Only one new site may be needed for adequate communication linkage.

Applications for special use permits are handled on a first-come, first-served basis except that those applications providing for public needs receive priority over those for private needs. Where interests exist, Special Use Permits will be issued through a prospective and competitive bid. In administering permits, priority is given to projects with major impacts and to those that involve health and safety considerations, such as ski areas and organization camps. In the past five years, an increased effort has been made to discourage special uses on the Forest, particularly those that solely benefit private parties. The Forest also discourages uses on parcels designated as base-in-exchange.

Future Trends

Demand for both public and private uses of the Forest is increasing. Issuance of special use occupancy documents will become more difficult and time consuming as conflicts with other Forest management activities increases. A large number of existing permits need to be revised and brought up to date. Fee rates also need to be reviewed.

Corridors

Corridors and rights-of-way for public utilities are located throughout the Forest. Currently, corridors exist along US Highways 70, 82, and 380, State Highways 24, 37, 48 and 137, and Forest Roads 64 and 537. The largest utility is a 115 KV powerline. Most of the 394 miles of power and telephone lines are for local distribution. A large percentage of the interior private land has electricity and telephone service. Community and private water lines are another important use of the Forest with the City of Alamogordo having the most miles of pipeline. Table 46 displays the number of miles and type of corridors used by public utilities. In addition to these utilities, there are 11 electronic sites located on the Forest.

The two Wildernesses are exclusions for any utility installation while the topography and location of the Forest generally precludes any consideration for major transmission lines.

Table 46. Utility Corridors

Utility Lines	Miles
Electric	229
Natural Gas	7
Telephone	165
Water	40
Total	441

Future Trends

The need for distribution corridors for electrical transmission lines, gas and oil pipelines, and communication transmission lines is increasing over various portions of the Forest. For this reason most existing rights-of-way for distribution lines and pipelines are designated as corridors. Prospective users will be required to use these where technically and environmentally feasible.

SPECIAL AREA DESIGNATIONS

Special Areas are portions of the Forest designated for specific purposes.

Research Natural Areas

Research Natural Areas (RNAs) are set aside to provide and protect natural diversity in all of its forms. The areas typify important forest, shrubland, and mountain meadow types having special or unique characteristics of scientific interest or importance. Research Natural Areas are established for nonmanipulative research, observation and study. The Forest currently has no established RNAs.

Several examples of important biotic types have been identified on the Forest. Potential areas will be managed to protect RNA values until establishment reports are completed and areas are either included in or dropped from RNA consideration. The potential areas are: The William G. Telfer Area (Corkbark Fir) near Ski Apache (727 acres), Upper McKittrick Area (Mountain-Mahogany) in the Guadalupe Mountains (827 acres), and Haynes Canyon Area (White Fir) near Cloudcroft (610 acres). The latter area is within the former Cloudcroft Experimental Forest.

Bonito Watershed

The Bonito Watershed has long been recognized for its importance to water users. The Bonito Watershed Act of 1939, covering about 25,200 acres in the headwaters of the Bonito River, restricted the types of activities that could occur on mining claims. The Act also provided that mineral patents could convey only the land's mineral rights and not the land surface itself.

PROTECTION

Protection is divided into four separate elements: air, fire, insect and disease, and law enforcement.

Air

Air quality over most of the Forest is generally good. The largest source of air pollution from Forest activities is smoke from fires (both wildfires and prescribed burning) and dust from unpaved Forest roads.

The Clean Air Act gives states most of the responsibility for managing air quality within their borders. The framework for air quality management is the State Implementation Plan. The Forest's role in air quality management is to coordinate Forest management activities with State and Federal air quality control efforts and to protect air quality related values. This is accomplished by properly managing the air pollution generated by Forest Service activities such as prescribed fires, construction and road use, and the operation of various facilities.

Air quality problems generated from sources outside the Forest include urban plume and dust from the El Paso-Juarez area and blowing dust from the desert floor. The potential for degradation from these sources is considered low: the

winds that blow dust from the desert floor are usually seasonal and wind conditions that allow pollution from El Paso-Juarez to accumulate and spread far enough to affect the Forest rarely occur.

The White Mountain Wilderness is designated as a Class I air quality area under the Clean Air Act. Class I means that air quality in these areas may be only minimally degraded from present levels by sources specified in the Clean Air Act. The rest of the Forest has been designated as a Class II air quality area, a category which allows moderate degradation of air quality over baseline concentrations.

Air quality on the Forest is in compliance with the requirements of the State Implementation Plan for the State of New Mexico. Prescribed fire is used to dispose of forest residue and achieve other management objectives when other alternatives are limited. Temporary air degradation may occur during prescribed fires, but does not exceed air quality regulations. The Forest obtains permits annually for prescribed fires, and the local office of the Environmental Improvement Division is contacted for specific approval 24 hours in advance of ignition.

Current Management

Road dust and smoke from burning wildland fuels are sources of suspended particulate matter occurring on the Forest. At present there is no attempt to mitigate road dust. To minimize smoke pollutants, personnel conducting prescribed burns are required to adhere to all legal requirements. This includes obtaining an annual permit and contacting authorized regulatory agencies for approval prior to burnings. Local weather information, spot forecasts amd changing weather conditions are all important factors which are considered before burns are initiated and while they are in process. Wind speeds of more than four MPH are required for smoke plume dispersal.

Future Trends

A requirement to increase visibility monitoring for all Class I wilderness areas is anticipated. The Forest's only Class I wilderness area is the White Mountain Wilderness. A monitoring system should be initiated to determine existing visibility conditions so that future changes can be detected.

Eventually there will be a need to evaluate the effects of air quality changes on other aspects of the Forest and rangeland ecosystems.

Continued growth and development of the El Paso and Alamogordo areas will probably result in reduced air quality. The Forest will continue to cooperate with the State Environmental Improvement Division.

Fire

The Forest has a history of large fires which have occurred on the average of every seven years. The last big fire year was 1974 when 193 fires burned 33,658 acres. Annual averages for the 10 year period from 1970 to 1979 were 101 fires per year and 39 acres per fire. Sixty-two percent of the fires were caused by lightning; the rest were caused by humans, almost all of them resulting from recreational use of the Forest. Sixty percent of these are from escaped campfires while others are caused by factors such as smoking, warming fires, and children playing with matches.

The complex land ownership patterns within the Forest have increased the risk of fire. Much of the private land is being developed for residential occupancy; however, approximately 60 percent of the owners do not live year round on their property and are not always able to see that fire safety is maintained. Also, the generally high property values often result in small tracts of land where the desire for privacy encourages the use of vegetative screens between houses. Fire hazard is high in some areas because of such practices. There is also a potential for water shortages during dry years. In addition, narrow one-way streets and streets too steep for fire equipment occur in some communities within the Forest.

Fuel treatment measures to reduce fire hazard have been concentrated in areas located southwest of population centers and high resource value areas because all of the Forest's large disastrous fires have been driven by high winds out of the southwest.

Current Management

The current fire management program has two main thrusts: 1) protecting resources through fire prevention, presuppression, and fuel treatment and 2) protecting, enhancing and maintaining resource productivity by using prescribed fire to meet Forest management goals and objectives. Prescribed fire has been used for the disposal of activity fuels and for the improvement of forage production and wildlife habitat. Presently, Forest Service policy requires suppression action that is consistent with resource management goals and objectives.

Future Trends

The growing population within and adjacent to the Forest is most concerned about the increased fire risk caused by private developments. Public demand for protection and reduction of fire risk is expected to remain high, and fire-related issues will become more intense as additional subdivisions are built within and adjacent to the Forest.

Insect and Disease

Forest pests are managed using the concept of integrated pest management (IPM), a systematic decisionmaking process and resultant actions developed after considering pest-host relationships and resource management objectives. Actions may include doing nothing or utilizing various options including silvicultural, biological, chemical or other means, applied singly or in combination.

Two species of dwarf mistletoe and western spruce budworm, roundheaded pine beetle, and Ips bark beetle are the principal pests which threaten attainment of resource management objectives on the Forest. These, and other less common agents, act alone or in concert, and often take advantage of stresses caused by stand conditions or climatic factors.

Southwestern dwarf mistletoe, which parasitizes ponderosa pine, is present in over half of the pine stands on the Forest and is also common in mixed conifer stands. Estimates are that Douglas-fir dwarf mistletoe, the other important disease, infest well over half of the mixed conifer stands. Dwarf mistletoes cause growth losses, mortality and defect. Typically, growth losses are insignificant at low infection levels, but increase as infection intensity increases. At some point, dwarf mistletoe-induced stresses cause host trees to

attract bark beetles, and mortality occurs. Small trees are often killed outright without being attacked by beetles.

Western spruce budworm is a major, periodic defoliator of mixed conifer stands on the Forest. Budworm infestations cause varied amounts of tree deformity, radial growth loss, seedling damage, seed destruction, and stand regeneration failure. Four or more years of consecutive defoliation may result in top-kill and mortality in the smaller size classes. Short range control is by means of insecticides, which are used when threats to resource values are unacceptable. Long-range silvicultural management is used to reduce stand susceptibility to future outbreaks by means of intermediate cuttings to control stocking, improve vigor and growth, and favor nonhost species; and regeneration cutting to create single-storied stands favoring nonhost species. Generally, even-aged management techniques are preferred.

The latest infestation of western spruce budworm was detected in 1982 on about 6,600 acres in the Sacramento Mountains. In 1983, the number of acres defoliated increased to almost 109,000 acres of Forest, MAIR, and private lands. Approximately 240,000 acres of these lands were sprayed in the spring of 1984 with chemical and biological insecticides. This was done to prevent additional defoliation which would in turn result in significant, unacceptable resource losses. The document "Environmental Assessment of Western Spruce Budworm on Lincoln National Forest, Mescalero Apache Indian Reservation, and Associated State and Private Lands, 1983", which can be seen in the Supervisor's Office, contains additional information on the western spruce budworm and the infestation detected in 1982.

Roundheaded pine beetle is a recurring pest in pole-sized ponderosa pine stands, where it causes wide-spread mortality following periods of drought. The last serious infestation occurred in 1976. Ips bark beetles are a potential problem where ponderosa pine slash is not properly treated. These insects increase in number in green slash and then attack and kill standing live trees.

Current Management

Dwarf mistletoe management is an integral part of timber management. Infected stands are identified during the compartment examination process, and prescriptions are written which consider the effects of the parasite. Dwarf mistletoes are controlled by strict application of silvicultural techniques including: 1) removal of infected overstory trees as soon as regeneration is accomplished, 2) thinning of infected sapling- and pole-sized stands to growing stock levels which reduce the amount of mistletoe and maximize the growth of individual trees and 3), clearcutting followed by artificial regeneration when high infection intensity precludes regeneration by the shelterwood system. Almost all of these operations are performed as part of timber sales, although some high priority stands have been treated with funds allocated strictly for managing dwarf mistletoe.

Almost all of the mixed conifer stands on the Forest are multi-storied with a high percentage of white fir and relatively small amounts of ponderosa pine, Douglas-fir and Southwestern white pine. These stands are particularly susceptible to damage by the western spruce budworm. Short term management of infestations is by means of chemical or biological insecticides, applied by

aircraft or ground-based equipment. In the long term, infestations are best controlled by applying silvicultural techniques aimed at creating moderately-stocked, single-storied stands with a large component of ponderosa pine, white pine, and Douglas-fir.

Bark beetle infestations are prevented by properly timing logging and thinning operations, thinning overstocked sapling and pole-sized stands, and properly, timely disposal of slash.

Future Trends

Losses caused by dwarf mistletoe will decrease slightly, except in unmanaged stands, where they will continue to be high and long-term changes in stand structure will occur. Western spruce budworm will continue to be a management concern. Potential losses will depend on the interval between epidemics, stand conditions at the time, and whether insecticides are used. Sporadic, local infestations of bark beetles will occur, with resultant minor losses.

Law Enforcement

Violent crimes committed on Forest land are infrequent. Theft, vandalism or destruction of government property occur frequently. Drug trafficking is quite common. Illegal gathering of firewood for personal or commercial use has tripled in the past two years. Off-road vehicle use has increased considerably. Vandals and/or thieves damage unrenewable resources located within primitive caves on the Forest. Survivalist groups using automatic weapons frequent the Forest.

Current Management

The Districts do not have adequate funding or personnel to maintain full law enforcement activities. The Forest does have one full-time law enforcement officer in the Supervisor's Office.

Future Trends

The increasing use of the Forest by the public for various purposes will create law enforcement problems that will have to be resolved. If economic conditions continue to worsen in the immediate area, theft, destruction of government property, and fuelwood trespass problems will continue to increase. As long as controlled substances can be grown on National Forest land with little harassment or resistance, drug trafficking will continue to be a problem.

Current policy, supplemented by increases in funding, will enable Forest personnel to respond to law enforcement concerns, particularly relating to increased public recreation use. The level of law enforcement competence on the Forest must be raised to where law enforcement actions can be handled efficiently and effectively either by voluntary compliance or by punitive action.

FACILITIES

The Forest is responsible for construction, maintenance and administration of various facilities and corridors. These include roads, trails and a variety of buildings.

Transportation System

The Forest transportation system is composed of State highways, county roads and Forest roads. Table 47 displays the extent of this system.

Construction of new roads by the Forest is primarily for timber access. Reconstruction of Forest roads is also undertaken mainly for timber purposes with the exception of projects such as the Sac Peak Road. This Forest road (FR 64) will become a State highway offering improved access to the south end of the Sacramento Mountains and to Sunspot Solar Observatory.

Road maintenance responsibilities are divided between State and county agencies, specific users, and the Forest Service. The Forest maintains most roads with primary emphasis placed upon user safety and resource protection, and secondary emphasis upon user comfort. Current constraints have necessitated that many Forest roads be maintained only to prevent erosion and other resource damage. United States Department of Agriculture easements have not been granted for most roads maintained by other agencies, mostly county. Although these roads are under special-use permits, they remain under Forest jurisdiction and are solely the Forest's responsibility. To shift jurisdiction and maintenance responsibilitiy to these agencies, surveys and plats of road easements must be completed, most likely by the Forest, and accepted by the State and counties.

Table 47. Transportation System

Unit		No. of Miles
State & Federal highways		24
Forest roads & travelways		
arterial roads		33
collector roads		239
local roads		2448
	Total	2720
Forest trails		240
		No. of Units
Bridges & major culverts		52
Air fields & heliports		41
Communication sites		18

The only major transportation corridor identified for future work is the continuation of the Sac Peak Road (FR 64) in a south-easterly direction until it joins NM 24 at Pinon. This extension would, when completed, become a State highway as will the first section of FR 64.

The Forest receives permit applications for electronic sites on a regular basis. Adequate space is available at existing sites and the need for approval of new sites is very limited. The Forest Service is currently in the process of constructing a regional microwave system which will be combined with an "on Forest" subsystem to serve the communication and data transmission needs of the Forest and Southwestern Region. No electrical transmission or pipeline corridors are pending.

Administrative Facilities

The administrative facilities of the Forest are located in Alamogordo, Carlsbad, Capitan, Cloudcroft, Mayhill, Queen, Ruidoso and Sacramento. They include 4 District Ranger Offices, 6 work centers, 9 residences, the Supervisor's Office, Dispatcher's Office and Air Tanker Base (see Table 48).

Table 48. Facilities on the Forest

Offices	10.6 [1/]	Storage	34.9 [1/]
General Services administration offices	2	Barns	3
		Shops	1.5 [1/]
Residences	9	Water Systems	6
Quarters	13	Sewer Systems	6
Lookouts	10		

[1/] Fractions represent combined uses of facilities.

There is only one solid waste disposal site on the Forest. It is located near Mayhill and operated under a permit by Otero County. The need for such sites is not expected to be a major impact in the future as private land is generally available for such use.

There are nine dams on the Forest being operated by various organizations (Table 49). No proposals exist for the construction of additional ones.

Table 49. Dams on the Forest

Owner & Maintainer	No. of Dams	Use
Otero Co. Soil Conservation District	3	Flood retention & release
Forest Service	4	Livestock water
NM Game & Fish Dept.	1	Fish & Wildlife habitat

Future Trends

Increased concerns for resource damages and greater public use demands will require a different and more concise management program for the road system. Such management will involve closing as many miles of roads and travelways as possible while keeping a transportation system that serves both public users and Forest access needs. Closing unnecessary roads will allow for better maintenance on the resulting smaller system. More intensive management of off-road vehicle use will minimize the generation of unneeded travelways.

The Forest will continue to transfer jurisdiction and maintenance responsibility to appropriate agencies whenever possible. Until easements are granted, surface deterioration of roads will continue to contribute to resource loss and motorist discomfort.

The demand for Forest roads is significant. Several roads within the Forest are now heavily used. Some recreationists want more opportunities for off-road and primitive road use, while non-motorized recreationists want fewer roads. Future increases in Forest road use will also depend upon population growth in the surrounding area and changes in fuel prices.

The Forest needs to design and maintain a road network that supplies both needed access and varied recreation opportunities to meet future demands for roads and to ensure that the miles of roads on the Forest do not increase without proper planning. The Forest has an excess of unnecessary and potentially resource-damaging primitive roads, and this situation will continue unless adequate transportation planning and management are carried out.

4. Environmental Consequences

OVERVIEW

Environmental consequences are the effects and impacts of implementing a particular alternative on the physical, biological, social and economic environment. This chapter displays outputs by alternative and describes the direct and indirect environmental consequences that result from the alternatives considered in detail. Direct environmental effects are those occurring at the same time and place as the initial cause or action. Indirect effects occur later in time or are spatially removed from the activity or site of action, but are significant in the foreseeable future.

Many environmental effects, such as developed recreation opportunities, acres in unsatisfactory watershed condition, and the like can be measured and alternatives can be easily compared. Other effects, such as risk and hazard of fire and law enforcement, are difficult to quantify. In order to provide the reader with some measure of comparison for these difficult-to-quantify effects, resource outputs and/or costs are displayed and discussed as if there is a direct relationship between them and effects. While this might not be strictly true, the same relationship between cost or output and effects exist for all alternatives, and therefore the method is a valid one for comparing alternatives.

For example, while suitable habitat for wildlife can be measured in acres, many of the effects of activities on habitat are qualitative, and cannot be adequately evaluated in this fashion. Waters, access to waters, and escapes are examples of activities which affect quality of habitat and which are best compared either by outputs, or in some cases, costs.

Analysis and evaluation of the environmental consequences provide the basis for comparison of alternatives. The six alternatives considered in detail in developing the Proposed Forest Plan are described in Chapter 2 of this document.

Environmental consequences of alternatives result from application of various combinations of management prescriptions. In each alternative, the mix of prescriptions produces different levels of resource outputs, including developed and dispersed recreation, wildlife habitat, timber, fuelwood, and grazing use and capacity. The interaction among output levels and place and time of production results in distinct environmental consequences which vary among alternatives. This mix represents the short-term use of the environment.

Environmental consequences of all alternatives fall within certain limits because Forest-wide management requirements are imposed to ensure long-term productivity of Forest land. These requirements are part of standards and guidelines and apply to all management prescriptions. Alternatives considered in detail do not cause a significant reduction in long-term productivity. Chapter 4 of the Plan contains detailed Forest-wide management requirements and management requirements for specific areas. Chapter 5 of the Proposed Plan contains monitoring requirements that assure long-term productivity is maintained while meeting goals and objectives.

Irreversible and irretrievable resource commitments are noted where appropriate. Irreversible commitments are resource uses that affect the nonrenewable resources--soil, minerals, and cultural resources. Such commitments of resources are considered irreversible because the resource has deteriorated to the point that renewal can occur only over a long period of time or at great expense, or the resource has been destroyed or removed. The irretrievable commitments represent opportunities foregone for the period during which resource use or production cannot be realized. These decisions are reversible, but the production opportunities foregone are irretrievable. Irretrievable losses are calculated by subtracting selected outputs of the PA alternative from the alternative with the highest output for the first period (10 years). The first period is used because the Forest Plan generally will be revised every 10 years.

Probable adverse environmental effects which cannot be avoided are also discussed. Unavoidable adverse effects result from managing the land for one or more resources at the expense of other resources. Management requirements in prescriptions mitigate most adverse effects by limiting their extent or duration. Alternatives that would have resulted in excessive impacts were eliminated during alternative formulation. Mitigation/coordination measures within standards and quidelines further reduce these conflicts.

Short-term uses are those that occur annually while long-term productivity refers to the capability of the Forest to continue producing goods and services to the end of the fifth period and beyond. Short-term uses include timber and fuelwood harvest, recreation, livestock grazing, mineral extraction, and special land uses.

Soil and water are the primary resources upon which long-term productivity is based. Long-term productivity is decreased by short-term uses that result in soil damage or unsatisfactory water shed condition. Management requirements protect long-term productivity by mitigating impacts of short-term uses on soils and water and/or by specifying practices which enhance soil productivity and water resources.

Livestock grazing has the greatest potential to impact soil and water resources. Soil erosion and sedimentation are reduced as permitted livestock numbers (use) approach a balance with forage capacity, and are minimized when use is at or below capacity. Use is balanced with forage capacity in all alternatives , although the period in which balance is achieved varies.

Soil erosion and sedimentation caused by timber harvesting practices are associated with road construction and procedures used to extract wood products. Some of the consequences of timber harvesting cannot be avoided, but many are reduced or minimized by appropriate standards and guidelines so that long-term productivity is not affected.

Net public benefits (NPB) are derived from resources with market, assignable prices as well as from resources for which prices cannot be assigned (see Chapter 2 for a more detailed discussion of NPB). Examples of priced components that contribute to the NPB are volumes of timber and fuelwood harvested, acre

feet of water yielded, and forage produced. Nonpriced components contributing to the NPB include acres of visual quality, amount of soil lost, threatened or endangered wildlife habitat enhanced or maintained, and the quality of a wilderness experience. Nonpriced benefits include quantitative and qualitative outputs and effects. For instance, amount of soil lost is easily and adequately described in quantitative terms, while many of the effects of a wilderness experience are better described qualitatively. Chapter 2 contains a detailed discription of NPB.

Alternatives considered in detail resulted in little or no significant impact on some components of the environment, or did not differ significantly in their effects. Accordingly, the following subjects are not discussed further:

- Research Natural Areas.
- Water rights requirements.
- Ground water recharge.
- Flood plains.
- Air quality.
- Noise level.
- Civil rights.
- Urban quality.
- Diversity of tree species.
- Regeneration of timber stands within five years of harvest.
- Lands suitable for acquisition under Land and Water Conservation Fund.
- Fire, and insect and disease management in wilderness.
- Eagle Creek and Pine Lodge summer home areas.
- Existing organization camps.
- Review and approval of Plans of Operation for locatable minerals.
- Providing common variety minerals to other Federal, State, and local agencies.
- Land Line Location.

Plans of other agencies were reviewed to determine areas where cooperation was possible and for conflicts. Agencies and areas of cooperation are discussed in Appendix A. No unresolvable conflicts were identified.

Predicted outputs were developed using the linear programming model (FORPLAN) described in Chapter 2 as well as resource-specific procedures. Predictions are based on quantification of the relationships between renewable resources of the Forest. Additional detail on predictions is included in Appendix B or contained in planning records on file at the Forest Supervisor's Office in Alamogordo, New Mexico.

Section A of this chapter discusses environmental consequences in the framework of resource output levels; Section B covers economic and social considerations; Section C discusses miscellaneous considerations; and Section D summarizes effects.

SECTION A
RESOURCE CONSIDERATIONS

RECREATION

Dispersed Recreation

The dispersed recreation resource is affected by the level of dispersed recreation visitor use, the quality of the recreation experience provided, the variety of opportunities provided, and facilities. These factors vary between the alternatives.

Dispersed recreation use is measured by estimating the number of recreation visitor days (RVDs) projected for each alternative. RVDs are a common unit of measure used by recreation management specialists to estimate recreation use, and are defined in the glossary. Estimates of RVD's for each alternative are based on past use, population trends, access, facilities provided and variety of oppprtunities provided.

Recreation capacity and variety of experience are measured by the acreage in various recreation opportunity system (ROS) classes. The ROS is a classification system developed by Forest Service recreation specialists that classifies recreation opportunities based on land characteristics which may vary by alternative, for example, distance of an area from a road. Acreage of the Forest available for certain uses is another way of assessing recreation opportunities.

Dispersed recreation capacity, or practical potential, was determined on an annual basis using the ROS analysis which was a part of the Analysis of the Management Situation (AMS). Projected use for dispersed recreation, including wildlife and caves, but excluding wilderness, is not estimated to exceed the practical potential of 1,544 MRVDs by the end of Period 5 (see Table 50).

Table 50. Average Annual Dispersed and Wildlife Use - MRVDs

Period	Alternatives PA	A	B	C	D	E	F
			Dispersed, Including Caves				
1	596.0	577.1	605.9	587.2	592.7	590.9	582.3
2	674.1	653.2	695.7	662.3	677.6	665.0	656.9
3	730.8	728.2	756.5	720.3	731.8	722.5	713.5
4	776.0	778.7	795.9	770.5	775.3	769.0	757.8
5	811.3	816.4	830.6	808.6	809.6	805.8	791.9
			Wildlife				
1	386.3	370.2	386.3	386.3	417.6	386.3	386.3
2	466.3	391.7	466.3	466.3	505.3	466.3	466.3
3	538.1	377.2	549.8	502.6	593.0	549.8	503.3
4	520.9	361.1	626.4	486.4	610.9	578.6	488.8
5	537.7	378.8	651.7	503.6	593.4	563.2	504.1
			Dispersed and Wildlife				
1	982.3	947.3	992.2	973.5	1010.3	977.2	968.6
2	1140.4	1044.9	1162.0	1128.6	1182.9	1131.3	1123.2
3	1268.9	1105.4	1306.3	1222.9	1324.8	1272.3	1216.8
4	1296.9	1139.8	1422.3	1256.9	1386.2	1347.6	1246.6
5	1349.0	1195.2	1482.3	1312.2	1403.0	1369.0	1296.0

Alternative B provides the most opportunity for use, 1482.3 MRVDs, or 76 percent of projected demand for dispersed and wildlife recreation by the end of Period 5. The PA provides for use of 1,349.0 MRVDs by the end of Period 5, about 69 percent of the projected future demand. There is little difference between the PA and Alternatives C, D, E and F. Alternative A, which provides for 1,195.2 MRVD's, offers about 61 percent of projected demand.

The PA and Alternatives B, C, D, E and F will close the Forest to vehicle use except on system roads and trails designated as open or where authorized by permit or contract. Vehicles will be allowed 300 feet off the designated system for dispersed camping. Management emphasis will be on closing roads and areas for resource protection. Under Alternative A, the Forest will remain open to vehicle use in all areas except where signed closed. All alternatives allow for Forest-wide use of over-the-snow vehicles except in areas specifically closed. All alternatives provide for a reasonable system of designated roads and trails for motorized use.

The quality of recreation experience provided by each alternative is a subjective measurement. Each recreationist has a personal view of what constitutes a quality experience. However, amount and level of service provided for dispersed recreation are indicators of quality of experience.

Alternative D provides a higher level of service than any other alternative. About 68 percent of the dispersed recreation opportunity provided by this alternative is managed at standard service levels (SS). Other alternatives ranked by order of SS provided are; PA (56 percent), F (43 percent), E (38 percent), B (36 percent), C (21 percent), and A (0 percent).

Miles of trail maintained and level of maintenence are other indicators of quality of experience and are shown in Table 51.

Table 51. Trail Maintenance - Miles.

	Alternatives						
Maintenance Level/Priority	PA	A	B	C	D	E	F
Low (I)	24	98	92	65	22	92	44
Moderate (II)	100	0	15	0	100	8	70
High (IV)	23	0	20	14	31	21	17
Total Maintained by the Forest	147	98	127	79	153	121	131
Adopt-A-Trail	213	142	113	161	297	119	109
Total	360	240	240	240	450	240	240

The Forest will maintain the most miles of trail under Alternative D. The PA maintains about 4 percent fewer miles than Alternative D, but more than the other alternatives. Alternative C calls for maintaining about 46 percent fewer miles of trail than the PA. Under all alternatives except A, the Rim Trail is maintained at Level III (High), and the Osha Trail is maintained at Level IV (High). Except for the Rim and Osha Trails, the majority of the trails maintained by the Forest are in wilderness. The Wilderness trails receive moderate level maintenance under the PA and Alternatives D and F, and receive low level maintenance under the other alternatives. Under Alternative A, all maintenance is at Level I.

Under the Adopt-A-Trail program, individuals or groups contract with the Forest to maintain trails. A number of trails on the Forest have been adopted by a variety of groups. Under Alternative D, 297 miles would be dependent on such volunteer maintenance; the PA would make about 60 percent, or 213 available for adoption. Other alternatives would offer about 110 to 160 miles. Most of the trails offered for adoption are roads constructed to harvest timber but which are no longer needed, or travelways created casually and defined by subsequent use, but which are causing resource damage. These two-track travelways will be converted to single track use and maintained as trails.

Acreage available for various recreation opportunities as measured by ROS classes does not change significantly over the first five periods in all alternatives except Alternative C. In this alternative, about 13 percent of the Forest shifts from the ROS classes Semi-Primitive Non-Motorized and Semi-Primitive Motorized to Roaded Natural.

Caves

Under all alternatives, management objectives for the cave resource will be to protect and preserve their values while continuing to provide recreation opportunities for wild caving. The effects of the alternatives on the cave resource are measured by the quantity and quality of recreation opportunities available, by the degree of protection of the caves themselves, and by the search for and management of additional caves. Table 52 shows the annual level of cave use provided by each alternative, and dollars budgeted for cave protection and locating new caves.

Table 52. Annual Cave Use and Funding by Alternative.

Period		Alternatives						
		PA	A	B	C	D	E	F
1	Use (RVD's)	6,787	5,992	5,890	4,195	5,990	5,992	5,094
	Funding (M $)	407.7	97.3	380.9	62.3	293.7	97.3	108.9
2	Use	7,059	6,232	6,136	6,189	6,545	6,232	5,298
	Funding	360.6	157.1	338.3	62.2	298.6	97.1	108.7
3	Use	7,270	6,419	6,320	6,376	6,741	6,419	5,457
	Funding	306.6	103.1	284.3	62.2	303.7	97.1	108.7
4	Use	7,489	6,612	6,510	6,523	6,944	6,612	5,621
	Funding	306.6	103.1	284.3	62.2	306.6	97.1	108.7
5	Use	7,639	6,744	6,601	6,609	7,065	6,744	5,733
	Funding	306.6	103.1	284.3	62.2	306.6	97.1	108.7

The PA and Alternative D provide the highest level of use over the planning period, and Alternative F the lowest. The range between alternatives in the fifth period is 1906 RVDs, which represents a 33 percent difference in use.

Caves are protected by the same methods (gating and a permit system) under all alternatives. Differences arise in the rate at which known and newly-discovered caves are gated, the number of permits issued and the degree of control exercised over permit holders. The PA provides a high degree of protection by initiating and completing a program of gating known caves in the first two decades, while still allowing access by more caving enthusiasts than any other alternative. After known caves are gated, newly discovered ones will be gated and locked as soon as possible. Alternatives B and D also offer a high degree of cave protection by gating known caves at a slightly slower rate and by restricting the number of cavers through the permit system. Alternative B will designate about 31,000 acres as a special geologic area. The PA and Alternatives B and D also provide for a high degree of administrative control over cavers. These alternatives offer the highest degree of protection to caves by a combination of high funding levels for protection and by placing strict administrative controls on cavers. Alternatives A, C, E, and F provide less protection for caves than does the PA because the initial level of funding is reduced. Alternatives A, C, E, and F project cave use to levels twelve to thirty-eight percent lower than the PA.

The Regional Forester directed that a cave inventory be initiated to determine the location and extent of this resource. The study has been completed. Under the PA and Alternative B newly discovered caves will be inventoried, classified and managed for resource protection. Under Alternative D, all suitable geological terrain will be surveyed for new caves. New caves will then be inventoried and managed according to a classification system for protection of the resource while also providing opportunities for public use. Under Alternatives A, C, E and F cave inventories will be on an opportunity basis only.

Developed Recreation

Impacts of alternatives on the developed recreation resource are measured in three ways: by actual use (quantity), variety, and quality of experience. Downhill skiing, because of high present use and increasing demand, is displayed as part of total developed recreation, then separately.

Projected annual future demand for developed recreation is 531 MRVDs in the first period and 1457 MRVDs in Period 5. Future demand was based on regional trends and estimated downhill ski use projections for the five counties making up the Forest's planning area. The populations of west Texas counties, whose residents constitute a large portion of the developed recreation use on the Forest, are expected to increase more rapidly than those of the local five-county area. In addition, future use for downhill skiing is expected to increase at a much faster rate than population.

The developed recreation facilities provided by each alternative are expected to provide for the projected annual use levels shown in Table 53. Downhill skiing use is included in the figures.

Table 53. Average Annual Developed Recreation Use - MRVDs

	Alternatives						
Period	PA	A	B	C	D	E	F
1	569.2	490.9	541.7	535.0	558.5	575.3	552.1
2	757.6	551.7	690.0	633.3	741.3	728.5	720.4
3	884.8	618.0	819.2	745.3	906.6	849.9	841.1
4	974.9	662.8	908.2	822.6	1026.6	953.3	929.9
5	1046.0	690.6	981.6	881.0	1111.4	1022.4	998.9

All the alternatives, except Alternative A, more than satisfy the projected demand during the first period. By the end of Period 2, none of the alternatives satisfy projected demand. The PA supplies more developed recreation than any other during Period 2, but Alternative D provides more over the next three periods. All other alternatives provide fewer developed recreation opportunities than the PA during Periods 2 to 5.

The range and relative proportions of different experiences provided is as important in determining user satisfaction as is the number of RVDs provided by an alternative. Table 54 shows the additions to existing capacity planned for various types of developments, and the period in which construction or

reconstruction is scheduled. The additions are displayed as Persons At One Time (PAOT), the number of users which the facility can reasonably accomodate when it is fully occupied. Normal use rate for determining RVDs is 40 percent.

Table 54. Additions to Developed Recreation - PAOT

	Alternatives						
Period	PA	A	B	C	D	E	F
1	4,680	1,524	4,487	4,224	4,842	3,231	4,359
2	1,121	---	880	555	1,301	978	1,071
3	160	160	560	670	1,135	660	470
4	200	200	200	200	200	---	---
5	40	40	40	---	---	---	---
Total	6,201	1,924	6,167	5,649	7,478	4,869	5,900

Note: Current capacity = 2700 PAOT, exclusive of trailheads.

Overall, Alternative D provides more developed recreation opportunities than does the PA, while Alternatives A, B, C, E, and E provide less. Alternative D calls for construction of new sites and reconstruction of existing sites to provide for about 7,500 PAOT by the end of the fifth period. This alternative provides significantly more campground PAOT than any other alternative, although the PA and Alternative C call for the same amount of construction of group facilities. Construction of group facilities, is relatively inexpensive in terms of PAOT. All alternatives call for the reconstruction of Pines Campground, with the addition of 40 PAOT; all alternatives except Alternatives A and B, provide for the reconstruction of Deerhead Campground, with an increase PAOT of 30.

Other significant differences between the alternatives are: 1) Alternative D constructs three new campgrounds on the Guadalupe District, Alternative E constructs two, and the PA and Alternatives B and F construct only one, 2) all alternatives construct a group picnic ground near the existing picnic ground at Cedar Creek, but only the PA and Alternatives E and F provide the site within the first two periods; the other alternatives provide for site construction in Period 4, 3) Alternatives B and D provide for the construction of a campground and convenience facilities along the Sacramento River, and 4) Alternative D provides for the most new trailhead capacity (253 PAOT), the PA provides for the second most (193 PAOT), and Alternatives A and C provide the least (24 PAOT).

Quality of experience is measured by level of service provided. Under Standard Service level (SS), refuse containers are emptied and cleaned, restrooms are serviced, routine maintenance is performed, and litter is picked up, at intervals scheduled to result in little or no inconvenience to users. The interval between operations is greater and some are not performed under Less Than Standard Service levels (LSS). For instance, standard service may include emptying litter containers weekly, but under LSS, they may be emptied at longer intervals or removed and "Pack it Out" signs posted.

The PA and Alternative E operate more than 90 percent of facilities at SS levels. Alternative D maintains about 75 percent of the facilities at SS levels. Alternatives C and E maintain over half of the facilities at the higher level, and Alternatives A and B maintain about 50 percent at each level. Accordingly, almost all Forest visitors using developed recreation sites under Alternatives A and B will experience noticeably less satisfaction than under the PA and Alternatives E and D.

Downhill Skiing

The effects of the alternatives on downhill skiing are measured by the degree to which demand is met. Demand for alpine skiing on the Forest will continue to increase faster than the Forest's ability to provide the opportunity. All alternatives allow for some increase in downhill skiing; the amount and method of increasing opportunities varies by alternative as shown in Table 55.

Table 55. Opportunities for Downhill Skiing - MRVDs

	Alternatives			
Period	No expansion or new areas	PA, B, C, D, F Expansion and one new area	A Expansion, no new area	E No expansion, one new area
1	142.6	196.2	176.2	162.6
2	157.7	239.6	211.6	185.7
3	167.7	271.2	232.0	206.9
4	173.0	295.3	237.5	230.8
5	173.1	314.8	238.0	250.0

All alternatives except E call for the expansion of Ski Apache and Ski Cloudcroft upon approval of master development plans. All alternatives except A provide for the construction of an additional ski area by the private sector, dependent on the outcome of feasibility studies. They also call for the construction of other winter sports facilities near Cloudcroft by the Forest, which will be available for operation by concessionaires. The PA and Alternatives B, C, D, and F will come closest to satisfying demand. Under Alternative A, the existing ski areas will be allowed to expand, but no new ones will be created; it will result in the largest gap between potential use and capacity. Alternative E will not allow for expansion of existing areas, but will allow a new area to be built, and will produce slightly more RVDs than Alternative A. All alternatives will provide the same level of opportunity for cross-country skiing.

Adverse Environmental Effects

Adverse effects on dispersed recreation which cannot be avoided include: 1) temporary disruption of some dispersed uses in timber sale areas during harvest; 2) possible disturbance of wildlife-related recreation activities due to increased timber harvest; 3) disruption of wildlife because of increases in dispersed recreation activities; 4) increased user conflicts because of increased use coupled with reduced service levels in Alternatives A, B, C, and E; 5) reduction in quality of experience for ORV users in all alternatives except A; and 6) restrictions on access to caves due to the need to protect the resource.

Adverse environmental effects on developed recreation which cannot be avoided include: 1) increased user conflicts and deterioration of sites near heavily-used dispersed areas when use exceeds capacity; 2) temporary reductions in visitor use due to timber harvest activities or construction of recreation sites; and 3) increased crowding in ski areas with resulting degradation in quality of experience. If Ski Apache is allowed to expand without development of new transportation facilities, serious congestion and unsafe conditions will occur on the access road.

Irreversible and Irretrievable Commitments

The only irreversible effect on dispersed recreation, damage to cave resources by users, occurs in all alternatives to some degree, but is largest in Alternatives A, C, E and F, which provide the least protection.

The difference in visitor use between Alternative D, which produces the highest dispersed and wildlife recreation output in the first period, and other alternatives is irretrievable and is shown in Table 56.

Table 56. Irretrievable Commitments in Dispersed Recreation - MRVDs.

	Alternatives						
	PA	A	B	C	D	E	F
Average Annual Use	982	947	992	973	1010	977	969
Difference from Alt. D	28	63	18	37	--	33	41

Alternative A represents the largest irretrievable commitment, 63 MRVDs per year in the first period.

There are no irreversible effects on developed recreation from any alternative, since site productivity is preserved, all structures could be removed and the site restored to its original purpose. In actual practice, developed sites will continue to be used as such beyond the planning period unless they are destroyed by catastrophic events such as fire. Therefore, the land developed for this single resource use represents an irreversible effect.

The difference between Alternative E, which produces the largest number of developed RVDs in Period 1, and the other alternatives is an irretrievable loss, and is shown in Table 57.

Table 57. Irretrievable Commitments in Developed Recreation - MRVDs.

	Alternative						
	PA	A	B	C	D	E	F
Average Annual Use	569	491	542	535	558	575	552
Difference from Alt. E	6	84	34	40	17	---	23

Differences between Alternative E and the PA are relatively small, reflecting the emphasis placed on developed recreation in these alternatives. The difference between Alternative E and Alternative D is about 3 percent.

WILDERNESS

The effects of the alternatives on the wilderness resource are estimated by the number of acres managed as designated wilderness and the quality of the wilderness experience provided.

The New Mexico Wilderness Act of 1980 resolved the Rare II issue of additional wilderness acreage, with the exception of the Guadalupe Escarpment Wilderness Study Area (WSA), which it created. The Act requires the Secretary of Agriculture to review the WSA and make a recommendation as to its suitability or unsuitability for inclusion in the National Wilderness Preservation System by January 1, 1986.

By means of an agreement signed by the Director, Roswell District, BLM, and the Supervisor of the Lincoln National Forest, the BLM and the Forest Service agreed to make a joint recommendation for the Guadalupe Escarpment Wilderness Study Area and three BLM wilderness study areas - Devil's Den Canyon, McKittrick Canyon, and Lonesome Ridge - adjacent to it. Appendix C contains a description of the four WSAs and evaluates their suitability for wilderness status.

The New Mexico Wilderness Act also created the Capitan Wilderness and extended the boundaries of the existing White Mountain Wilderness so that the Forest now contains 82,879 acres of designated wilderness. The Act also forbids judicial review of the legal and factual sufficiency of the RARE II Final Environmental Impact Statement which classified roadless and undeveloped areas on the Forest into wilderness and nonwilderness categories. Roadless and undeveloped areas in the nonwilderness category are now available for other uses.

Alternative D would recommend to the Secretary of Agriculture that the WSAs be designated wilderness. This addition is the only increase in wilderness acreage considered. All other alteratives would recommend that the WSAs not be designated wilderness. Under all alternatives, the WSA will be managed to protect existing wilderness values until Congress acts.

Two measures of wilderness are the level of use relative to the capacity and the level of management. None of the designated wilderness or the potential wilderness, if designated, would reach capacity by the end of the planning period. The projected use (excluding BLM WSAs) by alternative is shown in Table 58.

Table 58. Average Annual Wilderness Use - MRVDs

	Alternatives					
Period	PA	B	A and C	D	E	F
1	22.6	22.6	21.3	30.8	21.8	22.5
2	27.0	25.7	24.2	36.4	25.3	26.7
3	31.5	27.7	26.0	42.0	27.2	31.1
4	35.0	29.6	27.8	46.5	29.1	34.6
5	35.9	31.5	29.5	48.7	30.9	35.5

Note: Current use = 20.4 MRVDs.

Use is expected to increase 45 to 76 percent over the planning period in all alternatives except D, where it is expected to increase 139 percent in the two designated wildernesses and the WSA proposed for designation in this alternative.

Quality of wilderness experience is measured by the level of service and trailhead access. Level of service in wildernesses on the Forest applies mainly to trail maintenance, construction, and reconstruction. Alternative D and the PA maintain trails in the two Wildernesses at Standard Service levels, or Level II. Alternative F provides Level II maintenance for trails in the White Mountain Wilderness only. The PA and Aternatives D and F provide for construction of five to six new trailheads designed to improve the distribution of access to the wildernesses. All other alternatives maintain trails at Less than Standard Service levels, or Level I, and provide only one new trail access. Under Level I trail surfaces are maintained at a primitive level, and a wilderness user can expect to encounter wet and rough spots and some trail areas obscured by vegetation.

Irreversible and Irretrievable Commitments

The acres of wilderness withdrawn from mineral entry require an irretrievable commitment of any mineral resource present in those areas. The inability to locate and develop possible oil and gas reserves in the WSA, if it should become wilderness as proposed in Alternative D, or if it is withdrawn as in the PA and Alternative B, would also be an irretrievable commitment. The extent of these commitments cannot be estimated. The average difference in wilderness use to the end of the first period between Alternative D and the other alternatives, 8.2 to 9.5 MRVDs per year, is irretrievable.

VISUAL RESOURCE

The Forest has been inventoried for visual quality objectives (VQOs). VQOs of preservation, retention, partial retention, modification and maximum modification are assigned to each acre based on the inventory criteria. The criteria include visibility, number of viewers, and uniqueness or variety of the landscape. Definitions of VQOs are contained in the Glossary.

All alternatives contain management requirements to maintain VQOs at current levels with emphasis on retention and partial retention. These two objectives comprise approximately 40 percent of the total Forest acres. Wilderness and the WSA, about 10 percent of the Forest, are classified preservation. The remaining 50 percent is classified modification or maximum modification.

The Forest has a high level of natural diversity and, therefore, a high level of visual variety and quality. Management activities, such as road construction, utility corridors, timber harvesting, and range and wildlife habitat improvements, have the greatest potential to affect the visual quality of the Forest. For the most part, these activities will take place on areas classified as modification or maximum modification, or, when located in areas classified retention or partial retention, will be designed to maintain the existing classification.

Alternative C, with its emphasis on commodity production, will have the greatest impact on visual quality, although the severity of these impacts will be moderated by several factors. The majority of roads constructed will be

Table 60. Relative Risks to Cultural Resources by Resource Activities[17]

	Alternative						
Activity	PA	A	B	C	D	E	F
Range	low	mod	mod	high	low	mod	low
Timber	high	mod	mod	high	mod	high	low
Fuelwood	mod	high	high	low	mod	mod	low
Minerals	mod	mod	low	mod	low	mod	mod
Roads	high	low	low	high	low	mod	low
Overall risk	mod	high	mod	high	mod	mod	low

[17] Based on the predicted number of sites in activity areas. Activities not listed have either low risk or are the same for all alternatives.

The overall risk depends heavily on the amount of timber and pinyon-juniper (PJ) fuelwood produced. Pinyon-juniper areas are in potential high site density areas and large harvests could affect a large number of sites. Timber sales are generally in low site density areas, but the larger sales will potentially affect a large number of sites. Alternative C calls for the largest amount of ground disturbing activities, such as timber harvests and road construction and a moderate amount of PJ fuelwood harvests. As a result, it has the greatest risk of damaging cultural resources. Alternative A calls for a large amount of pinon-juniper fuelwood harvests in areas of potential high site density, and has a high risk of damaging cultural resources. Alternatives PA, B, D and E call for moderate to high levels of timber and fuelwood harvests, and have a moderate level of risk to cultural resources. Alternative F calls for the lowest levels of ground disturbing activities and, therefore, has the lowest risk to cultural resources.

Benefit To Cultural Resources

The benefits of the alternatives on cultural resources are estimated by the number of acres surveyed, the number of sites identified, the amount of protection, interpretation and enhancement of cultural resources and the degree to which the sites can be avoided. These benefits are displayed in Table 61.

Table 61. Relative Benefits to Cultural Resources

	Alternative						
Activity	PA	A	B	C	D	E	F
Survey	high	mod	mod	high	mod	high	low
Identification	mod	high	mod	high	mod	mod	low
Protection	mod	mod	mod	low	high	low	mod
Interpretation	low	low	mod	none	high	none	low
Enhancement	low	low	low	none	high	low	low
Avoidance	mod	low	mod	low	mod	mod	high
Overall Benefit	mod	mod	mod	low	high	mod	mod

[17] Avoidance refers to sites routinely avoided by projects. As the number of acres disturbed increases in areas where sites may occur, the potential for accidental site disturbance increases and the potential for avoidance goes down.

Alternative D calls for the highest levels of protection and enhancement along with moderate levels of survey, site identification and site avoidance. The overall benefit is considered to be high. Alternative C calls for high levels of survey and site identification but will have low levels of protection and avoidance and no interpretation or enhancement. The overall benefit is considered to be low. Alternative F has low levels of survey, identification, interpretation and enhancement, and a moderate level of protection. However, since the level of avoidance is high, this alternative is considered to have a moderate rather than low benefit to cultural resources. The PA and Alternatives A, B and E have mixed levels of survey, identification, protection, interpretation, enhancement and avoidance, and are considered to have moderate benefits to cultural resources.

Effect of Cultural Resource Management on Other Uses and Activities

The potential effect of cultural resource management on other uses of the Forest is estimated by the amount of time that goes into planning, the cost of project modification, the need for special constraints on the projects, any potential management opportunities to take advantage of cultural resource interpretation or protection, the level of monitoring required and the possibility of project delays. These effects are displayed in Table 62.

Table 62. Potential Effect of Cultural Resources on Other Uses

	Alternative						
Activity	PA	A	B	C	D	E	F
Project planning	mod	high	mod	high	mod	mod	mod
Project modification	mod	high	mod	high	mod	mod	low
Special constraints	mod	high	mod	high	mod	mod	low
Management opportunities	mod	high	mod	low	mod	mod	low
Monitoring level	mod	high	mod	mod	mod	mod	low
Project delays	mod	high	mod	high	mod	mod	low
Overall effects	mod	high	mod	high	mod	mod	low

The effects are greatly influenced by the number of cultural resources in the project areas and the relative risks to these cultural resources. As a result, the levels of effect for most of the categories duplicate the overall levels of risk to cultural resources for each of the alternatives. Only Alternative C differs in two of the categories, with a moderate effect under monitoring level and a low effect under management opportunities. This is primarily due to a proportionately lower level of funding and an emphasis on commodity outputs. The overall level of effect of cultural resource management on other forest uses is high. Alternative A also has a high overall level of effect with the PA and Alternatives B, D and E having moderate effects. Alternative F is considered to have a low level of effect on other forest uses.

The overall levels of effect for each alternative are compared to the overall risks and benefits in Table 63.

Table 63. Overall Cultural Resources Risk/Benefit Assessment

Activity	Alternative PA	A	B	C	D	E	F
Risk to cultural resources	mod	high	mod	high	mod	mod	low
Benefit to cultural resources	mod	high	mod	low	high	mod	mod
Effect on other activities	mod	high	mod	high	mod	mod	low

Irreversible and Irretrievable Commitments

An irreversible and irrretrievable commitment of resources occurs when sites are consciously or accidentally destroyed before or during a ground-disturbing activity, including sites excavated as a result of management activities. Because it involves destruction of the site, excavation is done only when preservation in place is not possible. The largest commitment occurs in Alternatives A and C, which combine a high degree of risk with proportionately low levels of funding. Alternative F, because it contains the lowest level of ground-disturbing activities, has the lowest commitment. The other alternatives, which combine various levels of risk and funding, are similar in their irreversible and irretrievable commitments.

WILDLIFE AND FISH

Wildlife Habitat

Wildlife habitat is improved directly by management activities, such as seeding and burning, designed specifically to improve habitat, as well as by activities designed primarily to accomplish other resource objectives, such as some range and timber activities. Habitat is improved indirectly by development of waters, access to waters, and other methods which allow wildlife to utilize existing habitat which is limited by a lack of one or more necessary elements. Table 64 shows habitat improvements funded directly from wildlife appropriations, with additional funding from Knutsen-Vandenberg (K-V) Act collections generated by the sale of timber and fuelwood.

Table 64. Structural and Nonstructural Wildlife Habitat Improvements.

Period/Type	Unit of Measure	Alternative PA	A	B	C	D	E	F
Period 1								
Nonstructural								
Burns	Acres	6,912	6,625	11,640	6,675	18,050	11,275	5,850
Road Closures	Miles	45	---	80	45	105	100	46
Miscellaneous	Acres	3,648	1,139	4,822	1,031	3,468	3,202	2,464
Structural								
Water	Each	310	51	413	86	410	314	216
Fences	Miles	64	26	102	27	134	127	48
Enclosures	Each	5	6	8	5	6	7	3
Access/Escapes	Each	42	40	86	35	142	159	22

Table 64. Structural and Nonstructural Wildlife Habitat Improvements (con't)

Period/Type	Unit of Measure	Alternative PA	A	B	C	D	E	F
Period 2								
Nonstructural								
Burns	Acres	6,700	6,500	7,365	6,550	1,285	4,500	5,850
Road Closures	Miles	40	---	75	40	110	100	45
Miscellaneous	Acres	3,075	1,100	3,790	1,793	2,805	2,520	2,375
Structural								
Water	Each	134	42	221	53	221	204	91
Fences	Miles	54	23	75	20	101	87	40
Enclosures	Each	5	6	5	5	3	4	3
Access/Escapes	Each	45	50	56	45	92	95	29
Period 3								
Nonstructural								
Burns	Acres	512	125	1,975	175	2,050	1,775	100
Road Closures	Miles	---	---	30	---	55	55	---
Miscellaneous	Acres	2,465	1,200	4,230	1,403	2,980	2,507	1,759
Structural								
Water	Each	306	59	395	86	388	325	235
Fences	Miles	77	35	86	26	74	57	57
Enclosures	Each	8	9	8	8	7	8	6
Access/Escape	Each	52	50	28	45	86	103	29
Period 4								
Nonstructural								
Burns	Acres	300	---	1,700	50	1,785	1,500	100
Road Closures	Miles	---	---	25	---	60	60	---
Miscellaneous	Acres	2,810	1,215	3,910	1,425	2,160	2,703	2,202
Structural								
Water	Each	138	69	320	91	229	256	98
Fences	Miles	67	35	83	30	69	49	44
Enclosures	Each	5	6	5	5	3	4	3
Access/Escapes	Each	35	40	25	35	59	62	22
Period 5								
Nonstructural								
Burns	Acres	7,012	6,625	9,240	6,675	9,550	2,775	5,850
Road Closures	Miles	---	---	30	---	55	55	---
Miscellaneous	Acres	2,605	1,280	4,230	918	2,405	1,925	1,931
Structural								
Water	Each	328	67	451	114	409	358	227
Fences	Miles	77	47	88	29	73	67	60
Enclosures	Each	8	7	8	6	7	8	6
Access/Escapes	Each	52	50	28	45	86	103	29

Miscellaneous projects include openings, willow plantings, brush piles, planting and seeding, and plant releases.

Funding for other direct and indirect improvements is through other resource areas. Dispersed recreation, and timber and range management are the activities having the most effect on wildlife. The amount and kind of timber harvest, the intensity and type of recreational use, and structural and non-structural range improvements are activities which affect wildlife, but which are displayed elsewhere in this document.

Timber and fuelwood harvest have their greatest effects on wildlife by changes in vertical and horizontal diversity in the forest and woodland types. Intensity and amount of timber harvest are displayed in Tables 3 and 7, and fuelwood harvest is shown in Table 76. Horizontal and vertical diversity are considered in all timber and fuelwood harvest activities through application of the integrated stand management concept (see glossary for definition).

Industrial and recreational uses of local, collector and arterial roads may interfere with migration patterns and cause stress during fawning and calving seasons. Miles of roads and trails constructed/reconstructed and maintained are shown in Tables 91 and 89. These roads and trails improve access for hunters and disperse them over larger areas. Vegetation along reconstructed and maintained roads will be reduced within clearing limits. This activity will cause a minimal loss of habitat but will increase visibility of game animals. Local roads also increase the distance at which game animals can be seen by hunters. This impact will be mitigated by designing roads so that straight stretches are less than one-fourth mile in length whenever possible. Closure of local roads following timber sales will increase amount of forage available.

Fisheries

The fishery resource is extremely limited, with little potential for increase. Alternatives differ in the relative amount invested in maintenance and enhancement of existing fish habitat, as shown in Table 65. Values are average annual budget over 5 periods.

Table 65. Average Annual Fisheries Habitat Investments - Dollars.

	Alternative						
Period	PA	A	B	C	D	E	F
1	2,479	731	3,239	950	2,544	1,131	1,644
2	9,171	859	10,377	7,251	9,256	7,410	8,106
3	9,593	1,290	11,366	7,741	10,423	7,900	8,866
4	10,701	1,346	17,515	8,768	16,441	8,893	12,373
5	10,884	1,701	13,123	8,948	12,298	9,074	10,357
Average Annual	8,566	1,185	11,124	6,732	10,192	6,882	8,269

Alternative A represents a very low level of investment with a minimal increase over time. The PA and Alternatives B, C, D, E and F all substantially increase level of investment in the second decade and continue to increase, peaking in the fourth or fifth decades.

Alternatives B and D contain a very high level of investment and would enhance and maintain all habitat in optimum condition. The PA and Alternative F would maintain fish habitat in excellent condition. Alternatives C and E contain a

moderate level of investment, but maintain fish habitat in good to very good condition. Investment in Alternative A is minimal and may be insufficient to maintain current conditions (poor to fair).

Threatened and Endangered Species

Management of plant and animal species recognized (listed) by the State and Federal governments as threatened, endangered or sensitive (TE&S) is designed to bring about recovery and delisting of species. Effects on TE&S species are measured by dollars budgeted for direct protection and enhancement activities. Fencing of habitat is the main protection measure, while establishment of new populations is an enhancement measure used to attain recovery levels. Table 66 displays the total budget available for fencing and establishment of new populations.

Table 66. Average Annual T&E Protection and Enhancement Budget - Dollars

	Alternatives						
Period	PA	A	B	C	D	E	F
1	3,049	1,035	5,183	1,565	2,884	2,675	1,162
2	2,467	1,144	2,807	1,865	2,188	3,283	1,880
3	4,364	1,579	7,139	3,043	4,002	4,508	2,695
4	4,671	1,688	6,394	3,895	5,027	4,627	3,791
5	4,611	2,122	10,068	3,038	4,245	5,041	3,188
Average Annual	3,832	1,514	6,318	2,681	3,669	4,027	2,543

The PA calls for investing an average of $3,832 per year in TE&S habitat enhancement. Alternative B budgets about 65 percent more than the PA, Alternative E is about the same as the PA, Alternative D is slightly lower, and Alternatives A, F and C significantly lower. Therefore, Alternative B provides the fastest recovery rate for TE&S species of any of the alternatives, while Alternatives A, F and C do little to emphasize recovery.

Indicator Species

Management indicator species were selected to simplify the evaluation of the effects of alternatives on vertebrate species with different habitat requirements. These species indicate the effects of resource management within a given vegetative type.

Indicator species for grass-dominated habitats on the Forest are the meadowlark and Mexican vole. Ecological condition of rangelands affect these animals.

The rufous-crowned sparrow is the indicator species for the desert shrub type. Acres in satisfactory condition are a measure of favorable conditions for this species.

The pygmy nuthatch is the indicator species for the ponderosa pine ecosystem. Timber harvest and intensive silviculture have the greatest effect on mature ponderosa pine, and on this bird.

The indicator species for aspen, a seral stage of the mixed conifer type, is the hairy woodpecker. This bird excavates nest cavities in large aspen snags, which typically occur in mature stands of pure aspen, or in conifer stands established in and under mature aspen, with a few individual aspens remaining. Although

many such trees are scattered throughout the conifer type, assessing their value as habitat for the hairy woodpecker is difficult. Therefore, the parameter chosen to compare effects of alternatives is acres of mature aspen stands.

The plain titmouse and the mule deer are indicator species for the pinyon/juniper woodland. The major management activity affecting the habitat of these species is fuelwood harvest.

Elk were chosen to indicate the condition of the mixed conifer ecosystem. The ratio of area available for forage compared to area available for cover is most affected by timber harvest.

The red squirrel is the selected indicator species for Engelmann spruce although it uses the entire mixed conifer ecosystem. High levels of timber harvest and intensive silviculture will have detrimental effects on squirrel habitat.

Table 67 displays the effects of alternatives on indicator species. The percent change for each species indicates changes from existing habitat quantity and the effects of various timber and range management practices contained in each alternative.

Table 67. Percent Change in Habitat for Indicator Species

	Alternatives						
Species	PA	A	B	C	D	E	F
Meadowlark	0	0	0	0	0	0	0
Mexican vole	120	120	120	120	130	120	120
Rufous-crowned sparrow	0	0	0	0	0	0	0
Hairy woodpecker	-50	-70	-20	-70	-90	-80	-80
Pygmy nuthatch	260	130	180	150	80	80	270
Plain titmouse	0	0	0	0	0	0	0
Mule deer	0	0	0	0	0	0	0
Elk	-10	-10	0	10	0	10	-10
Red squirrel	40	30	10	-10	10	-10	100

No alternative would affect management indicator species populations and habitats to the point that minimum viable populations could not be maintained. None of the alternatives affect habitats for the meadowlark, rufous-crowned sparrow, plain titmouse, and mule deer. All alternatives significantly improve habitat for Mexican vole and pygmy nuthatch.

Hairy woodpecker habitat appears adversely affected in all alternatives, but is probably not as unfavorable as the table shows. The number of acres typed as pure mature aspen stands was used to measure habitat change. The Forest's objective is to perpetuate the aspen species through regneration of aspen stands using the clear cut harvest method. Alternatives vary in the amount of habitat for the hairy woodpecker depending on the timing of aspen harvests over the next 50 years. However, not all of the aspen was typed as pure aspen stands. Aspen also occurs in the mixed conifer type. Additional woodpecker habitat is created in conifer stands as a result of timber harvest activities which create openings

favorable for regneration of small clumps of aspen. The aspen found in the conifer stands is not included in Table 68. Evaluating the pure aspen stands only, Alternative B provides the least impact on suitable habitat for hairy woodpecker, and the remaining alternatives have greater reductions in habitat.

Red squirrel habitat is affected by the level and type of timber harvests in mixed conifer stands. Alternative F significantly increases the acres of suitable habitat, and the PA and Alternatives A, B and D increase habitat slightly. Acres of habitat decrease slightly under Alternatives C and E.

Habitat for elk is measured by the forage/cover ratio and the total acres of forage availability. Present elk range contains 43 percent forage and 57 percent cover, Forest-wide. After 50 years, the Forest-wide forage/cover ratio does not change significantly and does not approach the optimal ratio of 60/40 in any of the alternatives. Acres of cover increase 10 to 26 percent, while forage increases slightly only in Alternatives C and E. During the next 30 years, most of the timber harvesting will occur on the Sacramento Division in an area that is one of the Forest's primary elk ranges. The harvest activity is expected to increase forage and provide a more optimal forage/cover ratio in this area. The effect of these localized management activities on the primary elk range will be to increase suitable habitat for about 30 to 40 years before a decrease in forage occurs.

Although mule deer was not selected as an indicator species in the mixed conifer type, it uses the type heavily during the summer. The present forage/cover ratio in this type is close to the ideal 60/40. The amount of acreage suitable for forage decreases after 50 years under all alternatives, while suitable cover increases. As a result, the forage/cover ratio shifts unfavorably to 43/57 in Alternative A and F, and to 49/51 in Alternative C. Alternative C provides more acres suitable for forage, the limiting factor, than any other alternative by the end of the fifth period.

Management requirements responding to New Mexico's Comprehensive Plan for wildlife are discussed in the proposed Forest Plan. Included are requirements to mitigate resource activity impacts on snag management, rotation ages, growing stock levels, old growth retention, hiding cover, feature protection and size and dispersal of openings. Management requirements and direct and indirect habitat improvements affect achievement of New Mexico's comprehensive planning objectives and were considered in the development of all alternatives. Table 68 displays the ability of each alternative to meet the objectives in the State's plan.

Table 68. Attainment of Objectives in the Comprehensive Plan for Wildlife.

	Alternatives						
Species	PA	A	B	C	D	E	F
Game	Mod.	Low	High	Low	Mod.	Mod.	Mod.
Non Game	Mod.	Low	High	Low	Mod.	Mod.	Mod.
T&E	Mod.	Low	High	Low	Mod.	Mod.	Low

The PA and Alternatives B, D, E and F meet or exceed the objectives of the Comprehensive Plan. Alternatives B and D provide more direct habitat improvements, especially water developments, than the PA. The PA, however, provides slightly more manipulation of openings than Alternatives D, E and F. The PA and Alternatives B, D, E and F indirectly provide more habitat for big game in primary range on the Sacramento Division during the next 30 years, but afterwards the suitable habitat declines in this area due to decreases in forage. Nongame habitat is improved most in Alternative B and moderately in Alternatives D, E and the PA.

Overall, Alternatives A and C do not meet the objectives of the State plan. Alternative C indirectly provides the most forage for game species, but due to the intensive timber harvest activities, has increasing disturbance to the primary elk and deer ranges. Alternative C provides the fewest acres of mature mixed conifer and old growth stands, and both Alternatives A and C make few direct habitat improvements for game and nongame species.

Alternative F is similar to Alternative C in the level of direct habitat improvements, but Alternative F indirectly provides more game and nongame habitat. Despite the low level of T&E habitat enhancement, Alternative F meets the comprehensive plan objectives.

RANGE

About 700,000 acres of the Forest are classified as suitable rangeland, with another 404,000 acres classed as unsuitable either because topography limits access, or because the natural vegetation produces little or no forage for livestock. All lands are considered suitable for grazing or browsing by wildlife. There are no wild horse or burro populations or designated territories on the Forest.

Permitted use by cattle in 1980 was 153,247 animal unit months (AUMs), which exceeds present capacity of 120,560 AUMs. Other livestock comprise less than one percent of permitted use. An objective of all alternatives is to bring permitted use into balance with capacity. This is accomplished by reducing livestock numbers where range is in unsatisfactory condition, and/or improving management to better distribute livestock and utilize existing forage. Management improvements usually consist of various combinations of structural and non-structural improvements and adjustments in grazing season. Determination of the need to reduce numbers or increase management is done through the the range allotment analysis and management planning process. Management plans, which are prepared for all allotments and agreed upon by the Forest Supervisor and individual grazing permittees, provide the means of balancing use with capacity on individual allotments. In addition, some adjustments in livestock numbers are negotiated by allotment as opportunities arise.

Table 69 displays permitted use and capacity by alternative at the end of each ten year period.

Table 69. Average Annual Permitted Livestock Use and Grazing Use - MAUMs.

Period	Output	Alternative						
		PA	A	B	C	D	E	F
1	Permitted use	147.2	149.6	149.6	129.8*	147.2	147.2	150.8
	Capacity	117.9	120.6	121.5	129.8	119.0	120.2	118.1
2	Permitted use	141.2	146.0	146.0	131.5	141.2	141.2	148.4
	Capacity	116.6	124.2	125.2	131.5	119.0	121.1	110.8
3	Permitted use	144.8*	156.0*	159.2*	175.4	150.5*	150.9*	146.0
	Capacity	144.8	156.0	159.2	175.4	150.5	150.9	133.1
4	Permitted use	158.0	166.1	171.8	190.9	162.2	162.2	148.5*
	Capacity	158.0	166.3	171.8	190.9	162.2	162.2	148.5
5	Permitted use	156.8	163.7	170.5	192.8	159.7	159.4	150.8
	Capacity	156.8	163.7	170.5	192.8	159.7	159.4	150.8

* Indicates period of balance.

Alternative C achieves balance by the end of the first period by reducing permitted use 23.4 MAUMs and intensifying management to increase capacity to 129.8 MAUMs. Expenditures for range management average about 76 percent higher than in Alternative A, the 'current level' alternative, and are about twice those in the PA. Alternatives A and B reduce permitted grazing use at a rate of 3.6 MAUMs per period and provide for about 20 percent lower levels of investments than Alternative C so that balance is achieved during the third period. Increases in grazing capacity over 30 years are 35.4 and 38.6 MAUMs in Alternatives A and B, respectively. The grazing capacities are about 18 MAUMs lower than in Alternative C. The PA and Alternatives D and E have lower levels of investments in range improvements than Alternatives A, B and C, but attain a balance of permitted grazing use and capacity in the third period by reducing use at a more rapid rate of 6.0 MAUMs per period. Alternative F provides the lowest level of range management expenditures and reduces permitted use at the slowest rate of 2.4 MAUMs per period. Grazing capacity and use do not balance until the fourth period, and the capacity in all five periods is lower than in any other alternative.

Structural improvements are designed to improve distribution to utilize existing, unused forage. They include fencing to control livestock and wells, pipelines, and tanks to enhance, distribute and store water. Nonstructural improvements designed to increase forage include controlling brush and planting grasses in appropriate areas and reducing overstory densities in the woodland type. Table 70 displays the structural and nonstructural improvements proposed in each alternative.

Table 70. Structural and Nonstructural Range Improvements

Type	Measure	Alternatives PA	A	B	C	D	E	F
Period 1								
Structural								
Fences	Mi.	224	334	329	286	258	297	186
Pipelines	Mi.	113	152	174	234	111	137	94
Waters	Ea.	162	214	236	295	183	236	138
Corrals	Ea.	5	6	7	7	6	6	5
Stock Driveway	Mi.	1	6	6	6	3	3	2
Non structural	Ac.	3,290	3,640	3,640	11,572	3,640	3,320	3,320
Period 2								
Structural								
Fences	Mi.	187	269	244	271	215	218	139
Pipelines	Mi.	178	305	318	370	239	251	150
Waters	Ea.	156	206	212	249	185	193	119
Corrals	Ea.	3	3	5	5	4	4	3
Period 3								
Structural								
Fences	Mi.	179	229	222	215	166	183	135
Pipelines	Mi.	180	304	314	369	237	247	144
Waters	Ea.	96	114	103	132	93	116	71
Corrals	Ea.	---	1	---	---	---	---	---
Period 4								
Structural								
Fences	Mi.	247	239	265	388	211	306	201
Pipelines	Mi.	136	205	231	333	171	182	118
Waters	Ea.	193	222	314	358	236	259	152
Corrals	Ea.	---	---	2	2	1	1	---
Stock Driveway	Mi.	---	---	---	6	3	3	---
Non Structural	Ac.	---	640	640	---	640	320	320
Period 5								
Structural								
Fences	Mi.	201	298	280	280	220	248	169
Pipelines	Mi.	142	187	219	312	131	190	118
Waters	Ea.	168	249	237	250	225	265	138
Corrals	Ea.	1	3	2	2	1	1	1
Stock Driveway		1	---	---	---	---	---	1
Total								
Structural								
Fences	Mi.	1,038	1,369	1,340	1,440	1,070	1,252	830
Pipelines	Mi.	749	1,153	1,256	1,618	889	1,007	624
Waters	Ea.	775	1,005	1,102	1,284	922	1,069	618
Corrals	Ea.	9	13	16	16	12	12	9
Stock Driveway	Mi.	2	6	12	12	6	6	3
Non structural								
Burning-Spraying	Ac.	3,290	4,280	4,280	11,572	4,280	3,640	3,640

The level of range improvements is directly related to the rate of increase in grazing capacity. Alternative C provides for more structural and nonstructral improvements than any other alternative. Alternatives A and B provide the next highest level of improvements and the next largest increases in grazing capacities. The PA and Alternatives D and E are similar in the number and types of improvements, but are lower than Alternatives A, B, and C. Alternative F provides the least improvements and the smallest increase in grazing capacity. In order for grazing use and capacity to balance in the first period, Alternative C calls for high levels of investments and a large reduction in permitted use during the first 10 years. The reduction in use would be required only on those allotments showing characteristics of overgrazing and could be expected to pose temporary social and economic hardships on affected grazing permittees. In the long term, the grazing lands could support 60 percent more use than current conditions allow.

Irretrievable Commitment

Alternative F allows the most permitted grazing use of 150.8 MAUMs per year in Period 1. The differences in other alternatives represent irretrievable average annual losses in permitted use of 21 MAUMs in Alternative C, 3.6 MAUMs in the PA and Alternatives D and E, and 1.2 MAUMs in Alternatives A and B.

TIMBER

An objective of current management is to produce merchantable trees 18 to 24 inches in diameter within a rotation age of 120 years. The shelterwood harvest system is used to regenerate even-aged conifer stands. Clearcutting is done in aspen stands in order to regenerate the type. The selection harvest system is used to achieve and maintain old-growth characteristics in conifer types. Precommercial thinning is done when necessary to attain desired stocking levels and intermediate commercial thinnings at ten or twenty year intervals maintain those levels.

There is an imbalance of age classes present on the Forest, with more acreage in young stands than is desirable. Many stands are infected by dwarf mistletoe and/or are highly susceptible to damage caused by periodic epidemics of western spruce budworm.

The Timber Management Plan for 1970-80 called for an annual allowable sale quantity of 20.5 MMBF. The plan was revised in 1973 and 1975 to bring the allowable harvest level down to 14.1, then 10.4 MMBF, respectively. The average annual volume of timber sold during the decade 1971-80 was 10.3 MMBF, including sawtimber and roundwood. The Forest produced less timber than called for in the original 10-year plan because: 1) the Mescalero Apache Tribe (MAT) produced a large amount of timber which utilized a large proportion of local mill capacity, 2) a local sawmill went out of business, therefore all local timber was processed by a single mill, 3) economic conditions were unfavorable for the timber industry, and 4) local industry lacked the capability to harvest from steep slopes. The most recent update of the Timber Plan, dated February 1985, provides for an allowable sale quantity of 16.7 MMBF per year.

Demand for sawtimber depends on a number of variables including existing and potential mill capacity, and stumpage and market prices. The existing local industry requires a minimum of 15 to 18 MMBF per year to operate efficiently. It is assumed that additional mill capacity can be added in the long term to process all timber which could be produced on the Forest and adjoining lands.

Suitability

All Forest lands were categorized according to biologic capability, availability and suitability for timber production. A total of 257,103 acres were identified as tentatively suitable for timber production. The process for identifying tentatively suitable lands as contained in 36 CFR 219.14 is outlined in Chapter 3.

The FORPLAN model was used to determine the number of acres by timber strata, Division (Lincoln or Sacramento) and slope to be managed for timber production in each alternative. Lands assigned to timber production are classed as suitable. Tentatively suitable lands not assigned are classed as not appropriate. No harvesting will be done on these lands until a new Plan is prepared, when they will be reevaluated to determine suitability. Dead and dying trees will be salvaged, however.

Suitable lands vary by alternative because different prescription mixes were selected to meet a set of goals and objectives unique to each alternative. Logging method is dictated by slope. Logs are removed from stands on slopes greater than 40 percent using a cable system. This system suspends one end of logs to prevent ground disturbance on steep slopes. Logs are removed from stands on slopes less than 40 percent using rubber tired or tracked skidders. Table 71 shows acres of suitable land and the logging system to be used on each for all alternatives.

Table 71. Suitable Acres by Harvest System and Logging Method

Harvest System/	Alternatives						
Logging Method	PA	A	B	C	D	E	F
Shelterwood (even-age)							
Tractor	106,741	70,668	95,968	130,395	77,210	103,522	46,225
Cable	11,703	13,535	630	28,948	11,969	16,977	9,662
Clear Cut (even-age)							
Tractor	2,053	2,208	2,300	2,208	2,208	2,208	2,300
Cable	1,497	1,342	1,250	1,342	1,342	1,342	1,250
Selection (uneven-age)							
Tractor	14,527	17,708	12,192	20,806	8,077	9,286	7,748
Cable	2,899	1,340	0	10,988	5,673	1,514	3,314
Total Suitable	139,420	106,801	112,340	194,687	106,479	134,849	70,499

Over the next 50 years, the PA harvests timber from 16,099 acres of steep ground, while Alternative C harvests from 41,278 acres. Alternative B harvests timber from only 1880 acres of steep ground. All other alternatives harvest from 14,226 to 19,833 acres.

Even-aged Systems

Even-aged systems include intermediate cuts and regeneration cuts. Intermediate cuts are defined as all cuts in the life of a stand between establishment and regeneration cuts. The primary goal is to create desired stand characteristics

to increase timber production, wildlife production, visual quality, or other management objectives. Establishing regeneration is not a goal of an intermediate cut. There are two basic methods of intermediate cutting: removal of high risk or dead trees called salvage, and harvest of live healthy trees called precommercial or commercial thinning.

As shown in Table 71, the PA manages 121,994 acres, or 47 percent of the tentatively suitable land, with the even-age system. Alternatives C and E manage more (63 and 48 percent, respectively) than the PA. All other alternatives manage considerably fewer acres than the PA, ranging as low as 23 percent in Alternative F.

To perpetuate the aspen type, all alternatives provide for clearcutting 71 acres annually of aspen. Clearcutting is the optimum method for regenerating aspen because the species does not tolerate shade and will not sprout under an existing canopy, and because shelterwood methods favor conifer regeneration instead of aspen. Aspen clearcuts will not exceed 20 acres in size and most will be on smaller patches.

Clearcutting may be used in the mixed conifer and ponderosa pine types only in stands having an overstory so heavily infected with dwarf mistletoe that it cannot serve as a seed source and must be removed before the stand is artificially regenerated to the same species. Clearcutting is the optimal regeneration method, in preference to seed cuts, in stands severely infected with dwarf mistletoe, because heavily infected overstory trees produce small amounts of viable seed and dwarf mistletoe seeds produced in such trees serve to infect understory trees, including regeneration. Specialists feel that a variation of clearcutting will be used except in extreme cases. This variation uses shelterwood cutting followed by artificial regeneration and then removal of the overstory as soon as regeneration is established. Created openings will not exceed 40 acres in size.

Uneven-aged Systems

Selection harvest, an uneven-aged management system, was offered as an option in the FORPLAN model for all alternatives. For timber production, however, the selection harvest options were not appropriate in the short-term, since they were designed to create and maintain old growth stands for wildlife needs. Little timber volume was available for harvest before Period 5.

Selection harvests can be the best way to meet certain management objectives in specific stands, such as perpetuating multi-storied stands for visual quality along a highway or managing old growth stands. The PA manages 17,426 acres for old growth, about half as much as in Alternative C. Alternative E manages the least acreage, 10,800 acres, with the uneven-age system. Alternatives B, D and F manage fewer acres than the PA with the selection harvest system.

Long-Term Sustained Yield

Long-term sustained yield capacity (LTSYC) is the highest non-declining yield of timber products from suitable lands consistent with multiple use objectives of each alternative, and is a function of the number and productivity of suitable acres, and the management intensity of prescriptions used. The President's Revised Statement of Policy, PL 96-514, dated December 12, 1980, requires that the productivity of suitable forested land be maintained or enhanced, in order

to minimize inflationary impacts of wood product prices and to permit a net export of forest products by 2030. The standard requires that growth on commercial timber lands be brought to and maintained at 90 percent of the LTSYC for that alternative by the end of the fifth decade.

Growth in Period 5 and LTSYC are compared in Table 72.

Table 72. Comparison of Net Growth in Decade 5 and Average Per Decade LTSYC by Alternative.

	Alternative						
Outputs	PA	A	B	C	D	E	F
Growth MMCF	46.3	48.9	33.7	71.6	28.7	34.1	23.5
LTSYC, MMCF	38.9	34.8	29.8	58.7	30.9	40.3	18.7
% of LTSYC	119	141	113	122	93	85	126

All alternatives, except Alternative E, carry out the President's policy. Growth rates in excess of LTSYC indicate a high proportion of young, rapidly growing sawtimber stands. In a perfectly regulated forest, growth should equal LTSYC.

LTSYC is a measure of the long-term timber productivity resulting from each alternative. The maximum LTSYC for the Forest is 10,477 MCF per year based on the Max Timber-8 Periods Benchmark. Table 73 displays the LTSYC for each alternative and compares it to the maximum.

Table 73. Long-term Sustained Yield Capacity - MCF Per Year

		Alternatives						
	Maximum	PA	A	B	C	D	E	F
LTSYC	10,477	3,888	3,484	2,979	5,875	3,092	4,029	1,867
Percent of maximum		37	33	28	56	29	38	18

The LTSYC of each alternative is much less than the maximum the Forest is capable of producing. Alternative C results in the highest LTSYC of any alternative and utilizes 56 percent of the Forest's capacity to produce timber over the long run. Alternative E, which utilizes 38 percent of the maximum LTSYC, is next highest, followed in order by the PA, Alternatives A, D, B and F.

Size Class Distribution

Size (age) class distribution varies by alternative, depending on the number of acres managed for timber and the intensity of management. Uniform distribution of size classes is desirable because harvest yields are more uniformly distributed over time, variety and diversity of habitats are greater and the Forest assumes a higher state of health and vigor. Table 74 shows the size class distribution after 200 years. This time period is chosen because size class distribution fluctuates widely in shorter periods.

Table 74. Size Class Distribution of Suitable Acres at 200 Years - Percent of Area Managed for Timber

	Alternatives						
	PA	A	B	C	D	E	F
Size Class							
Seedling/Sapling	23	37	13	11	20	21	29
Post/Poles	13	20	22	28	17	23	13
Immature Sawtimber	32	10	32	34	37	34	22
Mature and Over-Mature Sawtimber	19	15	20	11	13	14	20
Old growth	13	18	11	16	13	8	16
Suitable acres - M	139	107	109	195	106	135	70

All alternatives provide more diversity than the present situation, but no alternative achieves equal distribution of size classes on areas managed for timber production within the 200 year time span modeled. Since old growth stands contain several size classes, they were not included in the comparison. There is an excess of immature sawtimber in all alternatives except Alternative A and F, which have too little. About 37 percent of the 107 M acres managed for timber in Alternative A are in the seedling/sapling size class, which is much more than is desirable and more than now exists.

Since the desired balance is achieved when all size classes except old growth are equally represented, the range between the size class with the fewest acres and the one with the highest is an indicator of how well an alternative achieves balance. Alternative F has the smallest range, 16, which is the difference, in percent, between seedlings/saplings and posts/poles. The other alternatives, in order of increasing range, are the PA and Alternatives B (19), E (20), C (23), D (24) and A (27).

The distribution of age classes varies not only among alternatives, but also widely between periods within alternatives. For instance, in the fifty years after Period 5, the relative amount of immature sawtimber in Alternative B increases from about one percent to 60 percent. It drops to 23 percent in the next 50 years, and then increases again to 37 percent in the last 50 years of the planning horizon. Variance gradually decreases in some of the alternatives until a "steady state" is reached, after which the relative proportions of age classes do not change significantly. Alternative C reaches a steady state in Period 5, although the variance remains relatively high until the end of the 200-year planning horizon. The PA and Alternative F approach a steady state after 75 years; Alternative B does the same after 175 years. Alternatives A, D, and E do not display any consistent pattern before the end of the planning horizon.

Overall, Alternative F achieves and maintains a better balance of age classes on suitable lands, followed by the PA and Alternatives B, E, C, D and A, in that order.

Irreversible and Irretrievable Commitments

The lack of management on tentatively suitable lands not selected for timber management will result in reduced growth and increased mortality from stand conditions, insects and diseases, but the basic productivity of the land will be preserved. The difference in timber production and LTSYC between Alternative C, which produces more timber and has the highest LTSYC, and any other alternative is irretrievable. This difference in Period 1 production is shown in Table 75.

Table 75. Irretrievable Commitment in Sawtimber Produced and LTSYC, Period 1

	Alternatives						
Irretrievable Commitment	PA	A	B	C	D	E	F
Sawtimber produced (MMBF)	25	60	85	0	76	37	95
LTSYC (MMCF)	19.9	23.9	29.0	0	27.8	18.5	40.1

FUELWOOD

Three sources of fuelwood exist on the Forest: 1) that produced as a by-product of timber harvest (CFL), 2) snags and live trees in the pinyon-juniper woodland type (PJ), and 3) dead and down wood of any species in any type. Pinyon-juniper and dead and down material are traditional sources of fuelwood, but activity-generated slash from timber harvest has become important and popular because of the large amount available and its accessibility. Management has emphasized this source because utilization reduces fuels at no cost and makes use of material that would otherwise be wasted.

Long-term sustained yield capacity for PJ fuelwood is estimated at 3.1 MMBF per year; with present road access it is only about 2.5 MMBF. Current harvest levels have been as high as 3.1 MMBF, which is slightly above the LTSYC of the presently accessible areas.

Yield capacity of CFL fuelwood is directly proportional to the amount of timber harvested and the proportion of the harvest assigned to fuelwood. CFL fuelwood consists of unmerchantable material such as limbs and tops, decayed or broken parts of logs, and roundwood, smaller than sawlogs, which may be used as fuelwood rather than products. Half of the potential roundwood was added to the CFL fuelwood projections in the FORPLAN model because the demand for roundwood is less than the amount which can be produced.

Future demands for fuelwood are difficult to predict because the factors which determine demand are complex and often contradictory. For instance, increases in costs for home heating fuels and gasoline usually occur together. Any increase in the cost of home heating fuel results in higher demand for fuelwood, but the accompanying increase in gasoline prices decreases demand for fuelwood by making it more expensive to harvest. The assumption was made that overall demand for fuelwood will increase at the same rate as local population increases. The demand for accessible fuelwood, such as CFL fuelwood, is expected to increase. Much of the PJ fuelwood, on the other hand, is in areas with few and poor roads, and will remain unavailable unless additional access is developed. Table 76 shows production of fuelwood by type and alternative, and compares it to maximum potential.

Table 76. Average Annual Fuelwood Production - MMBF.

Period	Type	Potential Volume	Volume Supplied by Alternatives PA	A	B	C	D	E	F
1	CFL[1/]	10.8	5.7	6.1	5.4	8.7	5.2	6.4	2.7
	PJ[2/]	3.1	2.0	3.4	2.5	1.9	2.1	2.2	1.3
	Total	13.9	7.7	9.5	7.9	10.6	7.3	8.6	4.0
	Percent		55	68	57	76	52	61	29
2	CFL	11.6	5.9	4.8	4.8	8.5	4.9	6.6	2.6
	PJ	3.1	2.0	3.4	2.5	1.9	2.1	2.2	1.3
	Total	14.7	7.9	8.2	7.3	10.4	7.0	8.8	3.9
	Percent		54	55	50	70	47	59	26
3	CFL	10.6	6.0	5.1	4.8	8.9	4.6	6.0	2.7
	PJ	3.1	2.0	3.4	2.5	1.9	2.1	2.2	1.3
	Total	13.7	8.0	8.5	7.3	10.8	6.7	8.2	4.0
	Percent		58	62	53	78	48	59	29
4	CFL	8.0	5.5	4.4	4.6	5.6	3.5	4.5	3.1
	PJ	3.1	2.0	3.6	2.5	1.9	2.1	2.2	1.3
	Total	11.1	7.5	8.0	7.1	7.5	5.6	6.7	4.4
	Percent		68	72	64	67	50	60	40
5	CFL	7.2	6.9	5.3	5.0	7.6	5.2	6.9	4.2
	PJ	3.1	2.0	3.8	2.5	1.9	2.1	2.2	1.3
	Total	10.3	8.9	9.1	7.5	9.5	7.3	9.1	5.5
	Percent		86	88	72	92	70	88	53

1/ Fuelwood produced from commercial forest land (CFL) as a byproduct of timber production. Potential is based on the maximum timber benchmark for eight periods.

2/ Fuelwood produced in the woodland type. Potential is based on the long-term sustained yield of 3.1 MMBF.

Alternative C, which yields more total fuelwood (488 MMBF) over five periods than any alternative, produces about 77 percent of the potential 637 MMBF. Alternatives A, E, PA, B, D and F follow in descending order, with Alternative F producing 34 percent of the potential volume.

Not only does total volume vary by alternative, but so do the relative proportions of CFL fuelwood to PJ fuelwood. Alternative C produces more CFL fuelwood than any other alternative, but the other alternatives, with the exception of Alternative F, produce more PJ fuelwood. Alternatives A, B, D and F produce relatively low levels of CFL fuelwood, but Alternative A produces more PJ fuelwood than any other alternative, and Alternative B is second.

In Alternatives A, C and E, the supply of fuelwood exceeds the demand during the first period. By the fifth period, the supply of fuelwood is expected to meet less than half of the demand in all alternatives.

Adverse Environmental Impacts

The only unavoidable adverse environmental impact of fuelwood harvest in the alternatives is construction of roads to utilize inaccessible areas. Alternatives B, D and E call for acquisition of rights-of-way and construction of some local roads to access PJ fuelwood cutting areas.

Irreversible and Irretrievable Commitments

The difference in volume of fuelwood produced in Period 1 by Alternative C and other alternatives is irretrievable and is shown in Table 77.

Table 77. Irretrievable Commitment in Fuelwood Produced - MMBF.

	Alternatives						
	PA	A	B	C	D	E	F
Difference from Alt. C	29	10	27	0	34	20	66

PLANT AND ANIMAL DIVERSITY

Alternatives affect relative numbers and distribution of plants and animals. These changes in diversity are contingent on management level of individual resources and integration of need for diversity into management activities. Alternatives which produce high levels of timber and fuelwood, or which intensify management of grazing or fuels usually increase early plant successional stages, and favor animals dependent on those stages. Alternatives with lower levels of timber and fuelwoood harvest, with reduced grazing use, or which increase the level of direct fire suppression tend to increase later successional stages, and animals dependent on them.

Recognition and application of the integrated stand management concept increases overall diversity by integrating need for it into timber, grazing, wildlife and recreation projects. An example is laying out a timber sale so that large homogeneous stands are divided into smaller ones to increase diversity and address various wildlife needs. Overall, timber volume may be reduced, and all wildlife needs will not be met on every acre, but a better mix of resources is achieved through increasing levels of diversity, that includes both vertical and horizontal components.

Ecological condition is a measure of diversity in grass-dominated ecosystems. Ecological condition is maintained or improved by balancing permitted use with capacity. Table 69 displays the rate of decline in use and increase in capacity by alternative, and also shows the period in which balance is achieved. Alternative C resolves the issue in the first decade and therefore provides the most diversity. All other alternatives achieve balance in the third or fourth decade, providing diversity at a slower rate than Alternative C.

All alternatives contain provisions for increasing diversity, but differ widely in their method of accomplishing it. The method selected determines not only the type of diversity, but also its location. Direct wildlife habitat improvements and timber harvest establish and maintain early stages of plant succession in the woodland and timber types while old-growth timber stands

represent later stages of plant succession. Increasing range capacity increases diversity but also favors climax vegetation. Table 78 displays the emphasis each alternative places on the principal means of achieving diversity.

Table 78. Wildlife Habitat Diversity - Relative Ranking.

Means of Achieving Diversity	Relative Ranking of Alternatives						
	Highest						Lowest
Direct Wildlife Habitat Improvement	B	D	PA	E	F	C	A
Timber Harvest	C	E	PA	A	D	B	F
Old-growth Acres	B	F	D	E	PA	A	C
Grazing Capacity	C	B	A	D	E	PA	F

For example, Alternative B provides more diversity through direct wildlife habitat improvement than any other alternative, but less through timber management than most of the others. It maintains a high level of old-growth and provides a relative high grazing capacity. The PA is moderate in providing diversity by wildlife habitat improvements, moderately high in timber harvest, moderately low in old-growth acres, and low in grazing capacity.

Irretrievable Commitment

Achieving and maintaining diversity has no unavoidable adverse effects, nor is it an irreversible decision. Reductions in timber harvested and in grazing use neccesary to achieve diversity are irretrievable and are discussed in the Timber and Range sections of this chapter.

SOIL AND WATER

The major effects of management activities on the soil and water resource are changes in water quality, water yield, and soil productivity. In the early stages of the planning process, ways to increase water yield were explored and modeled. The management practices required to accomplish significant increases in yield include extensive clearcutting in the mixed conifer type. The environmental impacts of clearcutting on this scale were judged unacceptable.

Since timber harvests are a potential cause of soil loss, constraints are placed on timber sales to prevent such losses. These constraints include limiting the area of each analysis area harvested in each time period, specifying the type of harvest method to be used according to slope, and selecting the locations of logging roads.

Road construction and site development cause temporary soil losses. The amount of soil loss caused by road construction varies by alternative and is directly proportional to the miles of roads constructed. Table 81 shows road construction by alternative.

Unsatisfactory watershed acres are primarily a result of past grazing practices. Starting in the late 1870's, the area which was to become the Lincoln National Forest was grazed heavily by domestic livestock, a situation which continued until the 1900's. Since that time, livestock numbers have been gradually reduced, and watershed condition has improved. Parts of the Forest are still in unsatisfactory condition, but management direction in all alternatives is to balance permitted grazing use with capacity. Table 79 displays the expected change in unsatisfactory watershed condition over time.

Table 79. Unsatisfactory Watershed Condition - M Acres.

Period	Alternatives						
	PA	A	B	C	D	E	F
1	107	107	107	107	107	107	107
2	99	101	96	97	98	98	101
3	90	92	84	83	87	88	93
4	76	79	71	66	73	76	81
5	62	63	55	46	56	61	68

The rate of improvement in unsatisfactory acres is slow during the first 20 years due to the time required for vegetation to become established. After Period 2, the rate of improvement increases in all alternatives. The beneficial effects of road closure projects, changes in off-road vehicle use, and improvements in range management are realized in Periods 3 to 5. Many of the unsatisfactory acres remaining after the 5th period are the result of long term loss of vegetation and unstable soil formations. Rehabilitation will be a long slow process in these areas.

Alternative C results in the smallest number of unsatisfactory acres by the fifth period, primarily because of range investments and a large reduction in permitted use in the first two decades. The other alternatives are similar to each other except for Alternative F, which has the slowest rate of improvement. Although all of the alternatives result in significant changes, a small part of the Forest will always be in unsatisfactory condition.

Irreversible and Irretrievable Commitments

All alternatives reduce the irreversible loss of soil productivity over time. However, some irreversible soil loss will continue after the end of Period 5. Alternatives A and F result in the greatest continuing soil loss because changes in road closures, ORV use and grazing management are slowest in these alternatives.

MINERALS

Each alternative affects mineral exploration and development in three ways:

- By the number of acres open and the number of acres closed to exploration and development of locatable, leasable, and saleable minerals.
- By the number of acres with known mineral occurrences or with a currently estimated, favorable potential which are allocated to the two categories of open or closed to exploration/development.
- By the restriction on access and operations to mitigate impacts on surface resources.

Development of locatable minerals--those covered by the 1872 Mining Law such as gold, silver, lead, zinc, and uranium --is governed by regulations requiring submittal of a Plan of Operation for each proposed activity, designed to mitigate environmental impacts. The greatest present and potential activity is centered around low-value gold deposits mainly on Smokey Bear Ranger District.

Operating plans provide for protection of surface resources, to the extent possible under the regulations, for minimizing impacts and for reclamation of areas after exploration or mining has ceased. Mining claims may be contested when the lands involved are designated for other Federal programs, such as land exchanges or Wilderness withdrawals, or when it appears the mining claims are being used for non-mining purposes. All alternatives contain approximately the same base level budget for review and approval of operating plans for locatable mineral activity.

Leasable minerals are generally energy minerals such as oil and gas. There is a continuing interest in exploration and development of these minerals Forest-wide. When interested parties apply for leases, the Forest reviews the potential impacts of leasing and recommends for or against lease approval to BLM. Recommendations for leasing contain stipulations for environmental protection. Upon approval, BLM administers exploration and development with participation by the Forest Service. Recommendations for or against leasing and stipulations necessary to protect surface resources are based on the degree of protection needed to meet multiple-use objectives.

All alternatives contain a base level budget to process energy mineral lease applications in a timely manner and to aid the BLM in administration of on-the-ground activities. The amount of money budgeted for this purpose varies slightly by alternative. Alternative F provides $5,000 per year, the PA and Alternative D provide $6,000 per year, Alternative E provides $7,000, and all others provide $8,000. Any significant discoveries in the future will require major budget adjustments under all alternatives.

There are now approximately 9,552 acres of administrative minerals withdrawals and 82,879 acres of wilderness closed to mineral entry; Alternative D closes an additional 21,251 acres of proposed wilderness (the WSA) by administrative withdrawal. Since wilderness is closed by the 1964 Wilderness Act, it will not be discussed further. The existing administrative withdrawals will be maintained under all alternatives until reviewed, in or before 1991, as required by the Federal Land Policy Management Act. The alternatives contain provisions for additional withdrawals for new recreation sites, RNAs, administrative facilities, and caves, as shown in Table 80.

Table 80. Recommended Minerals Withdrawals and Leasing Availability - Acres.

	Alternatives						
	PA	A	B	C	D	E	F
Leasable Minerals							
Available	993,696	1,020,256	988,700	1,020,256	999,005	1,020,256	1,020,256
Locatable Minerals							
Available	982,789	1,007,852	976,203	1,007,132	986,428	1,007,435	1,007,483
Withdrawn							
Wilderness	82,879	82,879	82,879	82,879	104,130	82,879	82,879
RNAs	1,337	2,164	1,337	2,164	1,337	2,164	2,164
Developed Areas	9,930	10,600	11,520	11,320	11,600	11,017	10,969
Special Geologic Area	---	---	31,556	---	---	---	---
Cave Protection	26,560	---	---	---	---	---	---

Abandoned mines are scattered over much of the Smokey Bear Ranger District and consist of a large number of dangerous shafts and adits that are unmarked or not blocked to entry. The location and extent of some of these is known, but many have not been accurately located and the extent of the hazard assessed. All alternatives provide support to correct known hazards. The PA and Alternative B would provide funding for identifying abandoned mines and for eliminating hazards. Alternatives D and E would initiate actions to identify unknown hazards but would not eliminate them. Alternatives A, C and F do not contain a program for identifying or eliminating unknown hazards. The same relationships among alternatives exist for reclamation of abandoned mining areas.

Irreversible and Irretrievable Commitments

An irreversible commitment of the mineral resource will occur when the minerals are extracted. An irretrievable commitment of the resource will occur if withdrawals result in the loss of production of a mineral or minerals. The extent of any potential loss of production is unknown, but may involve loss of production of strategic and critical minerals.

LANDS AND USES

Lands

Activities related to lands support other resource management and provide administration for approximately 380 special use permits. All alternatives have support costs built in to provide needed work, as shown in Table 81.

Table 81. Lands and Uses Program - Average Annual Budget, M Dollars.

	Alternatives						
Land Program	PA	A	B	C	D	E	F
Land Ownership Management	126.7	137.2	137.2	119.8	130.6	131.2	113.8
Rights-of-Way Acquisition[17]	49.5	24.5	25.5	10.7	14.1	22.0	37.2

[17] Average annual budget for first 3 periods; none budgeted in Period 4 and 5.

Land Exchange and Acquisition

All alternatives provide for acquisition and disposal of lands by exchange, donation, or purchase. Land will be exchanged with public and private entities as needed to carry out management programs. Acres classified as base-in-exchange or desirable for acquisition do not change by alternative.

Maps showing locations of lands classified as base for exchange or desirable for acquisition can be reviewed at the Forest Supervisor's Office.

Rights-of-Way Acquisition

Rights-of-way (ROW) are acquired directly by the Forest or in cooperation with State and County agencies in order to provide access for administration, commodity production, and recreation. The proposed Plan lists 44.8 miles of ROW needed in the first period.

Land Line Location

There are approximately 1,200 miles of land line requiring surveying on the Forest. All alternatives, except Alternatives C and F, provide for eliminating this backlog by the end of the third period. In Alternatives C and F, it would be accomplished by the end of the fifth period. Priority for surveying is related to the general emphasis of the alternative, with all alternatives providing for surveys to prevent or resolve occupancy trespass. The identification of occupancy trespass is directly related to the land line location program.

Utility Corridors

Existing designated utility corridors are available for new facilities. Some parts of the Forest, such as wilderness and the WSA, are classified as exclusion areas. These areas are unavailable for expansion in all alternatives, although the WSA would become available under all alternatives except D when or if Congress designates it nonwilderness. Under Alternative D, the Sacramento Escarpment and all areas on Smokey Bear Ranger District except present corridors are classified as avoidance areas, where corridors are discouraged but not prohibited. The other alternatives have no avoidance areas. All areas of the Forest not classified as exclusion or avoidance are available for use as corridors where this is environmentally and visually acceptable. All alternatives will provide for public utility routes to interior private land except private lands in wilderness. All alternatives provide for continued use of existing utility corridors.

PROTECTION

Fire

Fire risk and hazard will increase in all alternatives. Risk is directly related to human activity on the Forest, most of which is associated with recreation activities. Risk is highest in Alternatives B and D, which emphasize recreation use, followed closely by the PA and Alternative E. Risk increases least in Alternatives A, C and F because human activity is at lower levels than other alternatives.

Fire hazard is primarily a function of the amount and nature of fuels generated by natural processes and management activities. Natural fuels consist mostly of heavy, longlasting materials and increase with increasing stand age unless periodically reduced by fire. Activities such as road construction, timber sales, and precommercial thinnings generally create light, short-term fuels (slash). Reduction of these fuels is a normal part of projects which create them. Hazard caused by these fuels is usually temporary, lasting only until projects are completed. Mitigation is partially or wholly accomplished in all alternatives by lopping, piling or crushing, and burning. Slash is sometimes left untreated to accomplish resource management objectives when the probability of fire spread to adjacent stands is minimal or can be made so.

The effect of alternatives on fire management is measured by the total budget available for fire management, and its distribution between the principal fire activities, suppression and protection. Table 82 shows the relative risk and hazard associated with alternatives and the annual budgets assigned to each function.

Table 82. Relative Risk and Hazard Associated With Fire

	Alternatives						
	PA	A	B	C	D	E	F
Risk[1/]	High	Low	High	Medium	High	High	Medium
Suppression Budget (MM $)	1.51	2.10	0.92	2.10	1.51	1.51	3.60
Hazard[1/]	High	Low	Low	High	Low	High	Low
Protection Budget (MM $)[2/]	0.91	1.26	1.34	1.26	1.00	1.00	0.70
Total Budget (MM $)	2.42	3.36	2.26	3.36	2.51	2.51	4.30

1/ Relative to other alternatives.

2/ Reduction of activity-created slash is financed from project funds which are not included here.

The greatest probability of serious, uncontrolled fires is contained in the PA and Alternatives C and E. Of these alternatives, C contains a high level of funding for both suppression and protection, and both the PA and Alternative E are funded at moderate levels in both functions. Hazard is inherently low in Alternatives B, D and F, but risk is high in Alternative B and D relative to other alternatives. Alternative A has the smallest combined risk and hazard, but has a budget equal to Alternative C, which has a greater probability of fires. A fire budget analysis performed in 1984 determined that, under current management and with the present mix of personnel and equipment, an annual protection budget of 1.38 MM dollars provides maximum protection.

Wildfires are suppressed in all alternatives consistent with resource values involved or threatened, in accordance with management requirements to minimize serious or long-lasting effects of periodic large fires that impair land productivity. Fires occurring in or near developed areas, or which have a potential to spread to developed areas, will be suppressed. Other fires will be suppressed consistent with the current fire policy and resource values threatened.

Fuels treatment is done primarily in connection with timber and fuelwood sales, although prescribed burning specifically for fuels treatment is also done. Table 83 displays acres of fuels treated for each alternative.

Table 83. Average Annual Acres Treated to Reduce Fuels

Period	Source	Alternatives PA	A	B	C	D	E	F
1	Sawtimber Sales	3,750	2,850	2,000	8,550	2,500	4,100	1,875
	Fuelwood Sales	1,200	2,500	1,500	1,20	1,200	1,350	840
	Prescribed Burn	4,000	4,000	4,000	4,000	4,000	4,000	2,800
	TOTAL	8,950	9,350	7,500	13,750	7,700	9,450	5,515
2	Sawtimber Sales	3,750	3,300	2,500	9,500	2,500	3,300	1,760
	Fuelwood Sales	1,200	2,500	1,500	1,200	1,200	1,350	840
	Prescribed Burn	4,000	4,000	4,000	4,000	4,000	4,000	2,800
	TOTAL	8,950	9,800	8,000	14,700	7,700	8,650	5,400
3	Sawtimber Sales	3,750	3,300	2,500	9,500	3,000	4,500	1,760
	Fuelwood Sales	1,200	2,500	1,500	1,200	1,200	1,350	840
	Prescribed Burn	4,000	4,000	4,000	4,000	4,000	4,000	2,800
	TOTAL	8,950	9,800	8,000	14,700	8,200	9,850	5,400
4	Sawtimber Sales	3,750	3,300	2,500	6,000	4,100	4,000	1,550
	Fuelwood Sales	1,200	2,500	1,500	1,200	1,200	1,350	840
	Prescribed Burn	4,000	4,000	4,000	4,000	4,000	4,000	2,800
	TOTAL	8,950	9,800	8,000	11,200	9,300	9,350	5,190
5	Sawtimber Sales	3,750	3,300	3,000	7,200	2,000	2,800	1,550
	Fuelwood Sales	1,200	2,850	1,500	1,200	1,200	1,350	840
	Prescribed Burn	4,000	4,000	4,000	4,000	4,000	4,000	2,800
	TOTAL	8,950	9,800	8,500	12,400	7,200	8,150	5,190

The principal differences among alternatives is attributable to treatment of fuels from timber sales. Alternative C, which produces the most timber, also has the greatest acreage of fuels treated. Alternative A has the second largest fuels treatment program. Alternative A has a relatively small program of fuels treatment through timber sales, but compared to other alternatives it treats more acres by means of fuelwood sales. The PA has the second largest fuels treatment through timber sales, but overall ranks third. Alternative F has the lowest level of fuels treatment. All alternatives, except Alternative F, treat the same number of acres by means of prescribed burning.

Insects and Diseases

Damage caused by insects and diseases (I&D) is prevented or controlled by cultural or mechanical practices performed in conjunction with other resource management activities. Potential outbreaks detected by means of a periodic monitoring program are evaluated to determine if treatment is appropriate, and to develop a range of alternatives for suppression based on technical and biological capabilities, resource values, and other appropriate criteria.

Silvicultural practices designed to prevent losses by I&D are aimed at developing stands which are resistant to pests and at maintaining stand conditions which will prevent buildup of pest populations. These activities are

an integral part of timber management, but sometimes are carried out separately to deal with specific situations. Practices include thinning, harvesting, regeneration of new stands, utilization for fuelwood, and treatment of slash.

Direct suppression using chemical or biological pesticides is done when epidemics threaten resource values, both on the Forest and on adjoining land, or when other control measures are ineffective, or when the resource values threatened outweigh costs of suppression.

Alternatives differ in degree of emphasis on I&D management. In general, alternatives which emphasize intensive management of timber also emphasize management of pests, specifically dwarf mistletoes and western spruce budworm. Intensive prescriptions were specifically designed to develop and maintain stands in a condition resistant to western spruce budworm and dwarf mistletoes, and, where mistletoes are present, to prevent significant losses. Table 84 shows acres managed for timber, including those intensively managed to prevent I&D losses.

Table 84. Allocation of Timber Management Prescriptions - Acres.

	I&D	Alternatives						
Prescription	Emphasis	PA	A	B	C	D	E	F
High Intensity	High	49.5	64.6	35.2	55.6	63.7	85.4	11.5
Moderate Intensity	Low	40.6	9.6	0	8.9	1.7	1.5	8.1
Mod.-Low Intensity	None	0	13.5	20.7	25.3	0	4.7	21.3
Low Intensity	None	31.9	0	40.7	73.1	27.4	32.5	18.5
Old-growth	None[1/]	17.4	19.0	12.2	31.8	13.7	10.8	11.1
Nonentry	None	117.7	150.3	148.3	62.4	150.6	122.3	186.6

1/ Stands selected for old-growth will be dwarf mistletoe-free, or so lightly infested that the parasite can be eradicated in the first entry.

Alternatives are compared by percent of tentatively suitable acres managed to prevent losses caused by I&D. High and moderate intensity prescriptions address insects and diseases, but vary in target pest and timber type. High intensity prescriptions are designed to control dwarf mistletoes and prevent budworm losses in the mixed conifer type, and to control heavy dwarf mistletoe infestations in the ponderosa pine type. Moderate intensity prescriptions control dwarf mistletoes in lightly infected mixed conifer and ponderosa pine stands, but provide only a slight amount of protection from budworm in mixed conifer stands.

An objective of the PA and Alternative E is to prevent budworm damage and control dwarf mistletoes in mixed conifer stands highly valued for recreation and timber. Accordingly, they allocate more acres to high and moderate intensity prescriptions than any other alternative. The PA allocates about 35 percent of the tentatively suitable timber acres to the I&D control prescriptions, but about half of those prescriptions are moderate intensity. Alternative E manages slightly fewer acres for I&D control than the PA, about 34 percent of the tentatively suitable land, but allocates most of those acres to high intensity prescriptions. Alternative D is similar in that it applies high

intensity prescriptions to a large proportion of the managed acres, but since control and prevention is emphasized only in high value recreation stands, fewer total acres are managed.

Alternatives A and C also apply I&D control prescriptions to a moderate proportion of the tentatively suitable acres, 29 and 25 percent respectively, but many of the prescriptions are not applied to mixed conifer stands or stands in highly valued recreation and timber areas.

In Alternative F, insect and disease management is done primarily to maintain the health and vigor of forest stands near high-use recreation areas. Consequently, only about 8 percent of the tentatively suitable land is allocated to I&D control prescriptions. Alternative B applies high and moderate intensity prescriptions to about twice as many acres as Alternative F, but most of the treated acres are in ponderosa pine stands away from high-use recreation areas.

Law Enforcement

Law enforcement is carried out by specially trained (Level Four) Forest Service personnel and by local agencies (Cooperative Law Enforcement). Forest Service personnel enforce Federal regulations governing use of National Forest resources. Through Cooperative Law Enforcement agreements, local agencies are reimbursed for the costs of enforcing State and local laws on the Forest.

Alternatives vary in the amount budgeted for Level Four and Cooperative Law Enforcement, depending on management objectives. Table 85 displays average annual cost of law enforcement by alternative for five periods.

Table 85. Law Enforcement Costs - M Dollars

	Alternatives						
Type	PA	A	B	C	D	E	F
Level Four	107.2	26.8	67.0	26.8	67.0	67.0	60.0
Cooperative	46.8	30.0	56.2	56.2	56.2	56.2	45.0
Total	154.0	56.8	123.2	83.0	123.2	123.2	105.0

The PA provides the largest total budget for law enforcement, with emphasis on Level Four enforcement. It provides funds for training and for a coordinator in the Supervisor's Office to ensure consistent enforcement of Federal laws. It provides a moderate level of funding for cooperative law enforcement. Alternatives B, D, and E provide moderate funding for enforcement and a high level of cooperative law enforcement, but contain no funding for additional training or for coordination activities. Alternative F is similar to Alternative B but has slightly reduced funds for both Level Four and cooperative law enforcement. Alternatives A and C are similar in that they both provide minimum Level Four enforcement, but Alternative C provides for a high level of cooperative effort with local law enforcement agencies, while Alternative A contains a minimum level of funds for this purpose. Under Alternatives A and C, the Forest's ability to prevent resource loss from theft, vandalism and person-caused wildfires is significantly impaired.

Adverse Environmental Effects

Adverse environmental effects due to wildfires which cannot be avoided are: 1) temporary reduction in air quality caused by smoke from natural and prescribed fires; 2) short- and long-term loss of visual quality, wildlife

habitat, timber products, and recreation opportunities because of wildfires, 3) possible loss of life and damage to private property from uncontrollable wildfires, and 4) soil loss and watershed degradation from severe fires.

Irreversible and Irretrievable Commitments

Soil loss and watershed degradation resulting from uncontrollable high-intensity wildfires are essentially irreversible. Wildlife habitat destruction, timber burned, and loss of life and damage to private property are irretrievable.

Timber growth and yield losses associated with insects and diseases are irretrievable. Timber losses will be greater in Alternatives A, B, C and F, which de-emphasize intensive timber management or apply intensive management to timber stands outside the most productive mixed conifer areas. Overall, losses caused by insects and diseases in Alternative F will be high, but will occur on parts of the Forest having lower resource values.

Losses caused by trespass, theft, and vandalism are irretrievable. These losses are greatest in Alternatives A and C.

TRANSPORTATION SYSTEM AND FACILITIES

Transportation

Effects on the transportation system are estimated for six different factors: (1) the miles of managed transportation system; (2) the rate of road closure to achieve the managed system; (3) controls on transportation use, whether by season of use or type of use; (4) maintenance of the transportation system; (5) the types of roads that comprise the transportation system, and (6) road construction/reconstruction. Each alternative affects these factors to different degrees.

An objective of all alternatives is to provide adequate public and administrative access while controlling expenditures for maintenance. The managed system in each case includes all roads and trails to be retained. The open system is that part of the managed system that is available for general public and administrative use. The closed portion of the managed system consists of roads closed to public use, but opened periodically for management or administrative activities. All travelways have been resolved into either roads or trails. Table 86 displays the total managed system miles of roads and trails in each alternative, as well as the miles open to public use.

Table 86. The Managed Transportation System - Miles

	Alternatives						
	PA	A	B	C	D	E	F
Managed System	2,950	2,960	2,960	2,950	2,950	2,950	2,960
Open System	2,440	2,760	2,760	2,460	2,270	2,460	2,760

Although there is little difference among alternatives in total miles in the managed system, the alternatives vary in the proportion of the system which is open for travel. Alternatives A, B and F have the greatest impact on the total system by leaving the most miles open, followed by Alternatives C and E, the PA, and finally by Alternative D. The latter leaves 18 percent fewer miles open than Alternatives A and C.

Roads or other travelways are closed because they are duplicative and/or unneeded. Closure reduces the area of the Forest tied up in a single, non-productive use, prevents resource damage, and allows maintenance dollars to be spent in higher priority areas. Route closures take one of several forms:

- Put-to-bed - roadway moved to Level 1 maintenance, with drainage enhanced and physical barriers erected. Roadway is available for future use.
- Obliteration - complete closure with structures removed, drainage returned to original, and road bed seeded.
- Restoration - complete closure including returning roadway to original ground contours and seeding.

Routes closed by obliteration or restoration are removed from the system. They are generally roads or travelways whose location or design results in resource damage. Put-to-bed roads are used periodically for management or administrative activities. They are closed in between entries but remain on the system. Table 87 shows the effects of alternatives on routes put-to-bed and closed by obliteration and restoration.

Table 87. Roads and Travelways Closed - Miles per Period and Period of Completion.

	Alternatives						
Period	PA	A	B	C	D	E	F
1	100	25	25	250	50	50	25
2	120	60	60	360	125	100	60
3	170	40	40	0	75	150	40
4	140	25	25	0	60	170	25
5	150	25	25	0	60	140	25
Total for five periods	680	175	175	610	370	610	175
Total for eight periods	680	250	250	610	850	610	250
Period of Completion	5	8	8	2	7	5	8

The majority of closures under all alternatives use the put-to-bed (Level 1 maintenance) method. Alternative D has the greatest effect on the transportation system but requires a relatively long period to accomplish closures. It closes 850 miles of roads by Period 7 (Periods 1-5 are 10 years each, Periods 6-8 are 50 years each). It is followed by the PA and Alternatives C and E. Alternative C closes fewer miles than the PA, but it does so in two periods instead of the five required by the PA and Alternative E. Alternatives A, B and F have little effect on the road system because they require eight periods to close relatively few miles of unneeded roads.

There are three types of controls on use: seasonal, type of user and type of use. Roads may be closed seasonally during inclement weather to protect the road surface. They may also be closed to the general public but open for certain users such as Forest employees and contractors involved in timber harvesting. During periods of prolonged inclement weather, particularly heavy rain or snow, certain roads will be closed to all vehicular use. Controls on

the type of use refer to restrictions on single-track versus double-track vehicles. In certain areas, double-track vehicles cause much greater resource damage than single-track vehicles, and their use is essentially prohibited by converting those routes to trails. Table 88 displays the effects of the alternatives on controls.

Table 88. Transportation System Controls - Percent of Managed Transportation System.

	Alternatives						
Type of Control	PA	A	B	C	D	E	F
Seasonal or User	20	0	10	30	20	30	20
Type of Use	5	2	2	10	10	10	5
Total	25	2	12	40	30	40	25

Under the PA and Alternatives C, E and F, almost half of the roads in the managed system receive some type of control. The PA and Alternatives C, D, E and F limit 10 to 20 percent of the system to single-track use. In many areas this restriction formalizes the limits imposed by topography.

The Forest Service has five defined levels of road maintenance. These range from basic custodial care (Level 1) of roads not open to general public and administrative travel to maintenance of high traffic volume, paved roads (level 5). Maintenance levels of the open system by alternative are displayed in Table 89.

Table 89. Road Maintenance by Level

		Alternatives						
		PA	A	B	C	D	E	F
Open System Roads (miles)		2,080	2,520	2,520	2,220	1,820	2,220	2,520
Maintenance Level[1/]								
2	(%)	48	69	69	37	31	37	69
3	(%)	37	21	21	44	52	44	21
4	(%)	11	7	7	14	13	14	7
5	(%)	4	3	3	5	4	5	3

1/ Percent of open system. Remainder of managed road system is in maintenance level 1 (closed to general use).

In general, alternatives with a lower emphasis on commodity production (Alternatives A, B, D and F) have a higher proportion of low maintenance level roads (Level 2). Alternatives C, E and the PA have higher levels of road maintenance which will result in lower user costs and improved access for more types of vehicles, particularly those with less ground clearance.

Another effect of alternatives on the transportation system is on the type of roads in the managed system. Forest system roads are classified as arterial, collector, and local roads based upon their function in the network, with arterials being the most highly developed. Table 90 shows the percent of various types of roads now in place which will be managed under each alternative.

Table 90. Road Classification - Percent of Managed System

	Alternatives						
	PA	A	B	C	D	E	F
Arterial roads	2	1	3	5	2	5	1
Collector roads	13	9	13	30	12	30	9
Local roads	85	90	84	65	86	65	90
Managed system roads	2,590	2,720	2,720	2,710	2,500	2,710	2,720

Alternatives which emphasize commodity production, such as Alternatives C and E, show a need for routes allowing higher speeds, with better alignments and surfaces. Alternatives emphasizing amenities, such as Alternative B and D, require local roads, which are designed to lower standards for less traffic.

The existing road system is adequate to accomplish the objectives of all alternatives, except for local and collector roads required for timber sales and access to recreation facilities. New road construction and reconstruction for access to timber sales, pinyon-juniper fuelwood harvest areas, and recreation facilities are shown in Table 91. All roads constructed and reconstructed for timber sales and fuelwood are local roads, with one exception, and will be maintained at level 1, i.e. closed to use in between harvests to prevent resource damage. The exception to this is a road to be constructed for timber sales and to be maintained as a collector road, extending FR 64 from Sunspot to Board Canyon at FR 271. The road will provide additional public access for dispersed recreation and serve future timber sales. Roads for recreation facilities will be constructed for and maintained at levels appropriate for the amount and type of expected use.

Table 91. Road Construction/Reconstruction by Alternative - Miles

Period	Purpose	Alternatives PA	A	B	C	D	E	F
1	Timber Sale							
	Construction	102	52	45	144	45	77	37
	Reconstruction	40	11	9	31	10	16	8
	Fuelwood const.	0	0	1	0	1	0	0
	Recreation const.	2	0	0	0	2	1	2
2	Timber Sale							
	Construction	62	32	28	99	27	43	18
	Reconstruction	70	36	31	111	30	48	21
	Fuelwood const.	0	0	1	0	1	0	0
	Recreation const.	7	0	1	1	7	1	7
3	Timber Sale							
	Construction	30	12	11	38	11	18	6
	Reconstruction	102	57	50	179	53	86	32
	Fuelwood const.	0	0	1	0	1	0	0
	Recreation const.	3	0	1	2	5	3	3
4	Timber Sale							
	Construction	30	13	11	42	13	21	6
	Reconstruction	100	60	50	199	60	99	30
	Fuelwood const.	0	0	1	0	1	0	0
5	Timber Sale							
	Construction	30	12	12	41	9	15	6
	Reconstruction	100	58	55	196	43	69	30
	Fuelwood const.	0	0	1	0	1	0	0
Total	Timber Sale							
	Construction	254	121	107	364	105	174	73
	Reconstruction	412	222	195	716	196	318	121
	Fuelwood const.	0	0	5	0	5	0	0
	Recreation const.	12	0	2	3	14	5	12

Alternative C constructs and reconstructs the most miles of roads for timber sales, but does not construct any roads for access to pinyon-juniper fuelwood areas, and ranks fourth in miles of roads constructed for recreation purposes. The PA requires construction or reconstruction of about 38 percent fewer miles of roads for access to timber and fuelwood cutting areas than Alternative C, but calls for construction of more roads for recreation access. Alternative E, which emphasizes timber management in a fairly concentrated area, requires about 50 percent fewer miles of road construction and reconstruction for timber and fuelwood sales than Alternative C, and ranks third in miles of road constructed for recreation. Alternative D calls for construction and reconstruction of fewer roads for timber and fuelwood production than any other alternative except

F, but ranks first in miles of road constructed for recreation. The PA and Alternative F rank second in miles of road constructed for recreation facilities.

Adverse Environmental Impacts

Adverse environmental effects of the transportation system are associated primarily with soil loss and water quality. Overall, Alternatives A, B and F, pose the greatest risk of damage to road surfaces and increased erosion from inadequate drainage because they have the most miles of roads, least controls on use, and lowest level of maintenance. The risk of damage to road surfaces and increased erosion from inadequate drainage is lower in the PA and Alternatives C and E than in Alternatives A and B, but this is somewhat offset by an increase in risk associated with the increase in roads constructed and reconstructed called for in the former. Alternative D will have the least risk of any type of damage because it maintains relatively few miles of roads at high levels, and calls for construction and reconstruction of fewer miles of roads than any alternative except F.

Administrative Facilities

Over the next 50 years, every building and support system on the Forest will need to be replaced. Table 92 shows the replacement schedule by alternative and effects on facilities.

Table 92. Administrative Facility Replacement

	Alternatives						
	PA	A	B	C	D	E	F
No. Units needed	125	125	100	125	125	125	100
Units Replaced by Period							
1	15	5	5	20	10	20	5
2	30	10	10	25	20	25	10
3	30	10	10	30	20	30	10
4	25	10	10	25	20	25	10
5	25	10	10	25	20	25	10
Total Replaced	125	45	45	125	90	125	45
Deficit	0	80	55	0	35	0	55

Under the PA and Alternatives C and E, the replacement schedule will keep pace with needs. Under Alternatives A, B, D and F, the replacement schedule will fall progressively farther and farther behind needs even though the projected need in Alternatives B and F will be much lower. Therefore, Alternatives A, B, D and F will result in a steady deterioration of Forest administrative facilities.

Irreversible and Irretrievable Commitments

Construction of roads and facilities involves irreversible and irretrievable commitments. No additional commitments are involved in maintenance of existing roads and facilities, although deterioration caused by a lack of maintenance is irreversible if allowed to occur for long periods. Deterioration caused by lack of maintenance is irretrievable.

SECTION B
ECONOMIC AND SOCIAL CONSIDERATIONS

Economic Efficiency Analysis

National Forest Management Act (NFMA) regulations [36 CFR 219.12] require extensive analysis of economic efficiency in the formulation, estimation of effects, and evaluation of alternatives. In addition, the revised Resource Planning Act Statement of Policy requires management of National Forests to mazimize net social and economic contributions to the Nation's well-being in an environmentally sound manner.

Present net value (PNV) was chosen as one measure of economic efficiency. PNV is the discounted benefits less the discounted costs, and measures the net economic benefits to the public of all resources which have market value or which were given an assigned value in the planning process.

Maximization of PNV was an objective of each alternative modeled in FORPLAN. Each alternative, therefore, represents the most cost efficient combination of management prescriptions based on the goals and objectives of that alternative.

PNV was calculated by FORPLAN based on costs for labor, capital, and materials used to support the management direction of each alternative and on priced benefits generated from production of goods and services. Costs included emergency firefighter funds, timber user costs, and permittee user costs.

PNV is a measure of national economic efficiency or net returns to taxpayers as a group. It does not provide a complete measure of net public benefits because only the actual or potential prices of outputs for which prices have been estimated are counted as benefits, even though all expenditures necessary to produce both priced and non-priced benefits are counted as costs. As a consequence, those alternatives which focus on priced outputs are characterized by the highest PNVs. In addition, the assumption of constant unit prices for all priced outputs biases the estimates of PNV. Differences in quality of resource management and changes in commodity prices that may accompany changes in levels of outputs are not reflected in the assumed prices. Therefore, the PNV of an alternative stressing high quality experiences and/or low levels of commodity outputs is understated relative to the PNV's of other alternatives.

Since not all costs and benefits can be priced in the analysis, PNV was not the only index used to develop, compare, and evaluate alternatives. Alternatives were compared by maximizing net public benefits. Net public benefit (NPB) is an overall expression of the value to the nation of all outputs and positive effects (benefits) less all associated inputs and negative effects (costs) whether they can be quantitatively valued or not. Net public benefits are measured by both quantitative and qualitative criteria rather than a single measure or index. Alternatives having the highest PNV may not provide the highest PNB when nonpriced benefits and costs are considered. Chapter 2 provides more detail on PNB.

The Maximum PNV Assigned Value Benchmark is structured to provide the greatest monetary benefits for the costs incurred. This benchmark shows the most economically efficient combination of costs and benefits without specific regard for the protection of resources or provision for integrated multiple use management. The Maximum PNV Assigned Benchmark was not considered in detail, but instead was intended to be used to compare PNVs of alternatives considered in detail. There were no constraints placed on this benchmark. As constraints are added to meet objectives and goals of alternatives considered in detail, PNV decreases. Comparing PNVs of alternatives to Maximum PNV Assigned Benchmark provides a measure of the financial tradeoff or opportunity cost of an alternative.

Table 93 displays benefits, costs, and PNV tradeoffs from the Maximum PNV Assigned Benchmark as well as benefit/cost (B/C) ratios for alternatives. Revenues from the production of minerals are not included in the calculation of PNV. The Max PNV Assigned Benchmark is included as a reference point. Differences in parenthesis are dollar changes from the Max PNV Assigned Benchmark. A detailed comparison of tradeoffs is summarized in the Present Net Value Trade-off section of Chapter 2.

Table 93. Cumulative Present Value Benefits, Present Value Costs and Present Net Value-MM Dollars

	Max PNV Assigned	Alternatives						
		PA	A	B	C	D	E	F
Benefits	557.2	540.8 (-16.4)	455.6 (-101.6)	560.0 (-2.8)	532.9 (-24.3)	571.4 (+14.2)	547.3 (-9.9)	512.8 (-44.4)
Costs	144.2	180.7 (+36.5)	182.7 (+38.5)	160.6 (+16.4)	208.2 (+64.0)	174.0 (+29.8)	177.6 (+33.4)	186.7 (+42.5)
PNV	413.0	360.1 (-52.9)	273.0 (-140.0)	399.2 (-13.8)	324.7 (-88.3)	397.3 (-15.7)	369.7 (-43.3)	326.1 (-86.9)
B/C Ratio	3.86	2.99	2.49	3.49	2.56	3.28	3.08	2.75

The relatively large benefits developed by Alternatives B and D reflect the emphasis on recreation and wildlife. The nonmarket benefits are also associated with lower costs. Alternatives A and C, which emphasize market resources, have the lowest PNVs because management costs for timber and range are relatively high. Some nonpriced benefits inherent in these activities are not included in the total benefits. For instance, stands are intensively managed to prevent or control pests in order to benefit a variety of resources, and old growth prescriptions are applied to benefit wildlife or enhance visual quality, yet only priced benefits associated with timber are included in the totals.

The PNVs of the PA and Alternative E are similar and fall between Alternatives B and D on the one hand, and Alternatives A and C on the other. The PA and Alternative E are compromises between the amenity and commodity emphases of the

two groups of alternatives. Alternative F reflects the balanced emphasis of the PA, but because the protection costs are high relative to the other alternatives, it has a low PNV.

Benefits and Costs

Total annual priced benefits and costs for each alternative by period are displayed in Table 94. Total benefits are market and assigned values generated by all priced outputs over the planning horizen. Cash receipts are revenues collected from timber, grazing, and developed recreation, and are returned to the U.S. Treasury. Total Forest Service (FS) costs are anticipated budgetary appropriations and are divided into capital investments and operation and maintenance (O&M).

Table 94. Financial Summary of Alternatives - M Dollars per Year

	Alternatives						
Benefit or Cost	PA	A	B	C	D	E	F
Period 1							
Total Benefits	16,423	15,596	16,138	16,571	16,943	16,414	15,909
Cash Receipts	1,272	1,141	1,009	1,466	1,039	1,246	868
Total Costs	7,383	7,351	6,455	8,030	7,118	7,426	7,622
FS Budget	5,333	4,743	5,159	5,294	5,194	5,373	3,690
Capital Invest.	534	345	698	398	645	632	352
O&M	4,799	4,398	4,461	4,896	4,549	4,741	3,338
Other costs 1/	2,050	2,608	1,296	2,736	1,924	2,053	3,932
Period 2							
Total Benefits	19,347	16,784	19,040	19,353	20,073	19,180	18,630
Cash Receipts	1,342	1,200	1,106	1,690	1,109	1,279	878
Total Costs	7,442	7,526	6,472	8,740	7,099	7,148	7,560
FS Budget	5,394	4,879	5,138	5,834	5,156	5,122	3,659
Capital Invest.	544	332	542	418	572	536	385
O&M	4,850	4,547	4,596	5,416	4,584	4,586	3,274
Other costs	2,048	2,647	1,334	2,906	1,943	2,026	3,901
Period 3							
Total Benefits	24,312	19,144	24,392	23,545	25,847	24,497	22,571
Cash Receipts	1,447	1,298	1,221	1,842	1,301	1,467	959
Total Costs	7,128	7,253	6,509	8,520	7,005	7,030	7,456
FS Budget	5,073	4,601	5,174	5,621	5,023	4,949	3,567
Capital Invest.	536	353	659	517	674	543	354
O&M	4,537	4,248	4,515	5,104	4,349	4,406	3,213
Other costs	2,055	2,652	1,335	2,899	1,982	2,081	3,889
Period 4							
Total Benefits	25,993	20,333	28,654	25,215	28,801	27,605	24,264
Cash Receipts	1,502	1,342	1,277	1,946	1,443	1,644	1,011
Total Costs	7,033	7,176	6,460	8,418	6,915	6,995	7,415
FS Budget	4,965	4,542	5,113	5,411	4,864	4,796	3,521
Capital Invest.	403	335	571	498	478	447	265
O&M	4,562	4,207	4,542	4,913	4,386	4,349	3,256
Other costs	2,068	2,634	1,347	3,007	2,051	2,199	3,894

1/ Other costs include firefighting fund, timber purchaser credit, and grazing permittee investment.

Table 94. Financial Summary of Alternatives - M Dollars per Year (con't)

Benefit or Cost	Alternatives PA	A	B	C	D	E	F
Period 5							
Total Benefits	29,578	23,160	32,988	28,756	31,501	30,090	27,701
Cash Receipts	1,545	1,353	1,384	2,052	1,276	1,401	1,061
Total Costs	7,302	7,349	6,562	8,697	6,567	6,654	7,348
FS Budget	5,248	4,703	5,165	5,612	4,668	4,666	3,457
Capital invest.	464	364	622	425	513	505	310
O&M	4,785	4,339	4,543	5,187	4,155	4,161	3,147
Other costs	2,054	2,646	1,397	3,085	1,899	1,988	3,891

Returns to the Treasury and Counties

Cash receipts collected for timber, grazing and recreation use are returned to the U.S. Treasury. The majority of the receipts come from timber sales. Each year the Forest Service returns 25 percent of the gross revenues to the States for disbursement to counties based on the percentage of national forest acreage within each county. These payments to counties are in lieu of taxes.

Table 95 displays estimated U.S. Treasury and "25 percent fund" returns to the counties of Otero, Chaves, Lincoln, and Eddy. The estimates are based on projected sawtimber and fuelwood harvests, grazing use and developed recreation use. These figures are for comparative purposes only, and do not obligate the Forest Service to provide the amounts shown. Changes in market prices, market conditions and use patterns can cause fluctuating revenues.

Table 95. Estimated Average Annual U.S. Treasury Revenues and Returns to Counties - M Dollars

Period		Alternatives PA	A	B	C	D	E	F
1	Treasury	1,272	1,141	1,009	1,466	1,039	1,246	868
	County	318	285	252	366	260	312	217
2	Treasury	1,342	1,200	1,106	1,690	1,109	1,279	878
	County	336	300	276	423	277	320	220
3	Treasury	1,447	1,298	1,221	1,842	1,301	1,467	959
	County	362	325	305	461	325	367	240
4	Treasury	1,502	1,342	1,277	1,946	1,443	1,644	1,011
	County	376	336	319	487	361	411	253
5	Treasury	1,545	1,353	1,384	2,052	1,276	1,401	1,061
	County	386	338	346	513	319	350	265
Total Average								
	Treasury	1,422	1,267	1,199	1,799	1,234	1,407	955
	County	356	317	300	450	308	352	239

Alternative C returns more dollars to the Treasury and to counties, reflecting its emphasis on production of revenue-generating commodities, followed by the PA, and Alternatives E, A, D, B and F in descending order. Alternative C produces twice as much revenue as Alternative F and about 50 percent more revenue than Alternative B. Receipts increase over time in all alternatives except D and E, which predict increases until the fourth period, followed by declines of about 13 percent in the fifth. Revenues decline because these alternatives harvest less timber in the fifth period, offsetting increases in developed recreation.

Employment and Income

Each alternative has different effects on employment, population, and total income patterns within the Forest's zone of influence. Differences occur due to differences in resource output levels that are produced by each alternative. Timber and fuelwood production, livestock grazing, hunting, and recreation (especially camping and skiing) are of primary importance to the regional economic situation.

A computer input/output model (IMPLAN) was used to determine the effects of the output levels from each alternative on a variety of industry sectors. Three sectors were selected for analysis and included the following types of businesses:

- Timber sector - logging, sawmills, and wood products
- Livestock grazing sector - meat animals and miscellaneous livestock
- Tourism sector - hotels and lodging, restaurants, retail trade, amusement, and automobile services.

These particular industry sectors are expected to be most affected by Forest Service management decisions. The economic effects on sectors not included above were combined into a miscellaneous category.

IMPLAN is based on data developed in 1977. Employment predictions are reasonably accurate since there has been no substantial change in technology in most sectors since 1977. Income figures are displayed in fourth quarter 1980 dollars, to be comparable to other dollar values displayed in this document. The model projects employment and income potential only; there is no assurance that these projections will occur. Table 96 displays the effects of alternatives on employment and income in all sectors of the three counties comprising the Forest's planning area. Effects on Chaves County are not displayed because they are insignificant.

Table 96. Effects of Alternatives on Employment and Income by County. Average Annual Values at the End of the First Period.

County	LNF Base 1/	Current Total	Additions to Current Levels PA	A	B	C	D	E	F
Lincoln									
Employment	330	2,046	117	74	84	82	79	96	96
Income-MM$	5.5	47.6	2.0	1.3	1.4	1.4	1.3	1.6	1.6
Otero									
Employment	622	9,576	156	80	135	182	126	157	98
Income-MM$	10.6	182.6	2.8	1.5	2.3	3.4	2.1	2.8	1.6
Eddy									
Employment	94	19,910	12	9	13	15	33	27	7
Income-MM$	1.9	828.6	0.2	0.2	0.2	0.3	0.6	0.5	0.1
All Counties									
Employment	1,046	31,532	285	163	232	279	238	280	201
Income-MM$	18.0	1,059	5.0	3.0	3.9	5.1	4.0	4.9	3.3

1/ LNF Base is that portion of the current (1977) employment and income attributable to the Lincoln National Forest.

Impacts of Forest management programs predominately affect the tourism sector in all three counties, with Otero and Lincoln Counties receiving the majority of the change. Otero County receives the greatest change in employment and income overall, and is the only county affected by the timber program. The increase in timber sector jobs ranges from 15 in Alternative F to 63 in Alternative C, the commodity emphasis alternative.

In absolute terms, none of the alternatives show significant effects on the overall economy of the three counties. The PA adds more jobs than any other alternative, with an additional 285 jobs, but this amounts to about 1/10th of one percent of the total employed currently. The PA also adds $5.0 million, or about a half of one percent, to income. In relative terms, there is a great deal of difference among the alternatives. The PA provides more overall employment and income (about 75 percent more employment and 67 percent more income than Alternative A) and it benefits Lincoln County more than any other by adding about 55 jobs in the tourism sector. Alternative C provides more employment and income in Otero County because of the emphasis on timber production, and Alternative D provides the most benefits to Eddy County primarily through the tourism sector. Alternative A benefits the economy of the three counties less than any alternative.

Social Effects

The impact of alternatives on the lifestyle of southern New Mexico is negligible. Communities currently characterized as rural or semi-rural will not change as a result of Forest management direction proposed in these alternatives. Ranching will continue on rangeland which will become more productive and stable over time. The rapid reduction in permitted livestock

grazing, proposed in Alternative C, may reduce income to some ranchers and to ranching communities in the first and second periods. However, livestock income generated by this alternative will be greater than that generated by other alternatives in Periods 3 through 5. Small sawmills can be expected to close under Alternatives B, D and F, but the effect on community stability will be negligible. The PA and Alternatives B, D and E, which feature development of more recreation sites and expanded dispersed recreation will provide additional opportunity for urban and rural based recreationists to enjoy the natural environment. Wildlife enthusiasts will benefit under all alternatives but particularly Alternatives B and D, which feature optimum wildlife habitat integration in all resource activities.

None of the proposed alternatives are expected to result in any significant change in present use of Forest lands or products by minorities residing in the United States. National Forest opportunities will continue to be equally available to all residents of the United States. Minorities and women are hired directly by the Forest Service, obtain contracts from the Forest, or work for contractors who do. Level of hiring under the Equal Employment Opportunity Program is directly related to budget. Alternatives listed in descending order of first period budget are: Alternative E, the PA, C, D, B, A and F. The range in budget is $1.683 million per year, which occurs between Alternative E and F.

The American Indian Religious Freedom Act requires Federal agencies to evaluate their policies and procedures in consultation with leaders of traditional religions to determine mitigation necessary to protect and preserve American Indian religious practice. The Forest has consulted with the USDI-Bureau of Indian Affairs, Mescalero Agency, and the Mescalero Apache Tribal Council. No religious sites were identified on the Forest.

SECTION C
OTHER CONSIDERATIONS

Comparison with Regional Guide

The Southwest Region through the Regional Guide assigns each forest a share of the National RPA Program targets. Table 97 compares alternatives to the targets assigned for the first and fifth periods. Outputs having no targets, or those targets retained at the Regional level, are not shown.

Table 97. Comparison of RPA Targets with Average Annual Outputs for the First and Fifth Periods.

Output/ Activity	Unit of Measure	RPA Target	Alternatives PA	A	B	C	D	E	F
Period 1									
Recreation									
Developed	MRVD	531	569	491	542	535	559	575	552
Dispersed	MRVD	622	596	577	606	587	593	591	582
Permitted Use	MAUM	137	147	150	150	130	147	147	151
Timber									
Offered	MMBF	9	15	11	9	17	10	14	8
Reforestation	Acres	915	75	75	0	118	75	75	50
Timber Stand Improvement	Acres	455	1500	1200	144	144	1980	2800	450
Minerals	Cases	73	72	81	81	78	68	69	66
Fuels Treat.	Macres	2.1	8.9	9.3	7.5	13.8	7.7	9.5	5.5
Lands Purchased	Acres	726	100	5	5	5	200	100	50
Period 5									
Recreation									
Developed	MRVD	885	1046	691	982	881	1111	1022	999
Dispersed	MRVD	750	811	816	831	809	810	806	792
Permitted Use	MAUM	105	157	164	171	193	160	159	151
Timber									
Offered	MMBF	12	15	13	12	26	9	11	6
Reforestation	Acres	1469	750	521	271	630	260	283	219
Timber Stand Improvement	Acres	93	1400	0	0	0	0	0	0
Minerals	Cases	105	105	81	81	78	68	69	66
Fuels Treatment	Macres	3.3	8.9	9.8	8.5	12.4	7.2	8.2	5.2
Lands Purchased	Acres	11	0	0	0	0	0	0	0

Energy Efficiency

The energy cost will be essentially the same under all alternatives because of the base cost of providing minimal protection and management. Energy costs to users of the National Forest will vary by amount of activity, but the costs will result in increased benefits, some of which produce energy in return.

The capability of the Forest to produce energy depends on the production of oil, gas, and wood residues. Public interest in these energy sources has continued to increase within the past few years, although at this date the oil and gas resource remain in the exploration and developmental stages. Wood residues have not been traditional sources of energy on the Forest, but demand is increasing. All alternatives will utilize wood residues for additional energy production.

A large part of the Forest will be open to minerals development under all alternatives. Alternatives do vary, however, in the degree of restriction placed upon developers due to the presence of wilderness and/or natural areas.

Wildland livestock grazing, which is considered more energy efficient than livestock feedlots, will increase significantly only in Alternative C.

SECTION D SUMMARY OF EFFECTS

Relationship Between Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long Term Productivity

Short-term uses are those that occur on an annual basis while long-term productivity refers to the capability of the Forest to continue producing goods and services for another 50 years, or five periods. Short term uses include timber and fuelwood harvest, all recreational uses, grazing, mineral extraction and special land uses.

Soil and water are the primary resources upon which productivity is based. Short-term uses which erode soils and damage soil-water relationships impair long-term productivity. Management requirements provide for protection of long-term productivity by requiring mitigation or enhancement measures in the short run.

All alternatives maintain and enhance long-term productivity, although some loss will occur in the short term in localized areas. This loss in productivity will essentially cease when permitted grazing use is brought into line with capacity. Watershed condition will improve in all alternatives, although parts of the Forest will remain in unsatisfactory condition past the end of the planning period. At that time, unsatisfactory watershed condition will be essentially unrelated to man's activities.

Adverse Environmental Effects That Cannot Be Avoided

Unavoidable adverse environmental effects result from managing land for one resource or set of resources at the expense of others. Management requirements in prescriptions mitigate most adverse effects by limiting extent and duration of impacts.

Unavoidable environmental effects are:

Recreation. Project activities, such as timber sales and associated road construction, temporarily disrupt recreation uses by reducing or changing the type of recreation use that previously occurred on the area. Increased conflict between user groups is greatest in Alternatives PA and C.

Visual Quality. Timber harvest and road construction activities cause a temporary change in the landscape that is normally distasteful to observers. Debris on the ground, understory vegetation disturbance, dust, and noise are normally experienced as a result of such activities. These effects are short-term and most pronounced in Alternatives PA and C.

Wildlife. Increased human activities in project areas temporarily displace wildlife. Increased dispersed recreation use will have long-term adverse impacts on wildlife by disturbing life-maintaining activities. Alternative C, with high commodity outputs, has the greatest effects from project activities. Alternatives B, D and the PA pose the greatest impacts from dispersed recreation.

Delay in balancing grazing use with forage capacity until the third period will delay possible increases in forage-consuming wildlife populations. Improvement in aquatic resources will also be delayed. Alternative C is the only alternative which would not have this impact.

Livestock Forage. Timber harvesting, hunting, and fuelwood cutting may have a short-term disruptive effect on proper livestock distribution and forage utilization. There may also be a short-term decrease in available forage because of disturbance by logging equipment and accumulations of slash.

Timber. Reduced growth and increased mortality in timber stands not intensively managed for timber, or where management practices must be modified in consideration of other resources will occur in all alternatives, but especially in Alternatives A, B, and F.

Soil and Water. Soil loss and degradation of water quality is a result of the managed road system maintenance levels and road construction or reconstruction. Overall, this effect is greatest in Alternatives A, B and F, although the PA and Alternative C will have greater local effects because more miles of road are constructed.

Air Quality. Silvicultural, road construction, and prescribed burning activities cause slight temporary changes in air quality. These changes, which occur only during harvesting, construction and burning, will be in the form of increased smoke and dust in the air. Alternatives B and D create the most smoke because prescribed fire is used extensively for nonstructural wildlife improvements. The PA and Alternative C increase the amount of dust more than other alternatives because they call for more timber harvest.

Cultural Values. Disruption of prehistoric or historic evidence of early man's occupancy on the Forest is possible under all alternatives. The risk is greatest under Alternatives C and A because of the high levels of timber harvest, road construction and pinyon-juniper fuelwood harvest.

Fire Management. During the short-term period of logging and thinning operations, there are temporary increases in fire hazard from waste material left on the ground in the form of unmerchantable trees, tops, limbs, and needles. This risk is greatest in Alternatives PA and C.

Community Values. Long-term increases in recreation use, especially downhill skiing, will increase population and cost of living in communities with rural mountain lifestyles. These effects will be greatest under Alternatives PA, D, and E.

5. List of Preparers

James R. Abbott Forest Supervisor B.S. Forestry	Twenty-seven years of Forest Service experience in two Regions, on four National Forests; Fire Management in Chief's Office in Washington, D.C.; Forest Supervisor of Lincoln National Forest for eight years. Leader of the Forest Management Team; provided overall direction for the Forest planning process.
Janet M. Baca Computer Assistant	Five years clerk/steno experience; three years computer experience. Provided clerk/steno services and maintained planning process records. Computer Assistant responsible for file maintenance and data management.
M. Maxine Bean Support Services Supervisor	Seven years word and data processing experience; two years legal technician experience. Provided word processing service for Plan documents.
Joy E. Berg Land Management Planning Staff Officer B.S. Mathematics M.S. Forestry 1/	Two years in resource management on Ranger Districts; two years in programming and planning on National Forests; one year in economics as applied to land management planning on the Forest. Two years as primary staff in Land Management Planning on the Forest. Provided direction and coordination for the overall development of the Environmental Impact Statement and Forest Plan; served as Operations Research Analyst (one year).
Richard L. Carlson Forest Landscape Architect B.F.A. Landscape Architecture M.L.A. Landscape Architecture	Six years experience as Landscape Architect on two Forests. Member of Interdisciplinary Team; provided recreation and visual input for planning process. Coordinated final changes in Environmental Impact Statement and Forest Plan.
Donald E. Cunico Range, Wildlife & Watershed Staff Officer B.S. Range Management	Twenty-five years experience in Range and Wildlife Management which includes five years as Range Conservationist, nine years as District Ranger, and eleven years as Range and Wildlife Staff Officer on two Forests. Provided Range, Wildlife and Watershed input into planning process.
Norman L. Curran Mayhill District Ranger, 1984 to Present Cloudcroft District Ranger, 1978 to 1984 B.S. Agriculture (Range Management)	Twenty-four years of Forest Service experience in Range, Wildlife, and Forestry with experience on ten Ranger Districts in two Regions including fourteen years as District Ranger on two Forests. Developed management concerns as member of the Forest Management Team; organized local public involvement; provided direction for "on the ground" application of the Forest Plan.

1/ No longer with the Lincoln National Forest
2/ Retired from Forest Service

Tom W. Davis Guadalupe District Ranger B.S. Forest and Range Management 1/	Thirteen years experience with the Forest Service in two Regions and four National Forests, including one year as Range and Wildlife Substaff, four years as Range Conservationist on a National Grassland Ranger District two years working for the Recreation Lands Staff at the Supervisor's Office level as a Liaison Officer, and six years as a District Ranger. Developed management concerns as member of the Forest Management Team; organized local public involvement, provided direction for "on the ground" application of the Forest Plan.
Donald G. DeLorenzo Interdisciplinary Team Leader B.S. Agriculture (Wildlife Science) M.S. Agriculture (Wildlife Science) 1/	Two and one-half years as the Interdisciplinary Team Leader, or as a team member. Two years of natural resource management at the District level. Interdisciplinary Team Leader and Interdisciplinary Team member; provided resource input and coordination throughout the planning process.
Max Goodwin Cloudcroft District Ranger B.S. Forest Management	Eighteen years of Forest Service experience on five Ranger Districts, six Forests and two Regional Office assignments which included nine years in Timber, Fire and Recreation, four years Assistant Timber Staff, four years in Regional Office and one year as District Ranger. Developed management concerns as member of the Forest Management Team; organized local public involvement; provided direction for "on the ground" application of the Forest Plan.
Sidney P. Gordon Smokey Bear District Ranger B.S. Zoology 2/	Four years experience as Range Conservationist, nine years experience as Range, Wildlife and Watershed Staff Officer on two National Forests; fourteen years experience as a District Ranger. Developed management concerns as member of the Forest Management Team; organized local public involvement; provided direction for "on the ground" application of the Forest Plan.
David M. Johnson Forest Archaeologist B.A. Anthropology M.A. Anthropology	Four years experience with the Forest Service on two National Forests. Provided cultural resources input to the planning process.
James R. Keller Computer Specialist 2/	Three years experience in engineering data processing; ten years experience as Engineering Computer Applications Manager in two Regions; four years experience as Computer Specialist; Computer Systems Group Leader on the Forest. Wrote data entry programs for Land Management Planning data entry; coordinated processing on Forest-based ADP equipment; provided guidance for batch processing.

Frank B. Leonard Fire, Recreation and Special Uses Staff Officer, 1984 to Present Mayhill District Ranger, 1977 to 1984 B.S. Range Management	Twenty-eight years of Forest Service experience in Range, Wildlife, Forestry, and Fire Management, including sixteen years experience as District Ranger on three Forests in Region 3, and one year in current assignment. Developed management concerns as member of the Forest Management Team; organized local public involvement; provided direction for "on the ground" application of the Forest Plan. Provided data on fire and recreation for the planning process.
Stephen M. Lucas Forest Wildlife Biologist B.S. Agriculture (Wildlife Science)	Thirteen years of Forest Service experience in resource management areas on five National Forests which includes seven and one half years as a Wildlife Biologist on three National Forests. Member of Interdisciplinary Team; provided technical wildlife and range resource information for the planning process.
Nancy A. Matteson Cartographer Technician 1/	Nine years as Forest's Cartographer. Provided graphics, maps, layout and glossary for DEIS.
John McClain Forest Hydrologist B.S. Aquatic Biology M.S. Natural Resources 1/	Six years experience as Hydrologist. Member of Interdisciplinary Team; provided watershed input to planning process.
Gary A. Mick Forest Engineer B.S. Civil Engineering	Thirteen years experience as Civil Engineer on four National Forests. Provided engineering input related to facilities, including transportation system; conducted ORV public workshops.
Harriet Plumley Assistant Forest Planner B.A. Biology M.L.A. Landscape Architecture Ph.D. Resource Management and Planning	Six years with Backcountry Research Project in the Northeastern Forest Experiment Station. Two years as Operations Research Analyst, providing input for Forest planning conmputer models, such as FORPLAN and IMPLAN. One year as Assistant Forest Planner.
Stephen T. Sams Smokey Bear District Ranger B.S. Forestry	Fifteen years of Forest Service experience on five National Forests and seven Ranger Districts which included five years in Timber, nine years as Recreation and Lands Staff, and one year as District Ranger. Developed management concerns as member of the Forest Management Team; organized local public involvement, provided direction for "on the ground" application of the Forest Plan.

Wray Schildknecht Operations Research Analyst B.S. Wildlife Sciences 1/	Two years as Operations Research Analyst providing input for data base construction, data management and initialization of FORPLAN model development.
Patricia M. Spoerl Forest Archaeologist B.A. Anthropology Ph.D. Anthropology 1/	Four years experience with the Forest Service. Coordinated revision and editing of DEIS and Forest Plan. Provided cultural resources input to planning process.
Stanley W. Stroup Timber, Lands and Minerals Staff Officer, 1984 to Present Recreation and Lands Staff Officer, 1977 to 1984	Seven years experience on Ranger Districts, principally Timber Management; three and one-half years as District Ranger; five years in Timber Management at Forest level; seven years as Recreation and Lands Staff Officer; one year in current assignment. Provided recreation, minerals, wilderness, lands and timber input for the planning process.
Dennis M. Watson Forester B.S. Forest Management	Twenty years Forest Service experience in timber at District and Forest level which includes four years as Timber Substaff. Member of Interdisciplinary Team; coordinated and provided resource maps and data through the RIDS computer mapping and reporting system; provided Timber input to the planning process.
Laurence J. Whelan Fire/Timber Staff Officer B.S. Forestry 1/	Twenty-one years experience in forestry; seventeen years on four Ranger Districts. Provided input on Timber and Fire for the planning process.
David C. White Interdisciplinary Team Leader B.S. Forestry M.S. Watershed Science 1/	Two and one-half years as Interdisciplinary Team Leader, providing direction and coordination for the overall planning effort.
Robert E. Wood Land Management Planning Staff Officer B.S. Forestry M.S. Forestry	Ten years as Forest Pathologist in two Regions; two and one-half years as a Regional Interdisciplinary Team Member; one year as Primary Staff in Land Management Planning. Provided direction and coordination for the overall development of the Environmental Impact Statement and Forest Plan from 1983 to present.

6. Mailing List

Copies of the Lincoln National Forest Proposed Land and Resource Management Plan and Environmental Impact Statement were distributed to the following agencies, organizations, and individuals. Names marked with an asterisk received a copy of the Forest Plan, EIS and Summary. Others received only the Summary.

Federal

Advisory Council on Historic Preservation *
  Washington, DC
Animal & Plant Health Inspection Service, USDA *
  Hyattsville, MD
Apache-Sitgreaves National Forests *
  Springerville, AZ
Army Corps of Engineers, DOD
  Albuquerque, NM
  Washington, DC *
Bureau of Indian Affairs
  Albuquerque, NM *
  Mescalero, NM
Bureau of Land Management *
  Carlsbad, NM
  Las Cruces, NM
  Roswell, NM
  Santa Fe, NM
Carlsbad Caverns & Guadalupe Mtn. National Parks *
  Carlsbad, NM
Carson National Forest *
  Taos, NM
Cibola National Forest *
  Albuquerque, NM
Coconino National Forest *
  Flagstaff, AZ
Coronado National Forest *
  Tucson, AZ
Delaware River Basins Commission, Environmental Unit
Deputy Assistant Secretary of Defense, DOD *
  Washington, DC
Environmental Protection Agency *
  Dallas, TX
  Washington, DC
Equal Employment Opportunity Commission *
  Washington, DC
Federal Aviation Administration *
  Fort Worth, TX
Federal Energy Regulatory Commission *
  Washington, DC
Federal Highway Administration *
  Fort Worth, TX

Federal Railroad Administration *
Washington, DC
General Services Administration *
Washington, DC
Gila National Forest *
Silver City, NM
Interstate Commerce Commission *
Washington, DC
Kaibab National Forest *
Willioms, AZ
NOAA Ecology & Conservation Div.
Washington, DC
National Park Service
Santa Fe, NM
Alamogordo, NM
National Solar Observatory
Sunspot, NM
Office of Equal Opportunity, USDA *
Washington, DC
Prescott National Forest *
Prescott, AZ
Rocky Mtn. Forest & Range Experiment Station, USDA *
Fort Collins, CO
Santa Fe National Forest *
Santa Fe, NM
Science & Education Administration, USDA *
Washington, DC
Soil Conservation Service *
Roswell, NM
Washington, DC
Albuquerque, NM
Tonto National Forest *
Phoenix, AZ
U.S. Air Force, DOD *
Washington, DC
U.S. Navy, DOD
Washington, DC
USDA Forest Service, Region 3 *
Albuquerque, NM
U.S. Department of Commerce *
Washington, DC
U.S. Department of Energy *
Washington, DC
U.S. Dept. of Health & Human Services *
Washington, DC
U.S. Dept. of Housing & Urban Development *
Fort Worth, TX
U.S. Department of Interior *
Washington, DC
U.S. Department of Labor *
Washington, DC

U.S. Department of Transportation *
Washington, DC
U. S. Fish and Wildlife Service *
Albuquerque, NM

State

Museum of New Mexico *
Santa Fe, NM
NM Department of Agriculture *
Las Cruces, NM
NM Department of Forestry
Capitan, NM
NM Department of Game and Fish *
Roswell, NM
NM Division of State Forestry *
Socorro, NM
NM State Bureau of Mines and Minerals *
Socorro, NM
NM State Engineer *
Roswell, NM
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Representative Robert B. Corn *
Representative Toots Green *
Representative Ben Hall
Representative Maurice Hobson *
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Representative Robert S. Light
Representative James K. Otts
Representative Leonard Sheffield, Jr.
Senator Budd H. Hebert
Senator Cress Stuart Ingle
Senator Timothy Z. Jennings
Senator James Martin
Senator William Vandergriff
Senator Marvin L. Watts *

New Mexico State Clearinghouse copies for distribution to:
Agricultural Experiment Station, New Mexico State University *
Cooperative Extension Service, New Mexico State University *
Eastern New Mexico University *
Governor of New Mexico *
New Mexico Bureu of Mines and Mineral Resources *
New Mexico Commissioner of Public Lands *
New Mexico Communications Divisions *
New Mexico Crop and Livestock Reporting Service *
New Mexico Department of Agriculture *
New Mexico Department of Commerce and Industry *
New Mexico Department of Developement *
New Mexico Department of Finance and Administration *
New Mexico Department of Game and Fish *

New Mexico Department of Natural Resources *
New Mexico Economic Development Division *
New Mexico Employment Security commission *
New Mexico Environmental Improvement Division *
New Mexico Institute of Mining and Technology *
New Mexico Natural History Institute *
New Mexico State Engineer *
New Mexico State Highway Commission *
New Mexico State Highway Department *
New Mexico State Historic Preservation Officer *
New Mexico State Forestry Division *
New Mexico State Parks Division *
New Mexico State Police *
New Mexico Planning Division *
New Mexico State Tourist Division *
New Mexico State University *
University of New Mexico *

Local

City of Alamogordo *
Village of Capitan
Chaves County Commissioners *
Eddy County Commissioners *
Lincoln County Commissioners
Otero County Commissioners *

Indian Tribal Units

Mescalero Apache Tribe *
Wendell Chino

Congressional Delegation

Senator Jeff Bingaman *
Senator Pete Domenici *
Representative Manuel Lujan, Jr. *
Representative Bill Richardson *
Representative Joe Skeen *

Libraries

Alamogordo Public Library *
Carlsbad Public Library *
Eastern New Mexico University Library *
Portales, NM
Fort Lewis College Library *
Durango, CO

New Mexico State University Library *
  Alamogordo, NM
  Los Cruces, NM
Ruidoso Public Library *
University of Texas at El Paso Library *

Educational Institutions

Colorado State University
  Forestry School
Eastern New Mexico University *
New Mexico State University *
  Crop & Soil Science Dept.
  Deportment of Fish & Wildlife
Northern Arizona University *
  School of Forestry
St. John's College *
  Natural History Institute in Santa Fe
Son Juon College
State University of New York, Plattsburg *
  Center for Earth & Environmental Science
University of Chicago
  Astronomy Dept.
University of Houston at Clear Lake City *
University of New Mexico *
  Maxwell Museum of Anthropology
  Recreation Program
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Industry or Business

Albuquerque Journal *
Amoco Production Company
Amselco Exploration Inc.
Arizona Public Service
ASARCO, Inc.*
Bonnell Ranch, Inc.
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Center for Anthropological Studies *
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Organizations

Alamogordo Chamber of Commerce
American Motorcycle Association *
American Wilderness Alliance *
Carlsbad Citizens for Responsible Land Management *
Desert Trophy Hunters
Dona Ana County Association Sportsman *
Eagle Creek Summer Home Assn. *
El Paso Baptist Association
El Paso Cactus & Rock Club *
El Paso Color Camera Club, Inc. *
El Paso Trans-Pecos Audubon Society *
El Paso Wilderness Preservation Committee *
Independent Petroleum Association of NM
Motorcycle Recreation, Inc. *
The Nature Conservancy *
National Parks & Conservation Association *
National Wild Turkey Federation *
Las Cruces, NM

Native Plant Society of New Mexico *
NM Audubon Council
  Albuquerque, NM
  Cerrillos, NM
  Silver City, NM
NM Cattle Growers *
NM Farm & Livestock Bureau *
NM Oil & Gas Association
NM Public Land Council
NM Wilderness Study Committee *
NM Wildlife Federation *
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  Albuquerque, NM
NM Wool Growers *
Pinon Mutual Domestic Water Consumer's Assn. *
Prairie Dawg Motorcycle Club
Robin Hood Water User's Assn.
Sierra Club
  El Paso Regional Group *
  Southwest Group *
  Santa Fe Group *
  Tularosa Basin Group *
Southeastern NM Grazing Association *
Upper Hondo Soil and Water Conservation District
The Wilderness Park Coalition *
The Wilderness Society *
  Washington, DC
  Phoenix, AZ
The Wildlife Society *
Wildlife Management Institute
Yucca Council, BSA

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American Television Relay, Inc.
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Mr. & Mrs. Donn J. Dose
Leeland F. & Holly Dougharty
Douglas Real Estate Company
Tommy E. Dow
David Dunn, Jr.
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Eagle Creek Riding Stables
Eagle Creek Summer Home Association *
County of Eddy
Eddy County Mountain Desert Rescue Squad
Mr. William J. Edgar
Eldorado Archeology
Mr. & Mrs. Jack T. Eldridge
Buck Ellison
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Mr. Chester Fine
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KOAT TV
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KVIA TV
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Millard Lewis
Mr. Orville Lewis *
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Lewis Family LTD. Partnership *
Caroline Lietzman *
Lincoln Cablevision, Inc.
Lincoln Communications
County of Lincoln

Lincoln County Historical Society
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Loper Rentals
Mr. J. B. Loudon
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Mahill Ranch Limited
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McVean & Barlow, Inc.
Means, Sackett & Hunt Partnership *
Wilmer G. Medlock *
Don Meier Productions
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E. E. Miller
Mrs. Lois A. Miller
Mrs. Roberto S. Miller
C. Richard Mitchell
Billie Ruth Morris
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Motorola Communications & Electronics, Inc.
Mountoin Bell
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Mrs. Evelyn M. Murphy
Albert Muse
Museum of New Mexico
Museum of Northern Arizona
National Science Foundation
T. C. Newkirk, Jr.
NM Archaeologicol Service, Inc.
New Mexico Broadcasting Company
NM State Highway Department
  Roswell, NM
  Santo Fe, NM
NM State Radio Communications Department
NMSU Botany & Entomology Dept.

NMSU/Joel Diemer
NMSU/CRMD
Nogal Mutual Domestic Water Con. & Mutual Sewage Works Assn.
Lawrence E. North
Northland Research
Mr. Kenneth Nosker
Otero Cable Television Co., INc.
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Glossary

A

Access - See public access.

Acre-Foot - A water measurement term, equal to the amount of water that would cover an area of one acre to a depth of one foot (43,560 cubic feet).

Affected Environment - The natural and physical environment and the relationship of people to that environment that will or may be changed by proposed actions.

Allotment - See range allotment.

Allowable Sale Quantity (ASQ) - The quantity of timber that may be sold from the area of suitable land covered by the Forest plan for a time period specified by the plan. This quantity is usually expressed on an annual basis as the "average annual allowable sale quantity."

Alternative - In Forest planning, a mix of management prescriptions applied in specific amounts and locations to achieve a desired management emphasis as expressed in goals and objectives.

Amenity - The pleasurable, educational, or aesthetic features of the land or resources.

Analysis Area - The basic land unit of analysis which is used to allocate and schedule management prescriptions.

Analysis of the Management Situation (AMS) - A determination of the ability of the planning area to supply goods and services in response to society's demand for these goods and services.

Animal Unit Month (AUM) - The quantity of forage required by one mature cow (1,000 lbs.) or the equivalent for one month.

Arterial Roads - Roads comprising the basic access network for National Forest System administrative and management activities. These roads serve all resource elements to a substantial extent, and maintenance is not normally determined by the activities of any one element. They provide service to large land areas and usually connect with public highways or other Forest arterial roads to form an integrated network of primary travel routes. The location and standard are determined often by a demand for maximum mobility and travel efficiency rather than by a specific resource management service. Usually they are developed and operated for long-term land and resource management purposes and constant service.

B

Basal Area - The cross-sectional area of a stand of trees measured at breast height.

Benchmark - A category of Forest planning alternatives used to establish standards by which to compare alternatives considered in detail. Benchmark alternatives include minimum level, minimum acceptable level, maximum resource levels, and maximum present net value levels.

Big Game - Those species defined by law which are managed as a sport hunting resource.

Biological Growth-Potential - The average net growth attainable in a fully stocked natural forest stand.

Board Foot - A unit of timber measurement equaling the amount of wood contained in an unfinished board 1 inch thick, 12 inches long, and 12 inches wide.

C

Canopy - The more or less continuous cover of branches and foliage formed collectively by the crown of adjacent trees and other woody growth.

Capability Area - Those areas of land delineated for the purpose of estimating responses to various management practices, resource values, output coefficients, and multiresource or joint production functions. Capability areas may be synonymous with ecological land units, ecosystems, or land response units.

Carrying Capacity - The optimum density of an animal species which a given environment or range is capable of sustaining, without deteriorating that environment or range.

Clearcut - Removal of all standing trees over a given area of land in a single cut. Clearcut areas may occur in large or small blocks, patches or strips.

Closure - The administrative order restricting either location, timing, or type of vehicle or person use in a specific area.

Collector Roads - Roads constructed to serve two or more elements but which do not fit into the other two categories (arterial or local). Construction costs of these facilities are prorated to the respective element served. These roads serve smaller land areas and are usually connected to a Forest arterial or public highway. Forest collector roads are operated for constant service.

Commercial Forest Land (CFL) - Forest land which is producing or capable of producing crops or industrial wood and has not been reserved or deferred for other uses.

Competition - When organisms of the same or different species utilize a common resource that is in short supply; or, when organisms seeking a common resource that is not in short supply nevertheless harm one another in the process.

Consumptive Use - A use of resources that reduces the supply, such as logging and mining. (See also nonconsumptive use.)

Cord - A unit of gross volume measurement for staked roundwood based on external dimensions, generally implies a stack 4 feet high by 4 feet wide and 8 feet long. The solid content of this measurement would equal 128 cubic feet. The actual volume of the above measurement is approximately 80 cubic feet.

Corridor - A linear strip of land which has ecological, technical, economic, social, or similar advantages over other areas for the present or future location of transportation or utility rights-of-way.

Critical Habitat - That portion of a wild animal's habitat that is critical for the continued survival of the species.

Cubic Foot - A unit of measure usually referring to wood volume (1 ft. x 1 ft. x 1 ft.).

Culmination of mean annual increment (CMAI) - See Mean Annual Increment.

Cultural Resources - The physical remains (artifacts, ruins, burial mounds, petroglyphs, etc.) and conceptual content or context (as a setting for legendary, historic, or prehistoric events, as a sacred area of native peoples, etc.) of an area associated with human use capable of providing scientific or humanitistic understanding of past human behaviour, cultural adaptation and related topics through the application of scientific or scholarly techniques of investigation.

Cutting Cycle - The planned, recurring period of time between successive cuttings or harvests in a stand of trees.

D

DE-FORPLAN - A specific linear programming computer model designed for use in Forest Service planning.

Demand - The quality of goods or services called for, given a price or other combination of factors.

Departure- A schedule which deviates from the principle of nondeclining flow by exhibiting a planned decrease in the timber sale and harvest schedule at any time in the future.

Developed recreation - Recreation use that utilizes constructed facilities and that concentrates at developed sites, e.g., campgrounds, picnic grounds, downhill ski areas, and observation sites.

Development - Working the improvements to physically expose or define locatable minerals.

Diameter at Breast Height (DBH) - Diameter of a tree approximately 4 1/2 feet above the ground.

Diameter Root Collar - This measurement is usually within 12 inches of ground level. The point of measurement is located just above the normal swelling of the tree stem.

Dispersed recreation - Recreation use that occurs outside of developed sites and requires few, if any, facilities other than roads and trails. Dispersed recreation activities include hiking, backpacking, cross-country skiing, snowmobiling, viewing scenery and driving for pleasure.

District - See Ranger District.

Diversity - The distribution and abundance of different plant and animal communities, habitat components, and species within the area covered by a land and resource management plan.

Draft Environmental Impact Statement (DEIS) - The statement of environmental effects required for major Federal actions under Section 102 of the National Environmental Policy Act (NEPA) and released to the public and other agencies for comment and review.

E

Ecosystem - A complex of living organisms interacting with their environment.

Edge - The more or less well-defined boundary between two elements of the environment, e.g., field/woodland.

Endangered Species - Any species which is in danger of extinction through all or a significant portion of its range and which has been designated in the Federal Register by the Secretary of the Interior as an endangered species.

Enduros - Mechanized or non-mechanized competition over a designated course with terrain ranging from difficult to open roads. Scoring is based upon maintaining an assigned speed average or averages and is done at checkpoints on the course. Speed is not the only object.

Environmental Assessment - A document of an environmental analysis which provides a basis for determining whether to prepare an environmental impact statement or a finding of no significant impact, and includes a discussion of alternatives and their impacts adequate to allow an alternative to be chosen.

Ephemeral Stream - A stream which flows only at certain times of the year when it receives water from springs or from some surface source, such as melting snow in mountainous areas.

Erosion - The wearing away of the land surface by running water, wind, ice, or other glacial agents. Erosion includes detachment and movement of soil or rock fragments by water, wind, ice, or gravity.

Even-Aged Management - The combination of actions that results in the creation of stands in which trees of essentially the same age grow together.

Even-Flow - Maintaining a relatively constant supply of timber from decade to decade.

Experience Levels - The range of opportunities for satisfying basic recreation needs of people. A scale of six experience levels ranging from "primitive" to "urban" is planned for the National Forest System.

Exploration - The broader term for mineral exploring or investigation of newly discovered areas.

Extensive Grazing - Season-long use of rangelands with distribution of livestock occurring through riding, salting, etc.

F

Facility Condition Class - The rating system used in the Recreation Information Management System to classify the condition and maintenance needs of recreation improvements.

Feral Goats - Goats escaped from domestication and have become wild.

Final Cut - Removal of the last seed bearers on shelter trees after regeneration is considered to be established under a shelterwood system.

Fire Risk - The probability of a fire starting from natural or man-made causes.

Floodplain - Land adjacent to a channel which is covered with water when the stream overflows its banks.

Forage - Edible portions of plants containing some nutrient value.

Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974- An act of Congress requiring the preparation of a program for the management of the National Forest's renewable resources and of land and resources management plans for units of the National Forest System. It also requires a continuing inventory of all National Forest System lands and renewable resources.

Forest land - Land at least ten percent stocked by forest trees of any size, or formerly having had such tree cover, and not currently developed for nonforest use.

Forest-wide Standard - A performance criterion indicating acceptable norms, specifications, or quality that actions must meet to maintain the minimum considerations for a particular resource. This type of standard applies to all areas of the Forest regardless of the other prescriptions applied.

FSH - Forest Service Handbook.

FSM - Forest Service Manual.

Fuel Break - Any natural or constructed barrier utilized to segregate, stop and control the spread of fire or to provide a control line from which to work.

Fuel Treatment - The rearrangement or disposal of natural or activity fuels to reduce the fire hazard. Fuels are defined as both living and dead vegetative materials consumable by fire.

Fuelwood -

CFL Fuelwood - Fuelwood generated by timber sales and/or natural mortality of species such as Douglas fir, ponderoas pine, etc. from commercial Forest lands.

PJ Fuelwood - Fuelwood, primarily pinyon pine and juniper, produced primarily in the woodland zone.

Full-Service Management - Management of developed recreation facilities and dispersed recreation areas to the established standards and objectives for public service and use.

G

Game Species - Any species of wildlife or fish normally harvested by hunters, trappers, and fishermen under State or Federal Laws.

Goals - A concise statement of the state or condition that the land and resource management plan is designed to achieve. A goal is usually not quantifiable and may not have a specific date for completion.

Goods and Services - The various outputs produced by forest and rangeland renewable resources, the tangible and intangible values of which are expressed in market and nonmarket terms.

Grazing Capacity - The maximum number of animals that can graze an area without damage to the vegetation or related resources.

Grazing Permittee - An individual or other legal entity who has been granted a term grazing permit to graze a specified number of livestock for a specific period on a range allotment.

Ground Water - Water in a saturated zone or a geologic stratum.

Group Selection - A modification of the selection silvicultural system in which trees are removed in small groups at a time.

Growing Season - The months of the year a species of vegetation grows.

Growing Stock Level(GSL) - The number or volume of trees growing in a forest or in a specified part of it.

Guideline - Any issuance that assists in determining the course of direction to be taken in any planned action to accomplish a specific objective.

H

Habitat - The natural environment of a plant or animal. The locality where the organizm may generally be found, and where all essentials for its development or existence are present. Habitats are described by their geographical boundaries, or with such terms as "shady woodlands", "banks of streams", "dry hillsides", etc.

Habitat Grouping - Grouping of habitat types in logical categories to facilitate resource planning and public presentations.

Habitat Type - An aggregation of all land areas potentially capable of producing similar plant communities at climax.

Harvest Level - The quantity of timber that may be sold from the area of land covered by a Forest Plan for a time period.

Herbicide - A chemical compound used to kill or control growth of undesirable plant species.

Herbivore - An animal that feeds on plant substances.

Human Resource Unit (HRU) - A human geographic area characterized by particular patterns of cultural lifestyles, economic conditions, institutional arrangements, and topography.

Incidental Grazing - Grazing use that occurs on lands not managed for the production of domestic livestock. May occur as a result of natural herd movement, trailing of livestock, or the use of domestic livestock for recreation.

Indicator Species - A wildlife species whose presence in a certain location or situation at a given population level indicates a particular environmental condition. Population changes are believed to indicate effects of management activities on a number of other wildlife species.

Individual Tree Selection - Involves the removal of selected trees from specified age classes over the entire stand in order to meet predetermined goals of age class and species distribution in the remaining stand.

Integrated Pest Management - A systematic decision making process and the resultant management actions which derive from consideration of pest-host systems and evaluation of alternatives for managing pest populations at levels consistent with resource management objectives. Forest Service Manual FSM 3400.

Integrated Stand Management - A concept used to design timber sales to accomplish multi-resource objectives by utilizing existing and potential vegetation types. Application of ISM results in mosaics of vegetation consisting of stands in different stages of growth and with contrasting conditions, arranged in a manner which satisfies special needs of resources such as wildlife, timber, soil, watersheds, and recreation. Treatments are developed for stands and aggregated into alternatives designed to satisfy various objectives. That alternative which best satisfies objectives is selected and applied on the ground.

A timber stand, as the term is used here, refers to a community of trees with similar characteristics which differentiate it from other communities of trees. Timber stands range in size from 10 to 100 acres, with an optimum size between 20 and 40 acres (aspen stands are often smaller than 10 acres). Each timber sale area consists of a number of stands, some of which are considered possible cutting units. A cutting unit is an area which may receive a specific treatment, for instance removal of an overstory. Cutting units may consist of one or more individual stands or may be part of a large stand.

Cutting unit boundaries are established by means of a sale area field reconnaissance. Cutting unit boundaries may and often do redefine stand boundaries to facilitate management objectives such as visual quality or dwarf mistletoe management, or activities such as fuels management and timber harvest. Cutting units are assembled into various sets, using an interdisciplinary approach, to create a range of timber sale alternatives. Each alternative is designed to achieve one or more objectives. Cutting units are distributed spacially to create desired age-class distribution, lessen the area impacted by timber management activities, or to provide habitat diversity for wildlife. Stands not selected for treatment may be scheduled for entry in subsequent ten year timber sale programs.

Typically, foresters delineate timber stands, and by means of extensive examinations, describe present conditions and possible treatments. About three years before the scheduled date of a sale, a reconnaissance is completed and possible cutting units are developed. For instance, a unit might consist of two adjacent dwarf mistletoe-infested stands and the proposed treatment might consist of removing all overstory trees to protect an understory.

An interdisciplinary team, consisting of specialists representing appropriate resources, examines the potential cutting units, and assembles them in combinations to achieve various objectives. For instance, road construction may be minimized in one alternative by selecting only cutting units located in one part of the sale area. All cutting units having a high priority for treatment may be selected, without regard to their distribution, to achieve the objectives of another alternative.

The interdisciplinary team also determines the effects of each alternative on all resources. For instance, concentrating all cutting units in one part of a sale, although it may minimize road construction costs and soil loss, might increase visual impacts and reduce habitat diversity for wildlife. On the other hand, treating all high priority stands may satisfy the objective of creating and maintaining healthy stands, but with significantly higher road costs and reduced habitat diversity.

The responsible offical (usually the Forest Supervisor) selects that alternative which best satisfies the objectives for the sale, and at the same time, best achieves the objectives stated in the Forest Plan.

Integrated Stand Management - A concept used to design timber sales to accomplish multi-resource objectives. It is applied by identifying stands or portions of stands and developing unique prescriptions which satisfy objectives for appropriate resources such as wildlife, timber, soil, water, and recreation. That combination of prescriptions which best satisfies objectives is then selected and applied on the ground.

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Intensive Grazing - Grazing management that controls distribution of cattle and duration of use on the range, usually by fences, so parts of the range are rested for a prescribed period.

Interdisciplinary Team (ID Team) - Collective participation of two or more disciplines or fields of specialized technical knowledge for natural resources management.

Interpretive Services (IS) - Visitor information services designed to present inspirational, educational, and recreational values to Forest visitors to provide the utmost in understanding, appreciation, and enjoyment from their Forest experience.

Issue - See Public Issue.

J

K

K-V Funds - Monies generated from timber sale receipts which are retained for improvements (timber, wildlife, watershed and recreation) on the sale area. Authorized by Kuntson and Vandenberg Act of 1930.

L

Land Exchange - The conveyance of non-Federal land or interests to the United States in exchange for National Forest System land or interests in land.

Land Line - For Forest planning purposes, National Forest property boundaries.

Late Forest Succession - A stage of forest succession where the majority of trees are mature or overmature.

Leasable Minerals - See Minerals, Leasable.

Linear Programming - A mathematical method used to determine the most effective allocation of limited resources between competing demands when both the objective (e.g., profit or cost) and the restrictions in its attainment are expressible as a system of linear equalities or inequalities (e.g., $y = a + bx$).

Local Dependent Industries - Industries relying on National Forest outputs for economic activity.

Local Roads - Roads constructed, maintained, and used for the activities of a given resource element. Some use may be made by other element activities, but normally maintenance is not affected by such use. These roads connect terminal facilities with Forest collector or Forest arterial roads or public highways. The location and standard usually are determined by the requirement of a specific resource activity rather than by travel efficiency. Forest local roads may be developed and operated for constant or intermittent service depending on land use and resource management objectives for the area served by the facility.

Locatable Minerals - See Minerals, Locatable.

Long-Term Sustained Yield Capacity - The highest uniform wood yield from lands being managed for timber production that may be sustained under a specified intensity of management consistent with multiple-use objectives.

M

M - Thousand.

MM - Million.

Management Action - Any activity undertaken as part of the administration of the Forest.

Management Area - An area of similar management goals and a common management prescription. Consists of a grouping of capability areas selected through evaluation procedures and used to locate decisions and resolve issues and concerns.

Management Concern - An issue or problem requiring resolution, or condition constraining management practices identified by the interdisciplinary team.

Management Direction - A statement of multiple use and other goals and objectives, the management prescriptions, and the associated standards and guidelines for attaining them.

Management Indicator Species (MIS) - See indicator species.

Management Opportunity - A statement of general actions, measure, or treatments that address a public issue or management concern in a favorable way.

Management Practice - A specific measure, action, or treatment.

Management Prescription - Management practices selected and scheduled for application in a specific area to attain multiple use and other goals and objectives.

Mass Movement - Downslope unit movement of a portion of the land's surface, i.e., a single landslide or the gradual simultaneous downhill movement of the whole mass of loose earth material on a slope face.

Mature Timber - Trees that have attained full development, particularly height, and are in full seed production.

MBF - Thousand board feet. A measure of wood volume.

MCF - Thousand cubic feet. A measure of wood volume.

Mean Annual Increment of Growth - The total increment of volume growth per acre, usually expressed in cubic feet per acre, up to a given age, divided by that age. Culmination of mean annual increment (CMAI) of growth is the age at which the mean annual increment is greatest or reaches its highest point.

Mineral Entry Withdrawal - Public lands withdrawn from operations of the general mining laws and/or the mineral leasing laws to protect administrative sites, recreation areas or other areas with special values.

Mineral Exploration - The search for valuable mineral deposits on lands open to mineral entry.

Mineral Production - Extraction of minerals from their deposits.

Minerals, Leasable - Coal, oil, gas, phosphate, sodium, potassium, oil shale, sulphur (in Louisana and New Mexico), and geothermal steam.

Minerals, Locatable - Those minerals which are disposed by the mining laws from public domain. May include certain nonmetallic minerals and uncommon varieties of mineral materials. May include any solid, natural inorganic substance occurring in the crust of the earth, except for the common varieties of mineral materials and leasable minerals.

Minimum Stream Flow - A specified level of flow through a channel that must be maintained by the users of a stream for biological, physical, or other purposes.

Mining Claims - That portion of the public estate held for mining purposes in which the right of exclusive possession of locatable mineral deposits is vested in the locator of a claim. It does not convey any ownership right to the land surface except for what is needed for mining purposes.

Monitoring and Evaluation - The periodic evaluation on a sample basis of Forest Plan management practices to determine how well objectives have been met and how closely management standards have been applied.

Multiple Use - The management of all the various renewable surface resources of the National Forests so that they are utilized in the combination that will best meet the needs of the American people; making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions; that some lands will be used for less than all resources; and harmonious and coordinated management of the various resources, each with the other, without impairment of the productivity of the land, with consideration given to the relative values of the various resources, and not necessarily the combination of the uses that will give the greatest dollar return.

N

National Environmental Policy Act (NEPA) - An act to declare a national policy which will encourage productive and enjoyable harmony between man and his environment, to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the heath and welfare of man, to enrich the understanding of the ecological systems and natural resources important to the nation and to establish a Council on Environmental Quality.

National Forest Managaement Act (NFMA) - A law passed in 1976, as amendments to the Forest and Rangland Renewable Resources Act, that requires the preparation of regulations to guide resource development.

National Forest System Land - National Forests, National Grasslands, and other related lands for which the Forest Service is assigned administrative responsibility.

National Recreation Trails (NRT) - Trails designated by the Secretary of the Interior or the Secretary of Agriculture as part of the national system of trails authorized by the National Trails System Act. National Recreation Trails provide a variety of outdoor recreation uses in or reasonably accessible to urban areas.

National Register of Historic Places - A listing (maintained by the U.S. National Park Service) of areas which have been designated as being of historic significance. The Register includes places of local and state significance as well as those of value to the nation as a whole.

National Wilderness Preservation System - All lands covered by the Wilderness Act and subsequent wilderness designation, irrespective of the department or agency having jurisdiction.

No Action Alternative - The most likely condition expected to exist in the future if current management direction would continue unchanged.

Noncommodity Outputs - Use of a resource that does not reduce the supply, such as many types of recreation.

Nonconsumptive Use - Use of a resource that does not reduce the supply, such as many types of recreation.

Nondeclining Yield - A level of timber production planned so that the planned sale and harvest for any future decade is equal to or greater than the planned sale and harvest for the preceding decade.

Nongame Species - Any species (wildlife or fish) not formally recognized or designated by the State of New Mexico as game or endangered.

Notice of Intent - Written notice to the authorized Forest officer by those who intend to engage in mining activity on the Forest that may cause significant surface disturbance.

O

Objective - A specific statement of measurable results to be achieved within a stated time period. Objectives reflect alternative mixes of all outputs or achievements which can be attained at a given budget level. Objectives may be expressed as a range of outputs.

Occupancy Trespass - The illegal occupation or possession of National Forest land or property.

Off-road Vehicle Use (ORV) - Use of vehicles off of National Forest development roads, trails, travelways, and developed sites.

Old Growth - A stand that is past full maturity and showing decadence. 15 or more live trees per acre over 21 inches D.B.H. and with 0.5 snags per acre over 21 inches D.B.H. Two or more canopy levels with overstory closure of 10-40%, usually with a shrub-sapling layer combined exceeding 70% closure. Logs obvious on the ground.

Operations Plan - A written plan, approved by a Forest Officer, prepared by those engaged in mining activity on the Forest for prospecting, exploration, extraction and mineral processing activities that will likely cause a significant disturbance of surface resources; includes a description of methods to minimize disturbance and reclamation plans.

Outputs - The goods, services, products, and concerns which are measurable and capable of being used to determine the effectiveness of programs and activities in meeting objectives. Also goods, end products, or services that are purchased, consumed, or utilized directly by people. A broad term for describing any result, product, or service that a process or activity actually produces.

Overmature Timber - Trees that have attained full development, particularly in height, and are declining in vigor, health, and soundness.

Overstory - That portion of the trees, in a forest of more than one story, forming the upper or uppermost canopy.

P

Patented Mining Claim - A patent is a document which conveys title to land. When patented, a mining claim becomes private property and is land over which the United States has no property rights except as may be reserved in the patent. After a mining claim is patented, the owner does not have to comply with requirements of the General Mining Law or implementing regulations.

Permitted Grazing - Use of a National Forest range allotment under the terms of a grazing permit.

Personal Income - Income earned by all households within a region (salaries, wages, profit, rent, royalties, interest, etc.).

Persons At One Time (POAT) - A recreation capacity measurement term indicating the number of people that can use a facility or area at one time.

Person-Year - Approximately 2,000 working hours. May be filled by one person working yearlong or several people filling seasonal positions.

Planning Area - The area covered by a Regional or Forest Plan.

Planning Criteria - Standards, tests, rules, and guidelines by which the planning process is conducted and upon which judgements and decisions are based.

Planning Period - The 50-year time frame (1980-2020) for which goods, services, and effects were projected in the development of the Forest Plan.

Planning Question - A major policy question of long range significance, derived from the public issues and management concerns, to be decided when selecting among alternative Forest plans.

Planning Record - A system that records decision and activities that result from the process of developing a forest plan, revision, or significant amendment.

Practical Capacity - The effective upper use limit of recreation. It is 40 percent of theoretical capacity and is based upon usable versus unusable acres, weekend versus weekday use and peak season versus low use season.

Precommercial Thinning - The selective felling or removal of trees in a young stand primarily to accelerate diameter increment on the remaining stems, maintain a specific stocking or stand density range and improve the vigor and quality of the trees that remain.

Preferred Alternative - The alternative recommended for implementation as the Forest Plan based on the evaluation completed in the Planning process.

Preparatory Cut - Removal of trees near the end of a rotation so as to open the canopy and enlarge the crowns of seed bearers, with intent to improve conditions for seed production and natural regeneration, as typically in shelterwood systems.

Prescribed Fire - Introduction of fire under pre-designated conditions to dispose of slash or fuels, control unwanted vegetation, or stimulate grasses, forbs, shrubs or trees for range, wildlife, recreation, or timber management purposes.

Prescription - See Management Prescription.

Presuppression - Activiteis required in advance of fire occurrence to ensure effective management action.

Primitive Road - A two track road that has evolved primarily through use by off-road, high clearance vehicles. Usually no planning, design, or construction has occurred and the road snakes its way between obstacles to reach the user's destination.

Production - Removal (by mining) of ore from ground for processing and/or sale, also pumping of a well.

Productive Potential - The largest possible amount of output that a resource can supply without degrading the production capability of the resource.

Program Development and Budgeting - The process by which activities for the Forest are proposed and funded.

Programmed Harvest - The volume that is scheduled for harvesting. It is based on current demand, funding, and multiple use considerations.

Proposed Action - In terms of the National Environmental Policy Act, the project, activity, or decision that a Federal agency intends to implement or undertake which is the subject of an environmental impact statement.

Prospecting - A somewhat narrower scope of mineral search or exploring (a region), i.e., one mountain range, valley, drainage system, etc.

Public Access - Usually refers to a road or trail route over which a public agency claims a right-of-way available for public use.

Public Issue - a subject or question of widespread public interest releating to management of the National Forest System lands identified through public participation.

Q

Quad Maps - Standard U. S. Geological Survey quadrangle maps.

R

Range Allotment - A designated area of land available for livestock grazing upon which a specified kind and number of livestock may be grazed. It is the basic land unit used to facilitate management of the range resource on National Forest System and associated land administered by the Forest Service.

Range Condition - The state of health of the range based on what it is naturally capable of producing.

Range Improvement - Any structure or nonstructural improvement to facilitate management of range lands or livestock.

Range suitability - Land which is suitable for range, i.e., has allowable capacity. This is terrain which is or has potential to be grazed by domestic livestock on a sustained-yield basis under reasonable management goals.

Rangeland - Land where the vegetation is predominantly grasses, grass-like plants, forbs, or shrubs suitable for livestock grazing and browsing.

Ranger District - Administrative subdivision of the Forest supervised by a District Ranger who reports to the Forest Supervisor.

Real Income - Income based on real dollar values (values from which the effect of change in purchasing power of the dollar over time has been removed).

Record of Decision - A document separte from, but associated with an environmental impact statement that publicly and officially discloses the responsible official's decision on which alternative assessed in the Environmental Impact Statement to implement.

Recreation Information Management (RIM) - The Forest Service system for recording recreation facility condition and use.

Recreation Opportunity Spectrum (ROS) - A method of delineating types of recreation settings and experience opportunities. There are six ROS settings (primitive is not evident on the Lincoln National Forest).

Primitive - An essentially unmodified natural environment of a size or remoteness that provides significant opportunity for isolation from the sights and sounds of man, and a feeling of vastness of scale. Visitors have an opportunity to be part of the natural environment, encounter a high degree of challenge and risk, and use a maximum of outdoor skills but have minimum opportunity for social interaction.

Semi-primitive Nonmotorized - A predominantly unmodified natural environment of a size and location that provides a good to moderate opportunity for isolation from sights and sounds of man. The area is large enough to permit overnight foot travel within the area and present opportunities for interaction with the natural environment with moderate challenge, risk, and use of a high degree of outdoor skills. Motorized use is not present.

Semi-primitive Motorized - A natural or natural appearing environment. Concentration of users is low but there is evidence of other users. Vehicle travel is on primitive roads and trails on areas of moderate to large size.

Roaded Natural - A predominantly natural environment where the evidence of the sights and sounds of man is moderate, but in harmony with the natural environment. Opportunities exist for both social interaction and moderate isolation from sights and sounds of man.

Rural - A substantially modified natural environment. Sights and sounds of man are evident. Renewable resource modification and utilization practices enhance specific recreation activities or provide soils and vegetative cover protection.

Urban - An urban environment but with a background that may appear natural. Sights and sounds of humans are predominant with large numbers of people.

Recreation Residences - Houses or cabins on National Forest land that are not the primary residence of the owner.

Recreation Visitor Day (RVD) - A unit for measuring recreation activities which aggregates 12 visitor hours. May consist of one person for 12 hours, 12 persons for one hour, or any equivalent combination of continuous or intermittent recreation use by individuals or groups.

Reduced-Service Management - Management of developed recreation facilities and dispersed recreation areas below the established standards and objectives for public service and use.

Reforestation - The planting of seedlings, transplants, tree seeds, or for certain species, cuttings, for the establishment of a forest stand or tree cover.

Regeneration - The renewal of a tree crop, whether by natural or artificial means. Also the young crop itself.

Region - For regional planning purposes, the standard administrative region of the Forest Service administered by the responsible official for preparing a regional plan.

Regional Forester - The official responsible for administering a single region.

Regional Land and Resource Management Plan - The plan developed to meet the requirements of the Forest and Rangeland Renewable Resources Planning Act of 1974, as amended, that guides all natural resource management activities and establishes management standards and guidelines for the National Forest System lands of a given region. It also disaggregates the RPA objectives for the Region to the Forests within that region.

Regulated Timber - Timber on commercial forest land that included in the base used for calculating annual harvest.

Research Natural Area (RNA) - An area set aside by the Forest Service to preserve a representative sample of an ecological community; primarily for scientific and educational purposes. Commercial exploitation is not allowed and general public use is discouraged.

Resource Allocation Model - A mathematical model using linear programming which will allocate land to prescriptions simultaneously. The end purpose of the model is to find a schedule and allocation that meets the goals of the Forest and optimizes some objective function such as "minimize costs".

Resource Management Plan - A plan developed prior to the Forest Plan, that outlined the activities and projects for a particular resource element independently of considerations for other resources. Such plans are superseded by the Forest Plan.

Rights-of-Way (ROW) - Easements in the lands of others obtained for public access by donation, purchase, or condemnation. Generally does not apply to absolute purchase of ownership.

Riparian - Land areas which are directly influenced by water. Usually they have visible vegetative or physical characteristics showing this water influence. Streamsides, lake borders, or marshes are typical riparian areas.

Road maintenance levels -

> Level 1. Basic custodial care as required to protect the road investment and to ensure the damage to adjacent land and resources is held to a minimum. Level 1 maintenance often requires an annual inspection to determine what work, if any, is needed to keep drainage functional and the road stable. This level is the normal prescription for roads that are opened for traffic. Level 1 is to maintain drainage facilities and runoff patterns.

Level 2. Basic custodial care plus logging out, brushing out, and restoring road prism as necessary to provide passage, and maintenance of route markers and regulatory signs. This level is used on roads where management requires that the road be open for limited passage of traffic. Traffic is normally minor, usually consisting of one or a combination of administrative use, permitted use, or specialized traffic.

Level 3. Maintenance of roads for safe and moderately convenient traffic suitable for passenger cars. This level is used on roads which are opened for public traffic and generally applies when use does not exceed 15 average daily traffic (ADT). ADT should be used as a guide in determining the level and not as a sole criterion. A road may receive only one or two vehicles a day for most of the year. However, during a brief period, such as hunting season, the road may receive 20 to 30 vehicles.

Level 4. This level generally applies when use of a road is between 15 ADT and 100 ADT (see comment concerning ADT under Level 3). At this level, more consideration is given to the comfort of the user. These roads are frequently surfaced with aggregated material, but some routes may be paved because of limited aggregate sources and surface replacement cost factor.

Level 5. This level is generally maintained for use of 100 ADT and greater (see comment concerning ADT under Level 3). Roads in this category include both paved and aggregated surfaces. Safety and comfort are important considerations. Abrupt changes in maintenance shall be posted to warn travelers until deficiencies are corrected.

Roadless Area Review and Evaluation (RARE II) - The assessment of "primitive" areas within the National Forests as potential wilderness areas as required by the National Wilderness Act. This refers to the second such assessment which was documented in the final environmental impact statement of the Roadless Area Review and Evaluation, January 1979.

Rotation - The planned number of years between the formation or regeneration of a crop stand and its final cutting at a specified stage of maturity.

Roundwood - Timber and fuelwood manufactured in the round state--from felled trees to material trimmed, barked, and crosscut, e.g., logs, transmission poles, and pulpwood.

RPA - See Forest and Rangeland Renewable Resources Planning Act.

S

Salvage - The harvesting of trees that are dead, dying, or deteriorating (e.g., because overmature or materially damaged by fire, wind, insects, fungi, or other injurious agents) before their timber becomes worthless.

Sawtimber - Trees suitable in size and quality for producing logs that can be processed into lumber. For planning purposes in the Forest, trees with nine-inch or greater diameter were classified as sawtimber.

Sedimentation - The deposition of fragmental material transported by or suspended in water.

Seed Tree Cut - Similar to clearcutting except that a few of the better trees are left scattered over the area to provide seed for regeneration.

Sensitive Species - Those species which (1) have appeared in the Federal Register as nominations or proposals for classification and are under consideration for official listing as endangered or threatened species, or (2) are recognized by the Regional Forester to need special management to prevent the need for their replacement on Federal or State lists.

Sensitivity Level - Degree or measure of viewers interest in the same qualities of the landscape.

Seral - The plant and animal community which is the transitional stage of succession. If left alone, the seral stage will pass, and another plant and animal community will replace it. Aspen represents a seral stage that would eventually be replaced by conifers such as spruce.

Shelterwood Cutting - A regeneration method under an even-aged silvicultural system. A portion of the mature stand is retained as a source of seed and/or protection during the period of regeneration. The mature stand is removed in two or more cuttings.

Simulated Shelterwood - A cutting method that removes the overstory in one or more cuts from fully stocked understory of advanced regeneration. This method is used in stands of existing, unplanned regeneration.

Silvicultural System - The entire process by which forest stands are tended, harvested, and replaced. It includes all cultural practices performed during the life of the stand such as thinning, salvage and regeneration cutting. Silvicultural systems can be distinguished as either even or uneven-aged.

Site Preparation - Removing unwanted vegetation and debris from a site and preparing the soil before reforestation by chemical or mechanical means.

Slash - The residue left on the ground after felling and other silvicultural operations and/or accumulating there as a result of storm, fire, girdling, or poisoning.

Small Game - Birds and small mammals normally hunted or trapped.

Snag - A standing dead tree.

Soil Productivity - The capacity of soil to produce a specific crop such as fiber, forage, etc., under defined levels of management. It is generally dependent on available soil moisture and nutrients and length of growing season.

Special Use Permits - Permits, memorandums of understanding, and granting of easements authorizing the occupancy and use of land.

Stand - A group of trees of uniform species composition, age, condition and arrangement.

Standard - A principal requiring a specific level of attainment; a rule to measure against.

Standard Service Level (SS) - A level of service in recreation areas which provides an optimal level of operation and maintenance. For developed sites this includes hazard removal, periodic patrol during high-use periods, and cleaning sites in accordance with the USDA publication, "Cleaning Recreation Sites." In dispersed areas, this includes periodic patrol and litter pick-up on high use trails and areas, monitoring of use, imposing user restrictions where appropriate and necessary, and minor repair of resource damage.

State Endangered Species - Species whose prospects of survival or recruitment within the State are in jeopardy (Group I) or are likely within the foreseeable future to become so (Group II).

Subdivisions - Areas divided into individual home sites and/or blocks of lot with streets or roads and open spaces.

Successional Stage - A place in the gradula supplanting of one community of plants by another.

Suitability - The appropriateness of applying certain resource management practices to a particular area of land, as determined by an analysis of the economic and environmental consequences and the alternative uses forgone. A unit of land may be suitable for a variety of individual or combined management practices.

Sustained Yield - The achievement and maintenance in perpetuity of a high level annual or regular periodic output of the various renewable resources of the National Forest without impairment of the productivity of the land.

T

Targets - Objectives assigned to the Forest by the Regional Plan.

Theoretical Capacity - A measure of maximum potential supply for recreation based upon each acre of the forest being utilized at its upper physical and/or social capacity limit.

Threatened Species - Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range and which has been designated in the Federal Register by the Secretary of the Interior as a threatened species.
Timber - A general term for the major woody growth of vegetation in a Forest area.

Timber Base - The lands within the Forest suitable for timber production.

Timber Production - The growing, tending, harvesting, and regeneration of regulated crops of industrial wood. Industrical wood includes logs, bolts, or other round selections cut from trees for industrial or consumer use.

Timber Stand Improvement (TSI) - The elimination or suppression of the less desirable vegetation in favor of the more desirable tree growth. It includes thinning, clearing, weeding and release cutting.

Trailhead - The parking, signing, and other facilities available at the terminus of a trail.

Trail Maintenance -

Level 1 - Trails maintained for primitive experience level. Custodial care only. No tread maintenance. Drainage functional and not likely to fail. Trail sides not brushed but tread is kept passable. Small slides may remain except for those with erosion potential. Structures maintained as needed.

Level 2 - Trails maintained for near-primitive experience level. Tread maintained for public safety. Logs or similar rustic structures may be provided at stream crossings. Drainage same as Level 1. Signing at a minimum level commensurate with level of trail use.

Level 3 - Trails maintained for intermediate experience level. Tread maintained for public safety and user convenience. Drainage same as Level 1. Trailsides brushed out at Handbook standards. Structures maintained to original design standards. Signing same as Level 2.

Level 4 - Trails maintained at relatively high standards to provide for public safety and convenience. Tread relatively smooth, firm, and may require stabilization. Signing at high level, all other elements same as Level 3. These trails are generally maintained for family or senior citizen use.

Level 5 - Trails maintained for high use and experience levels, including special purposes such as VIS trails, bicycle trails, trails to major vista points, trails for the handicapped, etc. Basic care same as Level 4 but patching of paved tread may be needed annually. Trail sides maintained to meet high visual quality standards by brushing and clean-up of debris beyond the trail limits. Vistas are maintained.

U

Understory - The trees and other woody species growing under a more or less continuous cover of branches and foliage formed collectively by the upper portion of adjacent trees and other woody growth.

Uneven-aged Management - The combination of actions that result in the creation of forests in which trees of several or many ages may grow together.

Unregulated Timber - Timber on commercial forest land that is not included in the base used for calculating annual harvest because of the preponderance of other resource values such as recreation, aesthetics, endangered species habitat, etc.

Utilization Standards - Standards guiding the use and removal of timber.

V

Variety Class - A classification system for establishing three visual landscape categories according to the relative importance of the visual features. This classification system is based on the premise that all landscapes have some visual value, but those with the most variety or diversity of visual features have the greatest potential for having or attaining high scenic value.

Vegetation Treatment - Any activities undertaken to modify the existing condition of the vegetation.

Vertical Diversity - The distribution and abundance of different plant and animal communities from the ground level up.

Vigas - Heavy rafters, often a log used to support the roof of Spanish colonial architecture of the southwest.

Visual Absorpiton Capability - The ability of the landscape to conceal evidence of human modification. Rated as high, moderate, and low.

Visual Quality Objectives (VQO) - Measurable standards for the management of visual resources of the landscape. Refers to the degree of acceptable alterations of the characteristic landscape based on the importance of aesthetics. Objectives used in the Proposed Plan are:

Preservation - Provides for ecological change only.

Retention - Man's activities are generally not evident to the casual visitor.

Partial Retention - In general man's activities may be evident but must be subordinate to the characteristic landscape.

Modification - Man's activity may dominate the characteristic landscape but must, at the same time, utilize naturally established form, line, color and texture. Man's activities should appear as natural occurrences when viewed from foreground or middle ground.

Maximum modificaton - Man's activity may dominate the characteristic landscape but should appear as natural occurrences when viewed as background.

Visual Resource - The composite of basic terrain, geological features, water features, vegetative patterns, and land use effects that typify a land unit and influence the visual appeal the unit may have for visitors.

W

Water Rights - Rights given by State government for the diversion an use of water.

Watershed - A land area which collects and discharges excess surface water through a single outlet.

Water Yield - The measured output of the Forest's surface water, usually measured in acre-feet.

Wetland - Land where water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface.

Wilderness - All National Forest lands included in the National Wilderness Preservation System; an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain.

Wilderness Study Area (WSA) - One of the areas selected by Congress from an inventory of unroaded and undeveloped national forest lands as having apparent high qualities for wilderness. The areas are studied during the land management planning process to determine whether they should be recommended for addition to the National Wilderness Preservation System.

Wildlife - All nondomesticated mammals, birds, reptiles, and amphibians living in a natural environment, including both game species and nongame species. Animals, or their progeny, which once were domesticated but escaped captivity and are running wild (i.e., feral animals), such as horses, burros, and hogs, are not considered wildlife.

Wildlife Habitat Diversity - The distribution and abundance of different plant and animal communities and species within a specified area.

Withdrawal - An order removing specific land areas from availability for certain uses.

Woodland - Pinyon, oak and juniper forest usually growing at low elevations (less than 7500 feet).

Appendix

A. Public Involvement

Overview

Public involvement activities for the Lincoln National Forest Land and Resource Management Plan were begun in January of 1980. A mailing list was developed from lists of persons and organizations known to have visited, used, or be interested in the Forest, including; fuelwood cutters, both commercial and private; grazing permittees; recreation users (cyclists, hikers, ORV users); Christmas tree cutters; the news media; schools, colleges, and universities; Federal, State, and local agencies; and local industries. Mailers were sent out in January, asking if these persons or organizations would like to participate in the land management planning process. Those who responded to the mailer, plus additional key constituents, made up the initial LMP mailing list.

At the same time, the Forest Management Team, composed of the Forest Supervisor and District Rangers, and an interdisiplinary team made up of resource specialists, were briefed on the land management planning process. An initial list of issues, concerns, and opportunities (ICOs) was developed utilizing recent activities involving publics; existing plans, from the Forest Service and other agencies; National Forest Management Act regulations; letters and inquiries from publics; appeals of Forest Service actions; and internal direction.

This initial list of ICOs was incorporated into a mailer designed to solicit opinions from various publics as to the subjects which should be addressed in planning. On March 10, 1980, this mailer was sent to all Forest employees. On March 15, 1980, it was sent to approximately 3,400 people whose names appeared on the initial mailing list, with a response deadline of April 15, 1980. The 2,800 comments made by 432 respondees were analyzed by the interdisciplinary team and placed into one or more of the following subject areas; recreation, wood, water and soils, wildlife and fish, forage, transportation, lands, wilderness, and fire. The number and subject area(s) of comments, and the Forest's ability to address each in the planning process were used as criteria to develop a revised list of ICOs.

On May 8, 1980, a third mailer was sent to approximately 5,000 Forest users. Due to a mailing error, it was remailed on May 19, 1980, with a deadline of June 18, 1980. This mailer covered the following subjects:

1. Results of the previous mailing.

2. A request for priorities for trade-offs among resources.

3. The schedule of public meetings to be held in 1980.

4. An explanation of the basic steps of the planning process, showing where public comments are utilized.

5. A display of "Must Criteria" for alternatives.

6. A request for comments on selection criteria for preliminary alternatives.

7. A request for opinions on the current management situation and level of satisfaction with the current situation, as well as reasons for those opinions.

A total of 430 persons or organizations responded. The opinions and comments were analyzed by the interdisciplinary team and reviewed by the Forest staff officers. Many respondents were confused by the wording of the criteria; as a result, they were reworded and expanded. Also, two of the criteria were so similar that they were combined.

Ten public meetings were held in Carlsbad and Roswell (May 13); Ruidoso and Weed (May 14); Alamogordo (May 16); Las Cruces (May 17); Cloudcroft (May 27); and Mayhill, New Mexico (May 29), and El Paso, Texas (May 17 and 28). Approximately 200 people attended these meeting.

Small, one-fold business reply mailers were sent in December 1983, in March 1985, and in May 1986 to all permittees, and all persons who had previously been contacted or who had commented in one way or another. These mailers asked recipients which planning documents they wanted to receive or if they wanted their names removed from the mailing list. The purpose of these mailers was to reduce the cost of printing and mailing documents while at the same time assuring that persons received the documents they wanted.

ISSUE, CONCERN AND OPPORTUNITY DEVELOPMENT

The interdisciplinary team grouped similar comments from the responses to the three mailings, as well as from other responses, and proposed priorities for issues to be presented to the public. The issues by priority were screened by the Forest Management Team using the following criteria:

1. An issue must relate directly to the Forest or be influenced by activities on the Forest.

2. An issue must be within the Forest Supervisor's legal or delegated authority to resolve.

3. Resolution must be technologically feasible.

4. The Forest Plan must be the most reasonable level to deal with the issue.

5. Failure to resolve the issue must limit future management options.

6. An issue must deal with an existing situation, or one which is anticipated within the next ten years.

7. An issue must involve resource management practices rather than personnel performance.

Issues meeting all screening criteria were placed into one of the following categories, depending on method of resolution: standards and guidelines, policies, scheduling and budget, plan, and miscellaneous. This list was merged

with management concerns identified by the Forest Management Team and became the basis for the issues, concerns, and opportunities proposed to the Regional Forester and approved by him on October 16, 1980. As the planning process developed, some issues were resolved, and some were found not to be issues or were beyond the scope of the Forest to resolve. As a result, revisions were approved on September 21, 1982, and September 29, 1984. Issues, concerns, and opportunities were developed and tracked separately until the list was approved in 1980. Since that time, the approved list is referred to as issues without regard to origin.

Subsequent Public Involvement

The Proposed Lincoln National Forest Plan and Environmental Impact Statement were released for public review on June 29, 1985. Approximately 500 packets consisting of the Plan, the EIS and a summary of the EIS, were mailed, and an additional 250 summaries were sent to people who asked not to receive the complete packet. About 125 additional packets were distributed during and after the comment period.

Open houses were held in six locations in and around the Forest between August 1 and August 19, 1985, for the purpose of allowing the public to ask questions about aspects of the documents. A total of 17 people attended the open houses.

The formal comment period ended on October 18, 1985, although comments received to April 1, 1986 were considered. Eighty-two letters were received and their contents analyzed. Each letter was examined and the substantive comments therein determined. Each substantive comment was then addressed by a member or members of the Forest's management team. Copies of the letters, and our responses to them, are published as a companion volume to the EIS and Forest Plan.

The results of the cave and oil and gas leasing study published in January 1986 indicated that drilling could be done on about one-fourth of the Guadalupe Escarpment Wilderness Study Area (GEWSA) without significant risk of damage to caves. As a result of that study, and in response to public comments, which almost entirely favored wilderness designation, the Forest Supervisor tentatively decided to change the recommendation for the GEWSA from nonwilderness, as in the draft, to wilderness.

The tentative decision to recommend wilderness aroused opposition, mainly from inhabitants of the Carlsbad area. A forum was held in Carlsbad on April 12, 1986 to allow expression of opinions on management of the area. Approximately 240 people attended the forum, and 60 of them spoke. Most who expressed their opinions at the forum were against wilderness designation. Opposition was centered around restrictions on access and the perceived effects of wilderness designation on grazing permittees and wildlife. Many who opposed wilderness felt designation would be the first step in transfer of the area to the National Park Service, a move they opposed. Those who supported wilderness designation mentioned protection of the cave resource, protection of an unspoiled area, and having a place to be alone as reasons for wilderness.

Following the forum, the Forest received letters from 37 individuals or groups containing comments relating to the wilderness study area. Most of the writers were in favor of wilderness designation.
On May 8, 12 representatives of various interests or interest groups were invited to a meeting in Carlsbad to attempt to develop a compromise solution for management of the GEWSA. A compromise that could satisfy the needs of all users was not reached.

Following the May 8 meeting, the Forest Supervisor decided to recommend nonwilderness for the study area. He decided instead to designate it and approximately 5,300 acres adjacent to it as a special geologic area to recognize the uniqueness of the caves, and to provide maximum protection and management of the subsurface resources. This interim decision met with considerable resistance, culminating in a letter from Congressman Skeen and Senators Domenici and Bingaman, members of the New Mexico Congressional delegation. Because the letter summarizes the opposition to any special area designation, it is reproduced here:

> "This is in response to your letter dated June 16, 1986 in which you outlined your proposal to designate the Guadalupe Escarpment Wilderness Study Area (WSA) and 5,309 acres adjacent to it as a Special Geologic Area."
>
> "We share your interest in the need to give special attention to this area while at the same time accommodating the traditional uses of the land. As you are aware, however, there is strong opposition in the Carlsbad area to the proposal to designate the area as wilderness or any other designation which might preclude the multiple use of the land within the WSA. We appreciate your willingness to discuss this matter with us in Washington recently and to explore the various alternatives for the use of the land. We have some concerns, however, about the Special Geologic Area proposal."
>
> "First, we are concerned that there has been an insufficient justification for the designation of the land as a Special Geologic Area, particularly in light of the fact that there is existing authority for the Forest Service to protect the cave resources under Interim Directive No. 32 to the Forest Service Manual, which was released on April 9, 1986. The directive stresses the importance of properly balancing surface resource management and cave use with the protection of cave values. It also lists a number of existing laws and regulations affecting the management of Forest Service caves which might be utilized to achieve the proper balance between surface resource management and cave use. Therefore, we cannot support the creation of a Special Geologic Area until we are convinced that these existing authorities are inadequate to protect the land."
>
> "Second, we are concerned that the management direction statements for activities in the area under a Special Geologic Area designation provide insufficient guarantees that multiple use of the land in question will continue. In particular, we feel that the language dealing with grazing is too vague and fails to assure that grazing activities will not be impeded."

"Finally, we are concerned about the inclusion of an additional 5,309 acres in the Special Geologic Area. The WSA consists of approximately 21,251 acres. The proposed Special Geologic Area would encompass 26,560 acres. It should be noted that there are no known or suspected caves on 19,156 of those acres. We are concerned about the amount of land to be placed under this special jurisdiction in light of the restrictions to be imposed on the land and think the proposal needs further justification."

"We appreciate your sharing your proposal to create a Special Geologic Area in the Guadalupe Escarpment Wilderness Study Area with us. We hope that you find our observations to be helpful. For our part, we appreciate the opportunity to participate in the public review process and your careful consideration of our comments."

The strong opposition, including that of the Congressional delegation, led the Forest Supervisor to recommend the Guadalupe Escarpment Wilderness Study Area not be designated either wilderness or special geologic area.

CONSULTATION WITH OTHERS

Other Agencies and Indian Tribes

During the initial phase of public involvement (issue development) numerous agencies were contacted by mail. The purpose of these contacts was to explain the planning process and obtain input for development of issues. As a result, many of the agencies responded by letter or used the Forest response form.

Federal

Senator Harrison Schmitt
Senator Pete Domenici
Senator Jeff Bingaman
Representative Manuel Lujan, Jr.
Representative Bill Richardson
Representative Joe Skeen
Advisory Council on Historic Preservation
Animal & Plant Health Inspection Service, USDA
Bureau of Indian Affairs
Bureau of Land Management
Bureau of Outdoor Recreation
Bureau of Reclamation
Department of Transportation
Environmental Protection Agency
National Park Service
National Solar Observatory
Soil Conservation Service
U. S. Army
U. S. Fish & Wildlife Service
U. S. Geological Survey

State of New Mexico

Governor of New Mexico
Bureau of Mines & Mineral Resources
Commissioner of Public Lands
Department of Agriculture
Department of Energy & Minerals
Department of Forestry
Department of Game and Fish
Department of Natural Resources
State Engineer
State Extension Service
State Highway Department
State Historic Preservation Office
State Land Office
State Mine Inspector
State Parks and Recreation Division
State Planning Division
Water Resources Division

Local Agencies

City of Alamogordo
City of Carlsbad
County Commissioners, Chavez County
County Commissioners, Eddy County
County Commissioners, Lincoln County
County Commissioners, Otero County
Mescalero Apache Tribe
Otero Soil and Water Conservation District
Village of Cloudcroft
Village of Ruidoso

Educational Institutions

New Mexico State University

As the planning process progressed, many agencies and others were contacted by various Forest personnel to discuss problems or answer questions. Personal contacts were made with:

- New Mexico State University, Las Cruces, to request a study of road and trail uses, by motorized and nonmotorized users, and to determine methods to analyze public responses.

- Bureau of Land Management, Roswell, New Mexico, to discuss wilderness study areas.

- New Mexico Department of Game and Fish to develop a list of indicator species, population projections for deer and elk, wildlife standards and guidelines, and projections of demand for hunting and fishing.

- U.S. Fish and Wildlife Service to develop a list of indicator species and management prescriptions for threatened and endangered species.

- New Mexico Natural History Council on William G. Telfer Research Natural Area and Ski Apache expansion.

- Mescalero Apache Tribe and Mescalero Agency, BIA, to discuss proposed expansion of Ski Apache, timber management, and management of insects and diseases.

The following agencies were contacted to discuss and review their plans and how they would be considered in the Forest's planning process. Personal contacts were made with:

- New Mexico Department of Game and Fish concerning their desire to increase game species numbers, and the need to consider ORV closures to protect wildlife habitat. Continued protection of threatened or endangered species was of interest to both the Forest and the Department.

- U.S. Fish and Wildlife Service was interested in the Forest's threatened or endangered species program and the protection being given to these species.

- Mescalero Agency, BIA, to discuss and review the timber management plan for the MAIR.

- Bureau of Land Management to discuss and review management plans for Roswell and Las Cruces Districts.

- National Park Service, Guadalupe Mountains and Carlsbad Caverns National Parks, to discuss and review their backcountry management plans.

Other Consultation

The following industries, special interest groups, or individuals were contacted outside the initial public involvement activities:

- Members of the Mew Mexico Congressional delegation to discuss issues, the planning process, and disposition of the Guadalupe Escarpment Wilderness Study Area.

- The Lincoln National Forest Grazing Advisory Board to discuss range management, the planning process, and simulation of range outputs.

- White Sands Forest Products to discuss the planning process, present and future conditions, computer benchmark runs, mill capacity, constraints on computer models, timber simulation, and standards and guidelines.

- Environmental groups, sportsman's associations, and caving groups to discuss the wilderness study area.

- Numerous local service organizations to explain the role of the public in the planning process.

Selected Issues And Concerns

Issues addressed in the EIS and Plan are outlined below. Following each is a short statement describing the complementary and conflicting relationships among resources within and between issues.

1. Recreation - "Demand for developed recreation facilities exceeds current supply, and is increasing. Developed sites and some areas heavily used for dispersed recreation are overused. Group facilities are inadequate. Recreation development on private land has not been coordinated with uses of public land. Demand for motorized dispersed recreation is increasing. Off-road travel by vehicles is damaging resources. Conflicts exist between motorized and non-motorized uses on roads and trails. Current management of caves does not respond to demand. Unacceptable damage to caves is occuring."

   Overuse of developed areas destroys vegetation and reduces soil productivity. Overflow from developed areas into popular dispersed areas produces negative impacts on those dispersed areas. Overuse of any area reduces the quality of the experience. Amount of forage is reduced for livestock and wildlife.

   Vehicle use off roads and trails causes soil erosion and destroys vegetation, especially in riparian areas.in particular. Dispersed recreation, especially that which is related to vehicles, disrupts wildlife, especially while reproducing.

   Local economies are dependent, in part, on recreation activities which take place on the Forest.

   Caves provide uncommon opportunities for recreation activities. Their presence limits access to and development of minerals, roads, and range and wildlife water improvements. Cave users often cause irreversible damage.

2. Wilderness - "A recommendation for or against wilderness designation for the Guadalupe Escarpment Wilderness Study Area must be made."

   Wilderness designation for the Guadalupe Escarpment Wilderness Study Area would complicate cave and grazing management, and reduce the opportunity for motorized recreation use on the forest. Utilization of mineral resources would be prohibited.

   Wilderness designation would increase available wilderness, and would prevent damage to caves by oil and gas exploration and development activities.

3. Range - "Grazing use exceeds capacity. Some areas of rangeland are in unsatisfactory condition. Wildlife and domestic livestock often compete for forage. Grazing capacity has not been fully defined in relation to other resource values. A large number of small grazing allotments complicates implementation of effective grazing management systems."

Grazing conflicts with timber management because cattle often damage reforested areas; with wildlife because domestic livestock often reduce the amount of forage available for wildlife, and because cattle often overgraze critical habitat such as riparian areas; with soil and water because of erosion and degradation of water quality; and with wilderness because structural improvements are visible and obtrusive.

Grazing complements fire protection by reducing levels of fire fuels. It provides a source of income and is important to the traditional lifestyle of local communities.

4. Timber - "A sustained yield level of sawtimber and other timber products has not been developed for the Forest, resulting in an inability to establish an allowable cut. There is an uneven distribution of age classes with a disproportionate amount of immature sawtimber, which complicates the scheduling of a non-declining even flow of timber products essential to maintaining a viable local wood products industry."

   Timber harvesting often conflicts with other resource activities: with recreation, because of visual impacts and temporary displacement of dispersed recreationists during harvesting activities; with wildlife, because roads disturb large mammals and because harvest of over-mature trees removes habitat needed by some species; with range, because there is a need to protect reforested areas from livestock; with soil and water, because of temporary soil disturbance and erosion; and with fire management, because amounts of small fuels are temporarily increased.

   Timber harvest benefits other resource areas because it creates suitable habitat and transitory forage for wildlife, provides a source of fuelwood, reduces large fuels, increases access for recreation purposes and administrative needs, and provides a source of income to the local community.

5. Fuelwood - "Demand for fuelwood from the Forest is increasing rapidly. Intensive management, including fuelwood harvest, is hampered by incomplete growth and yield information, untested silvicultural techniquies, insufficient funding, and inadequate access."

   Fuelwood gatherers often create unauthorized roads in their search for new sources, causing serious soil erosion and site destruction. Theft of fuelwood is a serious problem, resulting in loss of wildlife habitat and interfering with proper management of the resource.

   Unmerchantable by-products of sawtimber harvest (branches, treetops, and cull logs) provide a source of fuelwood. Fuelwood harvest is a recreation activity and an economic benefit. Harvest in the woodland zones creates suitable habitat and transitory forage for wildlife.

6. Minerals - "The Forest has a number of dangerous abandoned mine workings."

   Abandoned mine workings may have some historical interest, but they complicate range management and are safety hazards to recreationists.

7. Lands - "There are many parcels of private land in and adjacent to the Forest. This ownership pattern increases management costs and creates problems in access, utilities, and unauthorized occupancy. Rights-of-way are inadequate to efficiently protect, manage, and provide public access to the Forest."

   Adequate access is the key to management, administration, and use of all Forest resources. Many areas of the Forest cannot be properly administered or used by the public because access through private land is not available. This problem affects almost all resource areas.

   Lack of public access is beneficial to some wildlife.

8. Fire Management - "The Forest has had a history of large disasterous person-caused fires which have resulted in property and resource damage. The probability of serious losses is increasing because of increasing use of the Forest, numbers of improvements on the Forest, and development of private land in and adjacent to it. The present fire program appears to be inefficient."

   Large fires cause significant watershed degradation; destroy timber, and prevent reestablishment of stands through changes in microclimate; can destroy land monuments such as corner markers and witness trees; disrupt wildlife habitat and range forage, especially in the short run; destroy improvements and private dwellings and increase insurance premiums; and reduce private land values.

   Small, managed low-intensity fires reduce fuel levels, create forage for wildlife and livestock, and maintain diversity in the forested environment.

9. Insects and Diseases - "A significant portion of the Forest is infected by dwarf mistletoes, or is susceptible to damage caused by western spruce budworm."

   Dwarf mistletoes cause growth reduction and mortality in infected trees. Heavy infestations reduce timber yields and restrict management's options. Past management practices have created stand conditions highly susceptible to damage by western spruce budworm, which causes defoliation of host trees and kills buds and terminals. When infestations persist, trees are killed and stands seriously depleted.

   Management of these pests conflicts with a number of resource areas. Silvicultural practices require frequent stand entry and low stocking levels, causing conflicts with dispersed recreation uses. Reduction in stand densities reduce visual quality and cover for wildlife. Some wildlife feed on these pests and utilize trees killed by them.

Silvicultural prevention and suppression methods are expensive and must be rigorously applied. Use of chemicals is controversial, expensive, and effective only in the short term.

Failure to prevent or suppress these pests reduces stand values and restricts timber, recreation, and wildlife management options. Visual quality is reduced. Fuels are created which increase the probability of catastrophic fires. Spread to adjoining private lands results in property damage and reduction of land values.

10. Law enforcement - "Laws and regulations are not being consistently or uniformly enforced."

    A lack of coordination and uniformity in enforcement has contributed to resource damage, illegal occupancy, trespass and theft of fuelwood.

11. Transportation Facilities - "There is a lack of understanding between the Forest and other agencies about jurisdiction of existing roads. Management of the transportation system is inefficient."

    Deeded rights-of-ways and easements to counties and the State are necessary to formalize responsibility for road maintenance, but have not always been negotiated as needed.

    Road maintenance objectives have not been implemented on individual roads, resulting in inadequate and inefficient maintenance.

12. Local residents and regional users - "Interests and needs of local residents are often at odds with those of regional users."

    People who live in or near the Forest depend on it for their livelihood, as a source of fuelwood, and for dispersed recreation activities. Users who live at a distance are mostly from west Texas, and come for climatic and topographic relief, and for developed and dispersed recreation. Because of their differing needs, these users are often in conflict.

RESOLUTION OF ICOs IN ALTERNATIVES

Each alternative provides a different mix of outputs, determined in part by the range of prescriptions selected, which resolve issues in different ways. Some preliminary issues were resolved by using the same prescriptions in all alternatives; as a result, they were not considered in the final list of issues.

The following tables display selected outputs by issue and alternative and compare them to the level of outputs needed to resolve that particular issue by the end of the planning period, 2030. Information presented is based on actual data available, or on professional estimates. Resolution of some issues cannot be displayed in quantitative terms. Qualitative terms, based on estimates made by resource specialists, are used to display the degree of resolution of these issues.

Recreation

The Forest's ability to supply various recreation opportunities (potential) was based on the ROS estimates. Projected future uses for dispersed, caves (which are also included in dispersed) and developed recreation are based on historic use and projected population growth during the planning period.

Dispersed Recreation, including wildlife-MRVDs per year

			Amount Supplied and Percent Issue Resolution by Alternative						
Period	Capacity	Projected Use	PA	A	B	C	D	E	F
1	1,580	1,001	982	947	992	973	1010	977	969
			98	95	99	97	100	98	97
5	1,580	1,952	1349	1195	1482	1312	1403	1369	1296
			69	61	76	67	72	70	66

Alternative D is the only alternative to meet demand for dispersed recreation at any time during the planning period, although all other alternatives supply at least 95 percent of projected use in the first period. All alternatives supply from 61 to 76 percent of the projected use by the end of the fifth period. Overall, the alternatives are ranked in the following order in their ability to satisfy demand for dispersed recreation: B, D, E, PA, C, F, and A.

Cave Recreation - MRVDs per year

		Amount supplied and percent Issue Resolution by Alternative						
Period	Projected use	PA	A	B	C	D	E	F
1	7.1	6.8	6.0	5.9	4.2	6.0	6.0	5.1
		96	85	83	59	85	85	72
5	13.0	7.6	6.7	6.6	6.6	7.1	6.7	5.7
		58	52	51	51	54	52	44

None of the alternatives satisfies projected use for caves. The PA comes closest to resolving the issue. It also provides a high level of funding for cave protection. Alternatives B and D provide a moderate level of funding for e protection, while Alternatives A, C, and E provide significantly less. Alternative F provides less funding, and less use, than any other alternative. Alternative B establishes a special geologic area to provide maximum protection for the caves.

Developed Recreation, including downhill skiing - MRVDs per year

		Amount Supplied and Percent Issue Resolution by Alternative						
Period	Projected Use	PA	A	B	C	D	E	F
1	531	569	491	542	535	559	575	552
		100	92	100	100	100	100	100
5	1,457	1046	691	982	881	1111	1022	999
		72	47	67	60	76	70	69

Demand for future developed recreation opportunities is difficult to determine because it depends on estimates of population growth and changes in use patterns of local and regional residents. Estimates of future demand were made using the regional guidelines for developed recreation and the local use trends of downhill ski areas. Most of the alternatives satisfy demand for developed recreation opportunities in the first period, but fall below demand at the end of the planning period. The PA and Alternatives D and E each provide for about three-fourths of the demand in the fifth period.

Wilderness

The WSA was so designated by Congress in order to allow time to determine its oil and gas potential. Wilderness designation would prevent exploration for gas and oil, and would preserve wilderness values. Alternative D resolves the wilderness issue by recommending wilderness designation. All other alternatives resolve the issue by recommending non-wilderness designation, but with preservation of wilderness values until Congress acts. Alternative B designates the WSA a Special Geologic Area for the protection and management of caves.

Range

The range issue is resolved by bringing permitted use into line with capacity and by maximizing livestock numbers within available capacity. This is accomplished by reducing permitted numbers as needed to relieve overstocking and by intensive management aimed at distributing livestock over time and space in such a way that available forage is utilized. The measures of degree of resolution are period in which use is brought into line with capacity and total AUMs available in 2030.

Period of Balance and Grazing Capacity

	Maximum Capacity	Capacity (MAUMs) and Percent Issue Resolution by Alternative						
	MAUMs	PA	A	B	C	D	E	F
Period of Balance		3	3	3	1	3	3	4
Capacity at 2030	217	157	164	171	193	160	159	151
Issue Resolution		72	75	78	89	73	73	69

Maximum capacity was generated by the Maximum Grazing Benchmark. Four rates of reduction in use were used in the alternatives. Alternative C reduces use 23.4 MAUMs to achieve balance in the first period. The PA and Alternatives D and E reduce use at the rate of 6.0 MAUMs per decade, Alternatives A and B reduce use at a rate of 3.6 MAUMs per decade, and Alternative F reduces use at the slowest rate of 2.4 MAUM per decade. Alternatives A, B, C, D and E increase capacity more than the PA and Alternative F because they contain more funds for intensive management.

Timber

The timber issue is satisfied by establishing a level of harvest (allowable sale quantity) which can be sustained over time, and by managing timber stands to achieve approximately equal distribution of acres in all size classes.

Level of Sustainable Timber Harvest By Alternative

Period		Potential Volume	Volume Supplied (MMBF) by Alternative and Percent of Potential Volume						
			PA	A	B	C	D	E	F
1	MMBF	40	16.0	13.1	10.3	19.6	11.3	15.2	8.1
	Percent		40	32	25	48	28	38	20
5	MMBF	42	16.2	14.4	12.7	26.6	10.6	13.7	7.2
	Percent		39	34	30	64	25	33	17

Potential volume was obtained from the Timber Benchmark which maximized production for the first period. Volume supplied includes sawtimber and products (material from trees less than nine inches in diameter). All alternatives establish a level of harvest which can be sustained for at least 200 years, although the level of harvest varies between alternatives from 8.0 MMBF in Alternative F (7.0 MMBF in the fifth period) to 20 MMBF in Alternative C (27.0 MMBF in the fifth period).

Age class distribution varies by alternative. Distribution of acres is stable after 75 years in Alternative F, and distribution is relatively even at that time. This alternative best resolves this part of the timber issue. On the other hand, distribution does not stabilize in 200 years in Alternative A, and distribution remains poor. The PA stabilizes after 75 years, but immature sawtimber occupies more acres than is desirable. This alternative ranks behind Alternative F in resolving this portion of the timber issue.

Age class distribution stabilizes after 175 years in Alternative B, but there more immature sawtimber remains than is desirable, and this alternative ranks third in this respect. Alternative E, the insect and disease alternative, stabilizes at about 200 years and ranks fourth in resolving this portion of the issue.

Age class distribution is stable after 50 years in Alternative C, but the distribution is very uneven, and more immature sawtimber is retained than is desirable, with much less of other age classes. Overall, this alternative is fifth. Alternative D ranks behind Alternative C in age class stability and distribution. Distribution is not stable at the end of 200 years, and there does not appear to be a trend toward stability.

Fuelwood

Fuelwood supplied from Commercial Forest Lands (CFL) and Pinyon-Juniper Woodlands (PJ).

Period		Potential Volume	Volume Supplied (MMBF) and Percent Issue Resolution by Alternative PA	A	B	C	D	E	F
1	CFL-MMBF 1/	10.8	5.7	6.1	5.4	8.7	5.2	6.4	2.7
	PJ-MMBF 2/	3.1	2.0	3.4	2.5	1.9	2.1	2.2	1.3
	Total	13.9	7.7	9.5	7.9	10.6	7.3	8.6	4.0
	Percent		55	68	57	76	52	61	29
5	CFL	7.2	6.9	5.3	5.0	7.6	5.2	6.9	4.2
	PJ	3.1	2.0	3.8	2.5	1.9	2.1	2.2	1.3
	Total	10.3	8.9	9.1	7.5	9.5	7.3	9.1	5.5
	Percent		86	88	72	92	70	88	53

1/ Fuelwood produced as a byproduct of timber production.
2/ Long-term sustained-yield capacity is estimated at 3.1 MMBF.

Demand for fuelwood is difficult to quantify because there are many variables associated with it. The assumption was made that demand would always exceed supply. Because of the high demand for CFL fuelwood, and because timber products other than sawtimber have a low market value on the Forest, half of the roundwood produced in each alternative was made available for fuelwood. The Maximum Timber Benchmark which maximized timber over 200 years was chosen for potential CFL volume because it produced the most fuelwood overall. It produces less CFL fuelwood with time as the age-class distribution becomes more balanced. Estimated LTSYC was used for PJ fuelwood. An extensive network of roads and an intensive management system would be required to produce this maximum over the planning period.

Minerals

Alternative D best responds to the issue of dangerous abandoned mine workings. It provides for an inventory and plan as well as elimination of the most hazardous workings. The PA and Alternative B provide for an inventory and plan for elimination of any identified hazardous workings. Alternatives A, C, E and F provide no plan or elimination of hazards and are not responsive to the issue.

Land Ownership Adjustment and Rights-of-Way

	Potential	Alternatives PA	A	B	C	D	E	F
Average Annual Budget (M $)	137	127	137	137	120	131	131	114
Percent		93	100	100	88	96	96	83
Rights-of-Way Annual Budget	49.5	49.5	24.5	25.5	10.7	14.1	22.0	37.2
Percent		100	49	52	22	28	44	75

There is no difference among the alternatives in response to the land ownership adjustment issue. All alternatives contain the same acreage of lands identified for exchange and desirable for acquisition. Alternatives having the highest budget levels shown above result in more rapid response to land adjustment proposals. This is the only difference among the alternatives.

The response to the right-of-way portion of the issue is directly measured by the funding available for right-of-way acquisition. The PA provides the most response to the issue by providing a high level of funding for rights-of way. Alternative F ranks second in this respect, followed distantly by Alternatives B, A, E, D and C.

Fire

Alternatives vary in the degree of risk and hazard they create, as well as in the way they allocate suppression resources. Overall, the PA best responds to the issue because, while it causes high risk and probability of large fires, it allocates suppression resources in an efficient manner so that probability of damage to resources or of fires spreading to private land is low. Alternative F is last in resolving this issue because funding for prevention is low, and does not offset increase in risk. Alternative A ranks just above Alternative F because resources are inefficiently allocated. The other alternatives rank lower than the PA, but above Alternatives F and A because resources are not allocated as efficiently , or because risk increases more than in the PA.

Insects and Diseases

Response to the insect and disease issue is measured by the extent to which prescriptions designed to prevent significant pest-related losses are applied, and by the degree to which stands having a high value for recreation are protected.

		Alternatives						
	Potential	PA	A	B	C	D	E	F
Acres Intensively Managed (M)	257	90	74	35	64	65	87	20
Percent		35	29	14	25	25	34	8

Prescriptions were developed specifically to address dwarf mistletoes and western spruce budworm. These prescriptions call for intensive management practices designed to create non-susceptible conditions by rapid conversion to single storied stands, favoring non-host species, and low stocking levels. Alternative E resolves this issue best because it treats about as many acres as the PA, but concentrates more on areas having high value for recreation. The PA ranks slightly behind Alternative E, followed in order by Alternatives D, A, C, F, and B.

Law Enforcement

Response of the alternatives to the law enforcement issue is measured by the increase in budget above present funding, which is acknowledged to be inadequate. Another measure is the relative balance between enforcement by Forest Service personnel and local law enforcement agencies (funded through cooperative agreements between local agencies and the Forest).

	Alternatives						
	PA	A	B	C	D	E	F
Funding M$	154	57	123	83	123	123	105
Percent Increase	170	0	116	46	116	116	84

The PA emphasizes enforcement by Forest Service (level 4) employees, and provides a moderate level of funding by local agencies (cooperative). Alternatives A and F both provide for a balance between level 4 and cooperative,

although Alternative F provides more funds for both types of enforcement. Alternatives B, D, and E emphasize cooperative enforcement slightly over level 4, and Alternative C strongly emphasizes cooperative enforcement over level 4.

The PA is the most responsive to the issue but still falls short of totally responding because of personnel and budget constraints. However, all alternatives except A are significant improvements over the present situation.

Transportation System

The alternatives do not include specific objectives to respond to the mixed jurisdiction of the travel system. All alternatives would continue the present effort to coordinate transportation system jurisdiction among road management agencies. There is no improved response to the issue.

All alternatives except for A provide for maintenance of the transportation system at the designated maintenance level and respond to the issue equally well.

Local residents and Regional Users

Satisfaction of local and regional users by resource and alternative

	Satisfaction level by Alternative						
Output/User Favored	PA	A	B	C	D	E	F
Recreation							
Dispersed-local and Regional	High	Low	Mod.	Mod.	High	Mod.	Mod.
Developed-							
Local	High	Low	Mod.	High	Low	Low	Mod.
Regional	High	Low	Mod.	Mod.	High	Mod.	Mod.
Grazing-Local	Low	Mod.	Mod.	High	Mod.	Mod.	Low
Timber-Local	Mod.	Mod.	Low	High	Low	Mod.	V. Low

None of the alternatives satisfy the needs of both local residents and regional users. Those alternatives which produce higher levels of commodities such as timber and grazing tend to satisfy the needs of the local population, while those which produce a higher level of developed recreation are geared more to the needs of regional users, although there are some benefits to those local residents who use developed sites and businesses which provide services to tourists. Dispersed recreation is an activity enjoyed by all users; therefore the alternative producing the most dispersed recreation offers the highest degree of issue resolution.

B. Forest Planning Model

INTRODUCTION

Appendix B describes the analysis process used to develop the range of alternatives discussed in Chapter 2 of this Environmental Impact Statement.

The Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974, as amended by the National Forest Management Act (NFMA) of 1976 mandates preparation of National Forest System Land and Resource Management Plans. These plans are to provide for multiple use and sustained yield of goods and services from the National Forest System in a way that is sensitive to economic efficiency and maximizes long-term net public benefits in an environmentally sound manner [36 CFR 219.1(a) and (b)]. Regulations for implementing the procedural provisions of the National Environmental Policy Act (NEPA) of 1969 require that all reasonable alternatives, including the Proposed Action, be vigorously explored and objectively evaluated [40 CFR 1502.14]. In order to meet these requirements, the Forest developed a quantitative analysis incorporating economics into the process.

The purpose of the analysis is three-fold: First, it assures that each alternative contains the most cost-efficient combination of management activities to meet the objectives of that alternative. Second, it provides a means to evaluate or compare alternatives for the purpose of choosing one for the Proposed Action. Third, it allows a quantitative starting point from which nonmonetary values can be related and discussed.

Forest planning is a detailed analysis process. It is necessary to analyze the interrelationships between renewable and nonrenewable resources, economic trends, and the social aspects of distributing resources and services to society. The goal is to select the most economically efficient combination of management prescriptions that would achieve a given set of priced and nonpriced goals and objectives from the millions of possible combinations of management emphases which could be applied throughout the Forest.

Computer models provide tools for the manager to use in making decisions. Models designed for forest planning assist in keeping track of the schedules of management activities, resource outputs, environmental consequences, costs, and benefits that would result from a given combination of management prescriptions. While the models can select the most cost-efficient combination of management emphases, adjustments in resource distributions may be necessary to satisfy social-political obligations or intangible resource considerations which are not inherent in a mathematical model. Judgmental decisions are described in Chapter 2 and the constraints section of this appendix.

OVERVIEW AND ANALYSIS PROCESS

Requirements to be fulfilled in the planning process are described in the Federal Register 36 CFR 219.12. The process includes at least the following steps:

1. Identification of purpose and need.
2. Development of planning criteria.
3. Inventory data and information collection.
4. Analysis of the management situation.

5. Formulation of alternatives.
6. Estimation of effects of alternatives.
7. Evaluation of alternatives.
8. Selection of the preferred alternative.
9. Implementation plan.
10. Monitoring and evaluation.

Appendix B is concerned with steps 3, 4, 5 and 6 (the analytical phase of the process.) Steps 1, 2, 7 and 8 are the judgmental phase and require professional opinions based on past experiences and interpretations. Step 1 is detailed in Appendix A. Step 2 involves developing criteria to guide the planning process, i.e., identifying the kind and detail of resource inventories needed and identifying the quantitative or qualitative measures used to compare alternatives. Detailed information about Step 2 can be found in the planning records at the Lincoln Nation Forest Supervisor's Office, Alamogordo, New Mexico. Steps 7 and 8 are also detailed in the process records on the Forest. Steps 9 and 10 are the execution phase of the planning process and are described in the accompanying Forest Plan. A brief discussion of steps 3 to 6 is provided below.

Inventory Data and Information Collection

Individual resource inventories were completed to identify site specific areas having common environmental characteristics. Data was collected and stored in the Forest resource data base consistent with the available information and the level of detail needed.

Analysis of the Management Situation

The Analysis of the Management Situation (AMS) is a determination of the ability of the Forest to supply goods and services in response to society's demands. The primary purpose for this analysis is to provide a basis for formulating a broad range of reasonable alternatives. During development of the AMS, benchmark runs with single resource emphasis were developed to define the Forest capability to supply various renewable resources on the Forest. Benchmarks were also developed to determine the most cost effective means of managing the Forest.

Formulation of Alternatives

Formulation of alternatives is described in Chapter 2 and in the Formulation of Alternatives portion of this appendix. The primary objective is to provide an adequate basis for identifying the alternative that comes nearest to maximizing net public benefits, consistent with resource integration and management requirements of 36 CFR 219.13 and 219.27. The Constraints section of this appendix shows the constraints used to formulate each alternative.

Estimated Effects of Alternatives

The physical, biological, economic, and social effects of implementing each alternative considered in detail provide the analytic basis for comparison of alternatives. This is presented in detail in Chapter 4. To provide a clear basis for decision-making, Chapter 2 presents the major environmental impacts in comparative form in a manner which shows the major differences between the Proposed Action and the other alternatives.

Analysis Process

Analysis consists of exploring the productive potential of the Forest and comparing alternative strategies for management. This analysis is conducted with a model that is a computerized representation of the Forest. All Forests

were directed to construct a planning model with a standardized computer software package called Forest Planning--FORPLAN. The Forest used the Direct Entry option of FORPLAN (DE FORPLAN Version 2, Release 01).

Analysis prior to the use of the FORPLAN model included that needed to develop analysis areas, define prescriptions, and develop coefficients for both costs and outputs. These processes are explained in detail in their respective sections of this appendix. Cost and output coefficient development involved the use of various analytical models. In defining the inputs to the models that were used in addition to FORPLAN, the ID team always tried to integrate resources in the most cost efficient way and simulate outputs using the most cost effective practices.

After analysis areas and prescriptions were defined and coefficients were developed FORPLAN was used to generate benchmarks and alternatives. FORPLAN is a linear programming model that simultaneously distributes individual management prescriptions to specific land areas, and schedules use and development activities to achieve a specific set of objectives within certain constraints. Variables that are accounted for by the model include resource outputs, costs, and period of implementation. Given a set of data describing the Forest, an objective function and a set of constraints, the FORPLAN model determines an optimal or best possible solution to the problem. The objective function on all alternatives was to maximize present net value. Present net value is the total of discounted benefits minus discounted costs.

The primary use and purpose of the model is to look at the Forest's productive potential and describe what is and is not possible. Decisions about how to structure the model and the analysis are human choices. Decisions are not made by the model. The model is simply a device used to organize the elements of a decision problem and describe its results.

After the FORPLAN model was used to generate alternatives, the IMPLAN model was utilized to analyze economic impacts associated with the various alternatives. This analysis is explained in the Social and Economic Analysis section of the appendix.

INVENTORY DATA

The following discussion explains how resource data were utilized to delineate capability areas, define areas tentatively suitable for management practices, and determine production coefficients. Production coefficients are the per unit estimates of resource yields, e.g., the timber yield per acre of land.

The first step in gathering resource data was to define areas that could be utilized as the basic inventory units. These were defined by combining slope, vegetation, and soils information and were called 'capability areas'. All resource data were cataloged into these areas.

Analysis areas were defined as aggregations of the capability areas. Timber areas were defined as noncontiguous analysis areas with homogeneous characteristics. The nontimber analysis areas were defined as contiguous aggregations of capability areas and the boundaries were selected by a combination of watershed, transportation and management needs. The acres

contained within the nontimber analysis areas include the timber acres that fall within that analysis area. Inventory data was gathered by both capability area and analysis area. The data was used to develop the production coefficients and costs for the resources produced within each analysis area.

Production coefficients reflect the number of units per acre or per area of a given resource that can be produced over a specific period of time. These coefficients were estimated for the acreages within the analysis areas that would have a similar response to management. Resource specialists made these estimates using the latest research findings, simulation models, literature reviews, field observations, and professional experience. After the coefficients were generated for areas of similar response within the analysis areas, the ID team modified these coefficients as needed to form integrated allocation and scheduling alternatives (prescriptions) for the total analysis area.

The analysis areas are geographically locatable and resource data was used to develop coefficients for the individual analysis areas. Therefore, the resource yields and production costs designated by the Proposed Action alternative can be used to develop subsequent programs for plan implementation and to monitor progress in implementing the alternative.

The following list summarizes resource data sources used:

Continuous Forest Timber Inventory Data
Forest Site Index Data
Soil Inventories
Forest Slope Map
Forest Vegetation Map
Forest Recreation Opportunity Spectrum
Forest Visual Resource Inventory
Wildlife Field Review Information
Wildlife Field Inventory
Forest Transportation Inventory
Forest Fuelwood Inventory
Range Allotment Analysis Information
Range Allotment Management Plans
Range Improvement Inventory

ANALYSIS AREAS

Analysis areas are the land units used by the Forest to assign acreage to specific management emphases and schedule the outputs and costs through time. The analysis areas were delineated by a two level heirarchy in order to best estimate yield and cost coefficients for the various resources.

The first level in the hierarchy was defined as contiguous analysis areas having heterogeneous resource characteristics. The boundaries were defined by clear differences in watersheds, transportation corridors or management needs. All of the nontimber resources and the pinyon pine-juniper (PJ) firewood could be most easily analyzed by delineating the Forest into these contiguous units of land. The two statutory wildernesses and the one wilderness study area each made up separate analysis areas.

The second level in the hierarchy was defined as noncontiguous areas with homogeneous characteristics. The noncontiguous areas were designated to contain the tentatively suitable timber land. Lands were classified as tentatively suitable for timber if they met the criteria specified in 36 CFR 219.14. The timber lands were divided into homogeneous areas by Forest division, timber type, predominant size and slope class. The timber lands in the Smokey Bear Ranger District were assigned to the Lincoln Division. The timber lands in the Sacramento Mountains, on the Cloudcroft and Mayhill Ranger Districts, were assigned to the Sacramento Division. The assumption implicit in combining the homogeneous timber lands was that no roads other than timber purchaser logging roads would have to be built to harvest timber from any part of the Forest. Economic considerations in determining efficient timber harvest allocations are limited to differences in costs due to slope, Forest division, and management strategies. Advantages of combining the homogeneous timber areas were: 1) to provide the model greater flexibility in choosing management prescriptions for steep and gentle slopes and 2) provide the Forest and District staffs greater flexibility in selecting areas on the ground in which to obtain the scheduled timber harvest volumes. In this way, the spatial considerations of transportation corridors and competitive uses can be best reconciled with timber sale needs.

The noncontiguous analysis areas overlay the contiguous analysis areas and do not represent additional acres. Constraints were used in the FORPLAN model to coordinate the management emphases between the two types of analysis areas.

The contiguous analysis areas (AA's) are described in Table 98. The total acres is 1,092,760, which is 10,735 acres fewer than the 1983 Land Status Report shows. FORPLAN results and analysis are based on the total in the model. The number of acres within the contiguous analysis areas that are considered to be tentatively suitable timber land is noted in the table. The total tentatively suitable timber land is 257,103 acres. The noncontiguous analysis areas are listed in Table 99.

Table 98. Contiguous Analysis Areas

AA	ACRES	DESCRIPTION
1A	58,691	Jicarilla Mountains - Smokey Bear Ranger District. This analysis area is bounded on the north, west and east by the Forest boundary, and on the south by private land and Analysis Area 1B. Elevations range from approximately 6,000 to 7,600 feet. It includes 2,651 acres of tentatively suitable timber land with 187 acres of aspen, 1,316 acres of mixed conifer and 1,148 acres of ponderosa pine. There are 49,328 acres of pinyon-juniper woodland. The area contains 9 grazing allotments: Hightower, Jacks Peak, Wilson, Coyote, Haskins, Lone Mountain, Patos, Welch, and a portion of the Bar-W Allotment.

Table 98. Contiguous Analysis Areas (con't)

AA	ACRES	DESCRIPTION
1B	38,346	North Capitans - Smokey Bear Ranger District. This analysis area is bounded on the north and east by the Forest boundary, on the south by the Del Macho/Salt Creek Watershed boundary and the Capitan Mountains Wilderness, and on the west by the Del Macho/Salt Creek Watershed boundary and private land. Elevations range from approximately 5,500 to 8,000 feet. It includes 12,249 acres of tentatively suitable timber land with 112 acres of aspen, 1,967 acres of mixed conifer, and 10,170 acres of ponderosa pine. There are 23,896 acres of pinyon-juniper woodland. The area contains five grazing allotments: Brill, Arroyo Seco, Block, Merchant and Jacob Springs; and portions of six others: Berdado Gap, Tucson, Capitan Divide, West Capitan, Arabella and Bar-W Allotments.
1C	34,513	Capitan Mountains Wilderness - Smokey Bear Ranger District. This analysis area is bounded on the north by a line that divides lower slopes of pinyon-juniper from the steeper slopes of rock talus and mixed conifer, on the east by the Forest boundary, on the south by Forest Road 56 and a line that divides the lower slopes of pinyon-juniper from the steeper slopes of rock talus and mixed conifer, and on the west by Capitan Pass. Elevations range from approximately 5,600 to 10,000 feet. Terrain is steep and rugged with numerous talus slopes and rock slides. The predominant vegetation types include aspen, ponderosa pine and spruce-fir. Lower elevations may have some pinyon-juniper.
1D	69,644	South Capitans - Smokey Bear Ranger District. This analysis area is bounded on the north by the Capitan Mountain Wilderness and by the Rio Bonito Watershed, on the east and south by the Forest boundary, and on the west by the Rio Bonito Watershed. Elevations range from approximately 6,000 to 9,800 feet. It consists of 12,016 acres of tentatively suitable timber land with 499 acres of aspen, 5,258 acres of mixed conifer and 6,259 acres of ponderosa pine. There are 52,926 acres of pinyon-juniper woodland. The area contains eight grazing allotments: Latham, Baca, Matney Springs, Salazar, V.I., Capitan Gap, Comery, and Nogal Lake; and portions of six others: Skinner, Alienated, Kudner, Indian Divide, Capitan Divide, and West Capitan Allotments; two administrative pastures - Baca and Boone; Mesa Administrative Site; and a portion of the Capitan Watershed.

Table 98. Contiguous Analysis Areas (con't)

AA	ACRES	DESCRIPTION
1E	22,291	Carrizo Peak/Nogal Canyon - Smokey Bear Ranger District. This analysis area is bounded on the north by private land, on the east and south by the Rio Bonito Watershed, and on the west by private land and Forest Roads 400 and 108. Elevations range from approximately 5,900 to 8,600 feet. It consists of 3,434 acres of tentatively suitable timber land, with 230 acres of aspen, 2,629 acres of mixed conifer, and 575 acres of ponderosa pine. There are 15,618 acres of pinyon-juniper woodland. The area contains three grazing allotments: Spencer, Pino, and Roberts; and portions of five others: Bar-W, Indian Divide, Kudner, Alienated and Nogal Lake.
1F	48,366	White Mountain Wilderness - Smokey Bear Ranger District. This analysis area is bounded on the north by the Forest boundary, on the east by private land and Forest Roads 400, 108 and 107, on the south by the Rio Ruidoso/Rio Bonito Watershed and the Mescalero Apache Indian Reservation (MAIR), and on the west by the Forest boundary. Elevations range from approximately 6,600 to 11,000 feet. It is composed of high, rugged peaks with several sub-alpine peaks in the interior. The vegetation consists of virgin stands of mixed conifer and spruce-fir with large areas of grasslands. A band of pinyon-juniper is located along the western one-third of the area. The area provides excellent game habitat, including five miles of trout stream. It contains four grazing allotments: Elder Canyon, Finley, Diamond Peak and Church Mountain; portions of four others: Tortolita, Nogal Canyon, Lower Bonito and Loma Grande; and portions of two watersheds.
1G	11,613	Rio Bonito - Smokey Bear Ranger District. This analysis area is bounded on the north by the Rio Bonito Watershed, on the east by the Forest boundary, on the south by private land, and on the west by Forest Roads 400 and 108. Elevations range from approximately 7,000 to 9,000 feet. There are 6,388 acres of tentatively suitable timber land, with 235 acres of aspen, 3875 acres of mixed conifer and 2,258 acres of ponderosa pine. There are 2,513 acres of pinyon-juniper woodland. The area contains portions of Loma Grande and Lower Bonito Grazing Allotments. Bonito Lake and Rio Bonito both provide trout habitat.
1H	1,240	South Fork Bonito - Smokey Bear Ranger District. This analysis area is bounded on the north and west by a portion of the White Mountain Wilderness, and on the east and south by the Rio Ruidoso Watershed. Elevations range from approximately 8,400 to 10,000 feet. There are 1,046 acres of tentatively suitable timber land with 192 acres of aspen, 854 acres of mixed conifer, predominantly cork bark fir, and some ponderosa pine. This area has no grazing activity.

Table 98. Contiguous Analysis Areas (con't)

AA	ACRES	DESCRIPTION
1I	16,575	Upper Ruidoso - Smokey Bear Ranger District. This analysis area is bounded on the north by the Rio Ruidoso Watershed and the Forest boundary, on the east by private land and a ridge top, and on the south and west by the MAIR. Elevation ranges from approximately 6,500 to 11,000 feet. It consists of 12,330 acres of tentatively suitable timber land with 257 acres of aspen, 6,231 acres of mixed conifer and 5,842 acres of ponderosa pine. There are 2,651 acres of pinyon-juniper woodland. The area contains Cedar Creek Grazing Allotment. The communities of Ruidoso and Ruidoso Downs are located within this area as well as Sierra Blanca Ski Area and large blocks of private land.
1J	60,125	Lower Ruidoso - Smokey Bear Ranger District. This analysis area is bounded on the north, east and south by the Forest boundary, and on the west by private land and a series of ridge tops. Elevations range from approximately 5,600 to 7,800 feet. There are 3,341 acres of tentatively suitable timber land with 62 acres of aspen, 899 acres of mixed conifer and 2,380 acres of ponderosa pine. There are 49,862 acres of pinyon-juniper woodland. The area contains eleven grazing allotments: North Coe, Devil's Canyon, Eagle Creek, South Coe, Hightower Mountain, Eagle Creek Complex, Payton, East Hale, Hale Lake Complex, Perry Canyon and Cavanaugh.
2A	24,489	La Luz - Cloudcroft Ranger District. This analysis area is bounded on the north and west by the Forest boundary, on the east by the MAIR, and on the south by private land and a series of ridge tops. Elevations range from approximately 8,000 to 8,600 feet. There are 7,262 acres of tentatively suitable timber land, with 6,852 acres of mixed conifer and 410 acres of ponderosa pine. There are 15,959 acres of pinyon-juniper woodland. The area contains three grazing allotments: Nogal, Laborcita and South La Luz; and the La Luz Watershed.
2B	51,166	Alamo - Cloudcroft Ranger District. This analysis area is bounded on the north by U.S. Highway 82 and private land, on the west by the Forest boundary, on the east by a line that divides the west-facing steep slopes with pinyon-juniper from the less steep, mixed conifer areas, and on the south by a timber compartment. Elevations range from approximately 4,300 to 8,900 feet. The area consists of 9,637 acres of tentatively suitable timber land with 36 acres of aspen, 6,866 acres of mixed conifer, and 2,735 acres of ponderosa pine. There are 37,949 acres of pinyon-juniper woodland. The area contains Dry Canyon and San Andres Grazing Allotments, and portions of the Sacramento and Escondido Allotments.

Table 98. Contiguous Analysis Areas (con't)

AA	ACRES	DESCRIPTION
2C	32,469	Grapevine - Cloudcroft Ranger District. This analysis area is bounded on the north by a timber compartment boundary, on the east by private land and a line that divides the west-facing steep slopes with pinyon-juniper from the less steep, mixed conifer areas, and on the west and south by the Forest boundary. Elevations range from approximately 4,200 to 7,000 feet. There are 2,813 acres of mixed conifer timber land and 20,939 acres of pinyon-juniper woodland. The area contains portions of Escondido and Sacramento Grazing Allotments.
2D	19,936	Sacramento River - Cloudcroft Ranger District. This analysis area is bounded on the north and west by the Sacramento/Salt Flat Watershed, on the east by the Cloudcroft-Mayhill Ranger District boundary, and on the south by private land. Elevations range from approximately 7,600 to 9,000 feet. It consists of 15,954 acres of tentatively suitable timber land with 30 acres of aspen, 14,936 acres of mixed conifer, and 988 acres of ponderosa pine. There are 218 acres of pinyon-juniper woodland. The area contains portions of Sacramento and Scott Able Grazing Allotments.
2E	40,485	Upper Penasco - Cloudcroft Ranger District. This analysis area is bounded on the north by private land, on the west by a ridge top, on the south by the Sacramento/Salt Flats Watershed and Ranger District boundary, and on the east by the Ranger District boundary. Elevations range from approximately 7,600 to 9,500 feet. It consists of 36,284 acres of tentatively suitable timber land with 1,452 acres of aspen, 34,650 acres of mixed conifer, and 182 acres of ponderosa pine. There are 11 acres of pinyon-juniper woodland. The area contains portions of Sacramento and Scott Able Grazing Allotments, and the Alamo Watershed.
2F	13,806	Mountain Park - Cloudcroft Ranger District. This analysis area is bounded on the north by the MAIR and private land, on the west and east by private land and grazing allotment boundaries, and on the south by ridge tops and private land. Elevations range from approximately 7,000 to 9,300 feet. It consists of 11,695 acres of tentatively suitable timber land, with 401 acres of aspen, 9,933 acres of mixed conifer and 1,361 acres of ponderosa pine. There are 358 acres of pinyon-juniper woodland. The area contains portions of the James Canyon and Sacramento Grazing Allotments, large blocks of private land, and a portion of the La Luz Watershed.

Table 98. Contiguous Analysis Areas (con't)

AA	ACRES	DESCRIPTION
2G	8,771	Silver Spring - Cloudcroft Ranger District. This analysis area is bounded on the north by the MAIR, on the east by the Ranger District boundary, on the south by the Upper Rio Penasco Watershed, and on the west by private land. Elevations range from approximately 7,800 to 9,200 feet. There are 7,987 acres of tentatively suitable timber land, with 41 acres of aspen, 7,800 acres of mixed conifer and 146 acres of ponderosa pine. The area contains portions of the Summer Pasture and James Canyon Grazing Allotments.
2H	18,446	Upper James - Cloudcroft Ranger District. This analysis area is bounded on the north by the Upper Penasco Watershed boundary, on the east by the Ranger District boundary, on the south by private land and Ranger District boundary, and on the west by private land. Elevations range from approximately 7,200 to 9,000 feet. There are 17,454 acres of tentatively suitable timber land, with 228 acres of aspen, 16,500 acres of mixed conifer and 728 acres of ponderosa pine. The area contains three grazing allotments: Pumphouse, Hyatt, and Russia Canyon, and large blocks of private land.
3A	21,251	South Guadalupe (Guadalupe Escarpment Wilderness Study Area) - Guadalupe Ranger District. This analysis area is bounded on the north by Guadalupe Ridge, and on the east, south and west by the Forest boundary. Elevations range from approximately 4,800 to 7,300 feet. Over 72 percent of the area has slopes greater than 40 percent including escarpments with slopes in excess of 100 percent. There are 9,206 acres of pinyon-juniper woodland, with some areas of desert shrub. There is no suitable timber land. Isolated riparian areas are located in North McKittrick Canyon and Black River Canyon. The area contains Black River Grazing Allotment and portions of Soldier Springs, Dark Canyon and McCollum Grazing Allotments.
3B	28,726	West Guadalupe - Guadalupe Ranger District. This analysis area is bounded on the north, west and south by the Forest boundary, and on the east by a natural escarpment. The western escarpment is composed of rugged steep slopes. Elevations range from approximately 5,800 to 6,300 feet. There are 481 acres of pinyon-juniper woodland and some desert shrub, but no acres of suitable timber land. The area contains Rim and Woods Grazing Allotments, portions of Irabarne and Soldier Springs Allotments, and a wildlife/watershed area.

Table 98. Contiguous Analysis Areas (con't)

AA	ACRES	DESCRIPTION
3C	26,647	Dark Canyon - Guadalupe Ranger District. This analysis area is bounded on the north by steep drainages, ridge tops and Forest Road 540, on the west by grazing allotments, on the east by the Forest boundary and on the south by Guadalupe Ridge. Elevations range from approximately 6,000 to 6,800 feet; 67 percent of the area has slopes greater than 40 percent. There are 18,662 acres of pinyon-juniper woodland and some desert shrub, but no acres of suitable timber land. Dark Canyon is an important riparian area. The area contains portions of five grazing allotments: Sitting Bull, McCollum, Dark Canyon, Board Tree/Last Chance, and Soldier Springs.
3D	70,516	Central Guadalupe - Guadalupe Ranger District. This analysis area is bounded on the north by contours of steep drainages, on the east by the Forest boundary and contours of steep drainages, on the south by steep drainages, ridge tops and Forest Road 540, and on the west by a natural escarpment boundary. Elevations range from approximately 5,800 to 6,400 feet; 98 percent of the area has slopes of less than 40 percent. There are 55,140 acres of pinyon-juniper woodland and some grama/galleta grassland, but no acres of suitable timber land. The area contains portions of seven grazing allotments: National, Montgomery, Irabarne, Soldier Springs, Dark Canyon, Board Tree/Last Chance and Sitting Bull.
3E	47,042	East Guadalupe - Guadalupe Ranger District. This analysis area is divided into two areas; the largest is bounded on the north and east by the Forest boundary, and on the west and south by the contours of steep drainages. The smaller area is bounded on the north and east by the Forest boundary, and on the west and south by contours of steep drainages. Elevations range from approximately 5,200 to 6,300 feet: 78 percent of the area has slopes of less than 40 percent. There are 9,238 acres of pinyon-juniper woodland and some desert shrub grassland, but no suitable timber land. The area contains the Acrey Grazing Allotment and portions of seven others: Sitting Bull, Montgomery, National, Panama, Hardin, Sargent Seep and Prude Allotments.

Table 98. Contiguous Analysis Areas (con't)

AA	ACRES	DESCRIPTION
3F	89,121	North Guadalupe - Guadalupe Ranger District. This analysis area is bounded on the north by the Forest boundary, on the east and south by contours of steep drainages, and on the west by a natural escarpment. Elevations range from 5,500 to 6,300 feet; 99 percent of the area has slopes of less than 40 percent. There are 66,101 acres of pinyon-juniper woodland and some grama/galleta grassland, but no acres of suitable timber land. The area contains the Bear Springs Grazing Allotment, and portions of six others: Bullis Springs, Prude, Sargent Seep, Hardin, Panama and National Allotments.
4I	24,753	James/Penasco - Mayhill Ranger District. This analysis area is bounded on the north by the Upper Rio Penasco Watershed, on the east by private land, on the south by the Upper Rio Penasco Watershed, and on the west by the Ranger District boundary. Elevations range from approximately 6,500 to 8,600 feet. The area consists of 15,618 acres of tentatively suitable timber land, with 11,542 acres of mixed conifer and 4,076 acres of ponderosa pine. There are 6,170 acres of pinyon-juniper woodland. The area contains three grazing allotments: Curtis, Bounds and Davis; and portions of seven others: Lewis/McGee, Hunter, Smith, Miller Flats, Scott, Denny Hill and Bear Creek Allotments.
4J	20,461	Upper Agua Chiquita - Mayhill Ranger District. This analysis area is bounded on the north by the Upper Rio Penasco Watershed, on the east and south by the Agua Chiquita Watershed, and on the west by the Ranger District boundary. Elevations range from approximately 7,600 to 9,200 feet. There are 18,186 acres of tentatively suitable timber land, with 86 acres of aspen, 16,848 acres of mixed conifer and 1,252 acres of ponderosa pine. The area contains portions of four grazing allotments: E.K./North Bluewater, Pendleton, Perk and Agua Chiquita.
4K	19,730	Carrisa - Mayhill Ranger District. This analysis area is bounded on the north, west and south by Bluewater Creek Watershed, and on the east by grazing allotments. Elevations range from approximately 7,400 to 8,800 feet. It consists of 15,024 acres of tentatively suitable timber land with 526 acres of aspen, 11,644 acres of mixed conifer, and 2,872 acres of ponderosa pine. There are 742 acres of pinyon-juniper woodland. The area contains portions of three grazing allotments: Pendleton, Perk and Agua Chiquita.

Table 98. Contiguous Analysis Areas (con't)

AA	ACRES	DESCRIPTION
4L	37,803	Lick Ridge - Mayhill Ranger District. This analysis area is bounded on the north by the Sacramento/Salt Flat Watershed, on the east by grazing allotments and the Forest boundary, on the south by the Forest boundary, and on the west by the Ranger District boundary. Elevations range from approximately 6,400 to 8,200 feet. It consists of 14,804 acres of tentatively suitable timber land with 7,570 acres of mixed conifer and 7,234 acres of ponderosa pine. There are 21,232 acres of pinyon-juniper. The area contains the Carrisa and Jeffers Grazing Allotments and portions of the Agua Chiquita, Pinon, and North Harbert Allotments.
4M	20,608	Bluewater - Mayhill Ranger District. This analysis area is bounded on the north by the contours of several major drainages, on the east by grazing allotments, on the south by the Sacramento/Salt Flat Watershed, and on the west by grazing allotment boundaries. Elevations range from approximately 6,400 to 8,000 feet. The area consists of 4,490 acres of tentatively suitable timber land with 1,269 acres of mixed conifer and 3,221 acres of ponderosa pine. There are 15,460 acres of pinyon-juniper woodland. The area contains portions of ten grazing allotments: Ehart, E.K./North Bluewater, Cueva/Rough, Dog Canyon, Antelope, South Bluewater, Sowell, North Harbert, West Avis and Pinon.
4N	19,372	Lower Agua Chiquita - Mayhill Ranger District. This analysis area is bounded on the north by a ridge top and the Agua Chiquita Watershed, on the east by the Forest boundary, on the south by a ridge top and private land, and on the west by a ridge top and grazing allotments. Elevations range from approximately 6,600 to 8,500 feet. It consists of 6,355 acres of tentatively suitable timber land with 2,974 acres of mixed conifer, and 3,381 acres of ponderosa pine. There are 9,361 acres of pinyon-juniper woodland. The area contains four grazing allotments: Potter Hill, Prather, Akers and McEwan; and portions of six others: Ehart, Cridebring, Bear Creek, Denny Hill, Scott and Miller Flats Allotments.

Table 98. Contiguous Analysis Areas (con't)

AA	ACRES	DESCRIPTION
4O	39,611	Sixteen Springs - Mayhill Ranger District. This analysis area is bounded on the north by the MAIR, on the east by the Forest Boundary, on the south by the Upper Rio Penasco Watershed, a ridge top and private land, and on the west by the Ranger District boundary. Elevations range from approximately 6,200 to 8,400 feet. It consists of 18,530 acres of tentatively suitable timber land with 44 acres of aspen, 11,614 acres of mixed conifer and 6,872 acres of ponderosa pine. There are 20,518 acres of pinyon-juniper woodland. The area contains five grazing allotments: C. C. Walker, Upper Sixteen Springs, Lower Sixteen Springs, Bell, and Burnt Canyon; and portions of Upper Burnt Canyon and Lewis/McGee Allotments.
4Q	28,382	Cuevo Canyon - Mayhill Ranger District. This analysis area is bounded on the north, east and south by the Forest boundary, and on the west by grazing allotments. Elevations range from approximately 6,200 to 7,300 feet. It consists of 350 acres of tentatively suitable timber land with 245 acres of mixed conifer and 105 acres of ponderosa pine. There are 26,659 acres of pinyon-juniper woodland. The area contains Cueva/Rough, Dog Canyon, Antelope and Avis Grazing Allotments, and a portion of West Avis Allotment.
4U	27,765	Snow Canyon - Mayhill Ranger District. This analysis area is bounded on the north by private land, on the east and south by the Forest boundary, and on the west by private land and grazing allotments. Elevations range from approximately 6,000 to 7,300 feet. It consists of 1,205 acres of tentatively suitable timber land with 743 acres of mixed conifer and 462 acres of ponderosa pine. There are 26,560 acres of pinyon-juniper woodland. The area contains eight grazing allotments: Turpin, Cady, Mule Canyon, Cox, Jackson, Hunter, Smith, and Miller Flats.

Table 99. Noncontiguous Analysis Areas

AA	Timber Strata 1/	Division	Slope	Acres
1TL	MC/13-04	Lincoln	Low (<40%)	3,106
1TS	" "	"	Steep (>40%)	8,358
2TL	" "	Sacramento	Low	34,983
2TS	" "	"	Steep	16,582
3TL	MC/12-02	Lincoln	Low	1,116
3TS	" "	"	Steep	2,296
4TL	" "	Sacramento	Low	13,673
4TS	" "	"	Steep	7,997
5TL	MC/13-03	"	Low	37,746
5TS	" "	"	Steep	20,024

Table 99. Noncontiguous Analysis Areas (con't)

AA	Timber Strata 1/	Division	Slope	Acres
6TL	MC/12-05	Lincoln	Low	2,977
6TS	" "	"	Steep	4,632
7TL	" "	Sacramento	Low	9,621
7TS	" "	"	Steep	9,945
8TL	MC/14-01	"	Low	2,999
8TS	" "	"	Steep	2,482
9TL	PP/12-02	Lincoln	Low	8,535
9TS	" "	"	Steep	6,488
ATL	" "	Sacramento	Low	9,832
ATS	" "	"	Steep	1,473
BTL	PP/13-03	Lincoln	Low	4,094
BTS	" "	"	Steep	2,482
CTL	" "	Sacramento	Low	7,646
CTS	" "	"	Steep	1,340
DTL	PP/14-01	Lincoln	Low	6,207
DTS	" "	"	Steep	826
ETL	" "	Sacramento	Low	12,962
ETS	" "	"	Steep	2,770
FTL	AS/12-05	Lincoln	Low	565
FTS	" "	"	Steep	1,229
GTL	" "	Sacramento	Low	1,735
GTS	" "	"	Steep	1,109
HTL	MC/15-01	Lincoln	Low	400
HTS	" "	"	Steep	144
ITL	" "	Sacramento	Low	5,243
ITS	" "	"	Steep	3,486
			Total	257,103

1/ Timber Strata Descriptions:

MC/13-04 - Mixed conifer stand of immature sawtimber, age 41 to 80 years, in need of an intermediate harvest to remove overstory trees and some of the 9-16" diameter class trees.

MC/12-02 - Mixed conifer stand of immature poles, age 21 to 40 years, suitable for precommercial thinning only.

MC/13-03 - Mixed conifer stand of immature sawtimber, age 41 to 80 years, with predominantly single story stands in the 9-12" diameter class.

MC/12-05 - Mixed conifer stand of immature poles, age 21 to 40 years, with an overstory suitable for a removal harvest.

MC/14-01 - Mixed conifer stand of adequately stocked seedlings and saplings, age 1 to 20 years, in the 0-5" diameter class.

MC/15-01 - Mixed conifer stand of inadequately stocked seedlings and saplings, age 1 to 20 years, in the 0-5" diameter class.

PP/12-02 - Ponderosa pine stand of immature poles, age 21 to 40 years, suitable for precommercial thinning only.

PP/13-03 - Ponderosa pine stand of immature sawtimber, age 41 to 80 years, with predominantly single story stands in the 9-12" diameter class.

PP/14-01 - Ponderosa pine stand of adequately stocked seedlings and saplings, age 1 to 20 years, in the 0-5" diameter class.

AS/12-05 - Aspen stand of immature poles, age 21 to 40 years, with an overstory suitable for a removal harvest.

PRESCRIPTIONS

A prescription is a unique set of management practices or activities required at various time periods to produce a specified combination and level of goods and services. Each prescription includes resource production coefficients and costs. Prescriptions provide the management emphasis choices that are available for each analysis area.

A wide range of prescriptions was developed to meet the goals and objectives of the benchmarks and to address the issues developed early in the planning process. Each contiguous analysis area and noncontiguous timber strata had a unique set of management prescriptions based on the resource capability of the area or strata. Prescriptions ranged from minimum management intensities for all resources to intensive management of a single resource to achieve maximum output of that resource.

Prescriptions were developed to provide the most cost-effective methods for accomplishing various management objectives. The ID team considered available technology and research findings, and the prescriptions were coordinated to integrate various practices for the most cost efficient combinations. Documentation of the research consulted for the development of prescriptions can be found at the Lincoln National Forest Supervisor's Office.

The FORPLAN model met the goals and objectives of benchmarks and alternatives by assigning prescriptions to specific analysis areas while maximizing present net value. As a result, the most cost efficient combination of prescriptions were chosen to meet the goals and objectives of each benchmark and alternative.

Minimum Management Requirements

The regulations for National Forest Systems Land and Resource Management Planning [36 CFR 219] specify: 1) the minimum legal management requirements to be met for accomplishing the goals and objectives of the National Forest System [36 CFR 219.27 and 2] the minimum requirements for integrating individual Forest resource planning into the Forest plan [36 CFR 219.14 through 219.26]. These are collectively called Minimum Management Requirements (MMRs).

The minimum legal requirements defined in 36 CFR 219.27 can be categorized as either resource protection requirements that must apply to all management prescriptions or to prescriptions which specify practices involving: 1) vegetative manipulation of tree cover for any purpose, 2) timber harvest and cultural treatment, or 3) even-aged silviculture. The minimum resource integration requirements specified in 36 CFR 219.14 through 219.26 were achieved through the Forest's planning process, in prescription standards and guidelines, and in constraints placed on the FORPLAN model.

The Forest complied with 36 CFR 219.27 primarily by following the specific standards and guidelines associated with the individual resource management practices developed for various prescriptions. The least intensive management prescription contains the standards and quidelines for mitigation measures required to be present in all prescriptions and represents the least management activity and cost which will meet legal requirements. Therefore, low intensity level standards, activities, costs and outputs are the minimum and are equaled or exceeded in all other prescription levels. Standards and guidelines which comply with requirements involving vegetative manipulation of tree cover or silvicultural practices were developed primarily for prescription levels other than low intensity where these types of activities were emphasized.

The management requirements defined in 36 CFR 219.27 were integrated into the prescriptions where possible by modifying the yield coefficients and the management costs to assure compliance with the requirements. Most of the requirements, however, will be met by adhering to the management standards and guidelines stipulated in the Forest Plan.

Prescription Development Process

Prescriptions were developed for each of the 33 contiguous analysis areas to specify one of three levels: 1) low intensity management for all resources, 2) current level management for all resources and 3) intensive level management for a single resource with all other resources receiving current level management. Because there are a number of single resources, this resulted in about eight prescriptions for each contiguous analysis area. Timber prescriptions were generated for each timber strata and included primarily intensive level management stategies with various initial entry harvest times. Minimum management requirements were included in all of the prescriptions. The written standards and quidelines for these prescriptions can be found in the planning records at the Lincoln National Forest Supervisor's Office.

The prescriptions were incorporated into a FORPLAN model built on the Forest and used to generate the benchmarks. These benchmarks were used to help determine if the maximum and minimum prescriptions provided an adequate range of intensity levels for all resources. They were also used to refine and verify the cost estimates that were used for the various management activities.

The ID team reviewed the benchmark results and recommended prescription modifications to either provide a better range of choices for selected resources or to eliminate certain management strategies that were considered technically or economically infeasible. The major modifications are discussed below:

Timber - The range of timber prescriptions was considered to be inadequate, especially at the lower intensity management levels. In addition, the timber prescriptions constrained the model to harvest timber from all the steep slopes within a timber strata whenever timber was harvested from the low slopes in that strata. Additional timber prescriptions were generated to provide: 1) low intensity management prescriptions for all timber strata, 2) moderate intensity management for some of the predominant timber strata, 3) insect and disease management prescriptions for the mixed conifer strata in the Sacramento Division, and 4) separate prescriptions for the steep slopes.

Multiple-use prescriptions - The range of management possibility for the nontimber resources was considered to be too limited when only a single resource could be maximized in a given analysis area. Multiple-use prescriptions were developed to incorporate the maximum or intermediate levels of management for two or three resources that would be compatible. The multiple-use prescriptions were developed for most of the contiguous analysis areas and included a recreation/wildlife emphasis, a wildlife/range emphasis and a recreation/PJ fuelwood/wildlife emphasis.

Water yield - Analysis of the maximum water yield benchmark revealed that current water yield could be increased about 39 percent, but the required management prescriptions applied clearcut harvests to over half of the tentatively suitable timber lands every decade. The adverse environmental impacts to the soil and watersheds were deemed significant and unfeasible. The water yield prescriptions were eliminated from further model runs.

Transitory range capacity - Analysis of maximum range benchmarks showed that grazing capacities could be increased about 12 percent in the first decade and 17 percent in the fifth decade with the addition of transitory range prescriptions. Review of the management practices required to provide transitory grazing capacities on suitable timber lands revealed that the costs of maintaining the lands in suitable grazing condition were excessive and would not be a cost-effective way to manage those lands. In addition, the management practices required frequent clearcutting and posed unjustified adverse impacts to the soil and watershed condition of the land. The intensive range management prescriptions that used clearcut harvests to generate transitory range were eliminated. Also, transitory range capacities were eliminated from the timber management prescriptions.

After the prescription modifications were made, the benchmarks were rerun and the new results reviewed by the ID team. A summary of the management direction and emphases applied to the resource prescriptions used in the final model is discussed below.

WILDLIFE

Low management intensity: Emphasis is placed on meeting minimum legal requirements for wildlife species diversity and distribution of habitats to maintain minimum viable populations. Funding is included only to maintain projects needed to provide habitats for minimum viable populations of indigenous wildlife.

Current management level: Emphasis is placed on maintaining sufficient habitat in small project areas to maintain existing populations of big game, small game, nongame, and Threatened and Endangered (T&E) species. T&E species recovery is only emphasized for those species identified in recovery plans. Funding is included to provide for cursory coordination of projects and reaction to crisis situations. Future habitat planning or direct habitat improvement is funded at very low levels.

Maximum emphasis level: Emphasis is placed on high levels of management for habitat quality and production on the Forest. Funding is included to accomplish intensive surveys, plans, coordination, and direct habitat improvements to accelerate levels of wildlife habitats for big game, small game, game fish, nongame, waterfowl, and T&E species.

Intermediate emphasis level: Some of the multiple-use prescriptions included a moderate level of direct habitat improvement funding. Emphasis on wildlife habitat was the same as in the maximum management intensity prescriptions, but funding was not as high.

RECREATION

Recreation prescriptions were developed for all analysis areas, but the emphasis depended on the type of recreation that currently exists or that could be provided for the area. Not all areas had prescriptions for developed recreation and dispersed or wilderness recreation.

Low intensity level: Developed sites would not be maintained or reconstructed. As deterioration reaches a point where facilities are no longer usable, they would be abandoned. Only safety and resource protection would be emphasized. Dispersed recreation facilities and trails would not be maintained and would eventually be abandoned.

Current management level: Developed recreation facilities would be maintained at less than standard service level, except for the fee sites. Only Cedar Group Campground and the Cedar Group Picnic area would be constructed. Pines Campground would be reconstructed. The two existing downhill ski areas would be scheduled for expansion. Dispersed recreation facilities and trails would receive low level maintenance. Funding would be inadequate to maintain all facilities.

Maximum emphasis level: The overall intent of this emphasis level is to take advantage of the practical opportunities to expand developed recreation on the Forest to near optimal levels. Maintenance of most of

the developed recreation facilities would be at standard service level. In addition, funding is included to construct one new downhill ski area, a few new winter sports areas, and several new campgrounds, campground improvements, picnic areas and trailhead facilities. The two existing downhill ski areas would be scheduled for expansion. Dispersed recreation facilities and trails would maintained at moderate to high levels. Budget was included for the construction of new trailhead parking lots at wilderness trailheads and a few others.

Moderate emphasis level: Some of the multiple-use prescriptions included a less than maximum level of recreation development. Depending on the analysis area for which the prescription was developed, all or only some of the new facilities would be scheduled for construction. Maintenance would be at the maximum emphasis level.

TIMBER

Three basic types of timber prescriptions were established for even-aged management: low intensity, moderate-low and moderate intensity, high intensity and special spruce budworm prevention prescriptions. The latter type are discussed under high intensity. Uneven-aged management was modeled as old growth prescriptions.

Low intensity management: Low intensity timber prescriptions were modeled to simulate timber growth and yields under infrequent stand entry. Timber growth would be reduced due to lack of treatment of dwarf mistletoes and prevention of damage caused by western spruce budworm. The prescription includes no thinning or intermediate cuts, no timber stand improvement costs, one seed cut and one final removal harvest. Most regeneration of stands would be by natural means, except about one-fourth of the acres would be artificially regenerated. Low intensity prescriptions were developed for all timber strata, except aspen.

Moderate intensity management: Moderate intensity prescriptions were modeled for all strata except aspen. The principal difference between prescriptions is the level of growing stock achieved in the initial entry and maintained in subsequent ones, and the interval between entries. Other variables include removal or nonremoval of noncommercial species in thinnings and the number of intermediate-, seed- and removal cuts, which varied by strata. These prescriptions achieve a low level of dwarf mistletoe control but fail to prevent damage by western spruce budworm. Overall, potential growth is reduced and yields are less than optimal. Stands are maintained in an even-age condition.

Intensive management: Intensive silvicultural prescriptions were modeled with emphasis on placing the managed stands into optimum growing condition for maximum timber production and controlling or preventing losses caused by insects and diseases. Several options were developed to provide different growing stock levels for thinning and harvesting, time of first entry and intensity of the initial cut. All the prescriptions include one precommercial thinning, more than two intermediate cuts, at least one seed

cut and one final removal harvest, and large reduction in the number of mistletoe infected trees. Reforestation is assumed to be natural on most of the harvest acres due to the shelterwood method of harvest. The stands will be maintained in even-age clases.

Special spruce budworm damage prevention prescriptions were modeled for mixed conifer strata to simulate rapid reduction of budworm-susceptible stands and regeneration of non-host or resistant tree species (white pine, Douglas fir and ponderosa pine). The stands will be maintained in even-age classes.

Old growth management: Special prescriptions were modeled to provide old growth characteristics for wildlife purposes. The emphasis is on providing at least 15 trees per acre of greater than 21" Dbh and uneven-aged characteristics. Thinning and harvesting activities are done only to generate and maintain an uneven-aged stand. The selection harvest method is used. Stands were assumed to have no mistletoe infections. All timber strata, except the aspen, contained old growth prescriptions.

No harvest level: All timber strata were given a "no timber management" prescription which had no harvest and no costs. This allowed some of the tentatively suitable timber acres to be allocated to a 'nonentry' category.

RANGE

Low intensity management: The Forest would provide no range improvements. Range improvements would be maintained by the permittee without funds from the Forest. The number of range support personnel on the Forest would decline. Minimum redistribution of grazing use away from poor condition lands was assumed. Range capacity would result from natural forage growth under continuous grazing of the existing grazed areas. The grazing capacities were calculated to be lower than those under the current management systems.

Current management level: The 'current' management intensity represented the existing grazing systems used on each allotment. These systems included continuous grazing, deferred and rest-rotation. The capacities per acre were calculated to be greater than those in the low intensity management. Maximum capacities under this management system, however, were determined to be the maximum the existing grazed areas could sustain under improved management and better livestock distribution. Emphasis would be on reconstruction of priority range improvements with funds coming equally from the Range Betterment Funds and the Forest budget. The number of range support personnel would stay at current level.

Intensive management level: A combination of deferred and rest-rotation grazing systems was used to represent the intensive management level. Redistribution of use is emphasized, as high funding levels for structural improvements, such as fences and water developments, were incorporated in the management prescriptions. Capacities were determined to be higher than those under the 'current' management intensity. The benefits of a

rest-rotation system provided better forage utilization by including access to grazing areas not regularly used by domestic livestock. Funding was provided to fully develop all allotments. All existing range improvements would be reconstructed on schedule. Additional support people would be provided to assist in full utilization of the range resource.

PJ FUELWOOD

Current management level: Two prescriptions were developed for current PJ fuelwood management: 1) harvesting fuelwood from present accessible areas at levels that exceed the estimated long-term sustained-yield capacity in certain analysis areas and 2) harvesting fuelwood from present accessible areas at levels that are below the long-term sustained-yield. Harvests would occur in areas with slopes less than 40 percent and with canopy closures of 40 percent or greater.

Maximum emphasis level: Emphasis is on providing the maximum allowable PJ fuelwood harvest on analysis areas able to sustain the harvest. Roads are constructed to provide additional access to PJ fuelwood areas. Harvests would occur in areas with slopes less than 40 percent and the allowable harvest level would be at or below the estimated long-term sustained-yield capacity of each of the analysis areas.

After the range of emphasis levels were defined for all resources, the ID team developed the resource prescriptions for each of the contiguous analysis areas. The timber prescriptions were not developed for contiguous areas, but were generated for the timber analysis areas. Each contiguous analysis area had a unique set of management prescriptions to reflect the existing and potential resource capabilities of the area and the costs that would be incurred to provide different levels of those resources. Prescriptions developed for the contiguous analysis areas are listed in Table 100. Further details on the prescriptions developed for each analysis area are available in the planning records at the Lincoln National Forest Supervisor's Office.

Table 100. List of Prescriptions Applied to Contiguous Analysis Areas

Prescription	Description
1 - Low	All resources are managed at the low intensity management levels.
2 - Current	All resources are managed at the current management levels. PJ fuelwood harvest levels exceed the LTSYC.
F2 - Current	This is a modification of the 'current' prescription. It is identical except for the PJ fuelwood harvest level which is below LRSYC.
3 - Range	The range resource is managed at intensive level and all other resources are managed at their respective current management intensities.

Table 100. List of Prescriptions Applied to Contiguous Analysis Areas (con't)

Prescription	Description
4 - PJ fuelwood	PJ fuelwood is managed at the fuelwood emphasis level and all other resources are managed at their respective current management intensities.
5 - Wildlife	Wildlife habitat is managed at the intensive level and all other resources are managed at their respective current management levels.
6 - Watershed	Intensive management is provided for unsatisfactory watershed areas on the Forest, other than those caused by poor grazing practices. All other resources are managed at their respective current management intensities. This prescription was not used in any of the alternatives.
7 - Recreation	The recreation resource is managed at intensive levels and all other resources are managed at their respective current management levels. Additional recreation prescriptions were developed for the Wilderness Study Area (WSA) to distinguish a low, moderate and intensive level of wilderness and cave management.
8 - Multiple-Use #9	The PJ fuelwood, recreation and wildlife resources are managed at their respective intensive management levels. All other resources are managed at current levels.
9 - Multiple-Use #10	The recreation and wildlife resources are managed at their respective intensive management levels. All other resources are managed at current levels. Some of the analysis areas receiving this prescription had moderate management intensities for the recreation or wildlife resources.
10 - Multiple-Use #11	The range and wildlife resources are managed at their respective intensive management levels. All other resources are managed at current levels.

YIELD COEFFICIENTS

A yield coefficient is a number that quantifies the production or output level of a given resource per unit of land. The coefficient for a particular resource varies by geographic area (analysis area), management intensity and time period. The 200-year planning horizon is divided into eight time periods: the first five periods are each 10 years long; the last three periods are each 50 years long.

Yield coefficients were developed for most of the market resources and many of the nonmarket goods. For the nontimber resources, the resource specialists on the ID team analyzed the existing resource output levels and associated production costs on each of the 33 contiguous analysis areas. Three levels of yield coefficients were developed to reflect the three major levels of management intensities, using the current levels and costs as a base from which to project increased or decreased yields. The data was entered by hand into the FORPLAN data file.

Computer models were used to generate yield coefficients for range and timber. The Lincoln Range Model was used to project domestic livestock grazing capacities for five decades on the existing grazing allotments. Capacity estimates were determined for the following terrestrial ecosystems: grama grasslands, desert shrub, pinyon-juniper, mountain grass and the grass meadows interspersed within the Ponderosa pine and mixed conifer forests. The majority (70 percent) of the existing suitable range land is in the pinyon-juniper ecosystem; less than 5 percent is in the forested lands. For each vegetation type, capacity estimates were made for four site condition classes (very poor, poor, fair and good). Condition class was based on species composition, plant vigor and plant density. In wooded terrestrial ecosystems, condition class was further affected by canopy closure. As canopy closure increases, herbage productivity decreases and range condition decreases.

Transitory range capacities were determined for the timber lands receiving silvicultural management, but analysis of the additional capacities generated by timber harvests indicated that relatively small gains were possible and costs to maintain the transitory range would be high. (Refer to Prescription Development section of this appendix for further disussion of transitory range.) The transitory range capacities were not included in the total grazing capacity determination for the Forest.

Three range management intensities were applied to the estimated current capacities in order to project adjustments for future capacities. The differences in the management intensities are described in the previous section, Prescription Development Process. The capacity coefficients (AUMs per acre) were calculated by the range model for each vegetation type, condition class and management intensity by time period by capability area. The coefficients were then aggregated into analysis areas. All the capacity calculations were based on proper stocking of the existing grazing allotments. Wildlife use was assumed to be 4 percent of the available forage in all vegetation types and was deducted from the forage available for domestic livestock.

The range model was also used to determine how the condition class of the suitable grazing acres would change over time. The change includes a reflection of tree growth and subsequent increase in canopy closure, and the growth rates of herbage under the management system applied.

The range model data was entered into the FORPLAN data file through a computer program. For each contiguous analysis area and management prescription, the following variables were entered: 1) capacity coefficient by vegetation type by time period, 2) acres by vegetation type in poor or worse condition by time

period, and 3) acres by vegetation type in fair or better condition by time period. Eight time periods were used in FORPLAN. The last three time periods were assigned the same coefficients as the fifth decade time period.

After the FORPLAN runs were made, the total Forest grazing capacity calculated by the range model was compared to the capacity estimates from the annual grazing allotment studies. The 'current' base level in the model was adjusted to match the current capacity determined from field inventories. The base level adjustment was applied to all the total Forest capacities in each of the FORPLAN runs.

Timber growth and yields for various management strategies were simulated by ECOSIM (Rogers, et al. 1984). The following ECOSIM output data was used in the forest planning model: 1) average timber volume inventory over the life of the regenerated stands, 2) merchantable timber inventory per year, 3) merchantable timber volume harvested, 4) long-term sustained-yield capacity per decade, 5) sawtimber harvested, 6) wood products harvested and 7) available fuelwood. The ECOSIM data was entered into the FORPLAN data file through a program (RXYLD, Lincoln National Forest) that made necessary format conversions and generated additional data records for timber management costs and activities. Further information about the timber prescription yields can be found in the Timber Technical Report, Lincoln National Forest.

Outputs

The outputs that were included in the FORPLAN model are listed in Table 101.

Table 101. FORPLAN Outputs

tput de	Output Name	Unit of Measure
02.	Net merchantable timber volume harvested	Thousand cubic feet (MCF)/acre/period
03.	Net merchantable timber inventory	MCF/acre/year
04.	Long Run Sustained Yield Capacity	MCF/acre/period
05.	Sawtimber harvest - tractor logging	Thousand board feet (MBF)/acre/period
055	Sawtimber harvest - cable logging	MBF/acre/period
06.	Net wood products	MBF/acre/period
07.	Fuelwood sold - low slopes	MBF/acre/period
08.	Fuelwood sold - steep slopes	MBF/acre/period
09.	Dispersed recreation	Recreation visitor day (RVD)/area/year
10.	Wildlife recreation	RVD/area/period
11.	Wilderness recreation	RVD/area/year
12.	Developed recreation	RVD/area/year
13.	Grazing capacity	Animal unit month (AUM)/acre/year
14.	Permitted grazing use	AUM/area/year
22.	Cave recreation	RVD/area/year
23.	PJ fuelwood harvest	MBF/area/period
30.	Average net merchantable	

Table 101. FORPLAN Outputs (con't)

Output Code	Output Name	Unit of Measure
	timber inventory	MCF/acre/year
--	Suitable rangeland in poor condition - divided by:	Acres/acre/period
	Grama grassland	
	Desert shrub	
	PJ at 0-10 percent canopy closure	
	PJ at 10-39 percent canopy closure	
	PJ at 40 -69 percent canopy closure	
	PJ at 70 percent + canopy closure	
	Mixed conifer	
	Ponderosa pine	
	Mountain grass	
--	Suitable rangeland in fair or better condition divided by:	Acres/acre/period
	same vegetation types as above	

ECONOMIC COEFFICIENTS

Economic coefficients are the per unit costs or benefits that are associated with a resource output at a given point in time. The total priced benefits of the forest's outputs and the total costs of all management activities, both Forest Service and non Forest Service costs, are used to calculate the present net value (PNV) of the each alternative. PNV is the difference between the present value of the priced benefits and the present value of all costs discounted at 4 percent rate of interest. The PNV is used as a measure of economic efficiency. The greater the PNV, the greater the net economic return and economic efficiency.

Costs

Cost estimates for each management activity were developed from Forest budget records of 1980 to 1983. Non-Forest Service costs, such as private permittee investments for range improvements, were also included because of the potentially significant impacts. Some costs varied by output level and could be expressed as a cost per unit of output. Other costs varied by analysis area and management emphasis and were expressed as a total cost per area for a particular management activity. Costs that did not apply to a specific area or management prescription were defined as Forest-wide costs and incorporated into Forest-wide management prescriptions. Most of these costs did not vary significantly between alternatives.

Real price increases in costs over time were not used. It was estimated that all costs would increase at the same rate as inflation. Any increase in costs over time was a result of an increase in management intensity. All costs in the FORPLAN model are expressed in fourth quarter 1980 dollars.

Management activities that were tracked in the model are shown in Table 102. The units of measure indicate whether the costs were calculated as a function of the output level, e.g., $/MBF, or entered as a total cost for the analysis area. Where costs per unit of output were used, the unit cost is shown. The other costs are available in the planning records at the Forest Supervisor's Office.

Table 102. FORPLAN Activities and Costs

FORPLAN Activity Code	Activity	Activity Unit	Activity Description
010	Recreation management	$/area/period	Includes capital investments for construction and reconstruction of all developed and dispersed facilities, and operating and maintenance expenditures.
011	Cultural resources	$/area/period	Expenditures necessary for cultural resources studies and clearances for all ground disturbing projects.
012	FW recreation support	$/year ($56,000/year)	Recreation specialists support for all recreation projects forest-wide.
050	Wilderness recreation	$/area/period	Expenditures for management of the wilderness areas. Includes trail construction and reconstruction.
080	Wildlife management	$/area/period	Expenditures for operation and maintenance of all wildlife and fish habitat improvements.
081	FW wildlife support	$/year (25,000/year)	Wildlife specialist support for all projects affecting wildlife forest-wide.
100	Fish habitat improvements	$/area/period	Expenditures for structural and non-structural improvements that benefit fisheries other than T&E species.
110	Game and non-game habitat improvements	$/area/period	Expenditures for structural and non-structural improvements that benefit wildlife other than T&E species.
120	Threatened and Endangered Species habitat	$/area/period	Expenditures for surveys, plans, and management of habitats for T&E animals, plants and fish.
140	Range management	$/area/period	Expenditures for managing the forage resource used by domestic livestock, including allotment management, range analyses, planning and administration.

Table 102. FORPLAN Activities and Costs (con't)

FORPLAN Activity Code	Activity	Activity Unit	Activity Description
150	Range improvements	$/area/period	Expenditures for replacements of existing range improvements, construction of new improvements (e.g., fences and water developments), and revegetation of lands to establish forage cover.
160	Timber stand improvements	$/acre/period ($120/acre - avg) ($156/acre - heavy)	Expenditures for timber stand improvement activities, such as precommercial thinning, pruning, and release and weeding.
161	FW timber support	$/year ($74,000/year)	Timber specialists support for all timber management activities forest-wide.
162	Harvest acres	NC	Number of acres harvested in a given time period.
164	Reforestation	$/acre/period ($300/acre)	Expenditures for site preparation for regeneration, seeding, and planting.
165	Harvest - low slopes	$/MBF/period ($38.50/MBF-Linc.) ($35/MBF-Sac.)	Forest Service costs for silvicultural exams, timber sale preparation (reconnaissance, appraisal, sale award and marking) and sale administration on low slopes.
166	Harvest - steep slopes	$/MBF/period ($46.20/MBF-Linc.) ($42/MBF-Sac.)	Forest Service costs for silvi. exams, sale preparation and administration on steep slopes.
23C	PJ fuelwood management	$/MBF/period ($19.30/MBF)	Costs for the establishment and administration of PJ fuelwood sales.
220	Soil and water resource	$/area/period	Expenditures for soil surveys, planning and resource maintenance on projects not associated with other resources.
221	FW soil and water support	$/year ($36,000/year)	Soil and water specialists support for all projects forest-wide.
230	Soil and water resource improvements	$/area/period	Expenditures for direct soil and water resource improvements not associated with other projects.
270	Energy mineral mgmt.	$/area/period	Costs for administration of leases and permits associated with energy minerals.

Table 102. FORPLAN Activities and Costs (con't)

FORPLAN Activity Code	Activity	Activity Unit	Activity Description
280	Non-energy minerals mgmt.	$/area/period	Costs for administration of permits and leases for non-energy minerals, minerals materials, and compliance with mining laws.
350	Fire protection	$/area/year	Expenditures for fire prevention, detection, equipment maintenance and initial attack forces. Also, costs for the reduction of forest fuels.
380	Law enforcement	$/period	A forest-wide cost for the enforcement of laws pertaining to the management of the national forest lands.
410	Land Management Planning	$/period	A forest-wide cost for the preparation of Forest Plans, amendments, implementation plans and monitoring.
411	Computer support	$/year ($28,000/year)	Computer specialist support for LMP activities.
412	Drafting	$/year ($8000/year)	A forest-wide cost for drafting capability on the Forest.
420	Land ownership mgmt.	$/area/period	Expenditures for land status maintenance, land ownership planning, and exchange proposals. Also includes leases, easements, amendments and administration of permits.
421	Right-of-ways	$/area/period	Expenditures for right-of-way acquisitions for all projects, except PJ fuelwood access.
422	Right-of-ways for PJ fuelwood	$/area/period	Expenditures for right-of-way acquisitions for PJ fuelwood area access.
470	Existing road operation and maintenance	$/area/year	Expenditures for road system inventory, planning and maintenance of roads on the national forest.
481	Road construction - PJ	$/area/period	Costs for construction and reconstruction of roads needed for access to PJ fuelwood areas.
500	Fire, administration and other investments	$/area/period	A forest-wide cost for the construction of offices, dwellings, warehouses and other related facilities.

Table 102. FORPLAN Activities and Costs (con't)

FORPLAN Activity Code	Activity	Activity Unit	Activity Description
520	Fire, administration and other maintenance	$/area/year	Forest-wide costs for the maintenance of structural improvements used for fire and general administrative purposes, such as offices, lookout towers, warehouses, telephone systems and other related facilities.
550	General administration	$/year	A forest-wide cost for the work not associated with specific resource projects. Includes Supervisor Office support personnel, business management, travel and utilities.
551	Project rents	$/year ($46,000/year)	Forest-wide expenditures for the rental or lease of general purpose facilities.
552	Communications	$/year ($74,000/year)	Forest-wide costs for telephone tolls, phone rentals, and related utilities.
553	Contracting	$/year ($10,000/year)	Forest-wide costs for managing equipment purchases or rentals and supplies.
151	Grazing permittee costs	$/area/period	Private permittee costs for range investments necessary to carry out range allotment agreements. This is funded separately from the Forest budget and is not in the budget constraint.
168	Timber purchaser cable logging cost	$/MBF/period ($25/MBF)	An additional cost over the average cost of harvesting timber. This is a non-Forest Service cost incurred by the timber purchaser.
169	Timber purchaser credit	$/MBF/period ($26/MBF)	Costs for the construction of local roads for timber access paid by the timber purchaser. The cost is indirectly a Forest Service cost, as the money is credited to the purchaser's bill of sale.
15.	Fire Fighting Fund	$/year	Expenditures for fire suppression, including hotshot crews and fire aviation support. This is funded separately from the Forest budget and is not in the budget constraint.

Benefits

Some Forest outputs have an existing market and are sold with a known measurable dollar value. These market outputs include sawtimber, roundwood or wood products, fuelwood, developed recreation at fee sites and permitted livestock grazing use. Other outputs are not sold and do not have a well-defined market value. These outputs were assigned dollar benefit values; and their benefit

values were derived from "willingness-to-pay" studies. Dispersed and wilderness recreation, wildlife recreation and water yield are outputs that have assigned values. The outputs with market values and the outputs with assigned values are alled "priced benefits".

There are several Forest resources, such as visual quality, threatened and endangered species habitat, clean air and quality of a recreation experience, that do not have assigned dollar values. Outputs of this type provide "nonpriced benefits". Some of the nonpriced benefits were considered in the model through constraints on the production of priced benefits to ensure that minimum requirements for the nonpriced benefits were met.

Wildlife outputs were expressed as Recreation Visitor Days (RVDs) and were generated as a function of the number and types of habitat improvements scheduled for development. The wildlife benefit values were applied only to the number of RVDs that were expected to occur on the Forest. RVDs in excess of that amount were counted, but not assigned a dollar value. The cutoff level for the RVDs changed over time and was determined from population growth projections. The benefit values and the cutoff levels were based on guidelines in FSM 1920.84.

Recreation outputs were also expressed as Recreation Visitor Days. The projected output levels were based on the existing and planned developments, existing use and the projected population growth rate for the five-county area surrounding the Forest. Developed recreation RVDs were projected to increase 2 percent per year; dispersed recreation RVDs were projected to increase 1.8 percent per year in Period 1 and then show declining rates of increase from 1.4 percent per year in Period 2 to 1 percent per year in Period 5.

Range outputs were based on permitted livestock grazing use. Grazing use that exceeded the grazing capacity was not given a dollar benefit value.

The priced benefits that were tracked in FORPLAN are shown in Table 103. All benefits were valued at the time and place of consumption on the Forest. Real price increases occur when demand is expected to rise faster than the available supply. For those outputs in the table that show an increasing benefit value, demand is expected to rise. Where no increase in benefit is shown, prices are expected to increase at the same rate as inflation and have no real price increase. All benefit values are expressed in fourth quarter 1980 dollars.

Table 103. Benefit Values for Outputs

Output	Unit of Measure	Period 1	2	3	4	5
Sawtimber	$/MBF	45.00	45.00	45.00	45.00	45.00
Wood products	$/MBF	17.20	17.20	17.20	17.20	17.20
Fuelwood - CFL	$/MBF	17.00	17.00	17.00	17.00	17.00
Fuelwood - PJ	$/MBF	20.40	20.40	20.40	20.40	20.40
Dispersed recreation	$/RVD	3.80	3.80	4.33	4.67	5.32
Developed recreation	$/RVD	3.80	3.80	3.80	3.80	3.80
Wilderness recreation	$/RVD	10.14	10.14	11.56	12.47	14.20
Cave recreation	$/RVD	3.80	3.80	4.33	4.67	5.32
Wildlife recreation	$/RVD	22.60	22.60	25.80	27.80	31.60
Permitted grazing use	$/AUM	12.08	12.67	13.25	13.49	13.72
Water yield	$/AcFt	6.34	6.34	6.34	6.34	6.34

Note: Current water yield and current wildlife RVDs were not included in the model data, but the benefit values were added into the total benefits outside the model.

Gross Receipts

Cash receipts are collected from timber, fuelwood, grazing, developed recreation use and miscellaneous land uses, including mineral extraction. The collected revenues are returned to the U.S. Treasury and then 25 percent of the revenues are returned to the States for disbursement to counties. The amount of revenue given to the counties is based on the percentage of national forest land within each county. These payments to counties are in lieu of taxes.

Estimates of projected gross receipts were made for each alternative and are displayed in Chapters 2 and 4. The estimates were based on the projected harvest levels of sawtimber, wood products and fuelwood, grazing use and recreation use. The dollar revenues for the projected outputs were calculated from the receipt values shown in Table 104. The receipt values were based on the actual dollars received between 1981 and 1983 for timber, grazing, recreation and miscellaneous land uses. Miscellaneous land uses were included in the per unit value for recreation. Receipts from minerals were not included since they are difficult to predict, and the mineral receipts account for about one percent of the total receipts. No real price increases were assumed; prices are expected to increase at the same rate as inflation. All receipt values are expressed in fourth quarter 1980 dollars.

Table 104. Receipt Values for Outputs

Output	Unit of Measure	Dollar value
Sawtimber	$/MBF	45.00
Wood products	$/MBF	17.20
Fuelwood - CFL	$/MBF	17.00
Fuelwood - PJ	$/MBF	20.40
Grazing use	$/AUM	2.00
Developed recreation use	$/RVD	0.36

FORPLAN MODEL

The goal in alternative development is to find the most economically efficient combination of management prescriptions that would meet a given set of management objectives. Since there are 33 contiguous analysis areas, each with an average of eight possible management prescriptions, and 36 noncontiguous timber analysis areas, each with an average of 13 possible management prescriptions, millions of possible combinations would have to be analyzed to find the best combination. This would be impossible without computer assistance.

A linear programming model called FORPLAN (Forest Planning model) was used as a tool to test various combinations of prescriptions for the analysis areas. The model was asked to maximize or minimize a particular output or economic measure and meet a given set of constraints. The factors to be maximized or minimized make up the objective function. The constraints might be some of the management objectives that address legal requirements, issues, or desired levels of priced benefits and costs. In the benchmark runs of FORPLAN, the model was asked to maximize a single resource yield and then the model was rerun to maximize PNV while providing at least 98 percent of the maximum resource yield. In the alternative runs, the model was asked to maximize PNV.

PNV is a relative indicator of economic efficiency and was used as a means to develop and compare alternatives. The objective in development of each alternative was to maximize PNV, thus, each alternative is the most economically efficient combination of management prescriptions that will achieve a given set of priced and nonpriced goals and objectives.

Constraints

Constraints and prescription controls are used to ensure that outputs, effects, and management intensities will be provided at the levels required to achieve the particular goals and objectives of an alternative or benchmark.

Two general types of constraints are used in FORPLAN to control activities and outputs: absolute and flow constraints. Both types can be specified by analysis area and/or time period. Absolute constraints are used to constrain the amount or dollar value of some output or activity in a particular time period. A minimum amount, maximum amount, or range is specified. Flow constraints are used to control the relationship between the amount or value of some activity or output that occurs in consecutive periods. Harvest flow is the most common example, and the required relationship between harvests in adjacent periods is so important that it is given its own constraint set--timber harvest constraints. Flow constraints can be used to specify minimum or maximum proportionate decline from period to period, a minimum or maximum proportionate increase from period to period, or a range in which decline or increase from period to period is permitted.

Prescription controls are applied to FORPLAN to ensure that the model selects appropriate management intensities for particular analysis areas or forest-wide activities to meet particular objectives of the alternatives. The controls can be used to limit the types of prescriptions that will be available for consideration or to force a particular prescription to be selected for some analysis area.

Constraint sets and prescription controls were used only when necessary to manipulate model solutions to achieve an acceptable and feasible management program for an alternative. The constraints were determined by the ID team to be the most cost efficient way to meet the goals and objectives of the alternatives. Table 105 displays the constraints and prescription controls used for each of the benchmark runs. Terminology used in the table is presented below to assist in understanding the constraints.

1. Operator symbols:

   LE -- Less than or equal to. The model is not to exceed the values for the constraint in the specified time period(s).

   GE -- Greater than or equal to. The model must achieve, at a minimum, the values for the constraint in the specified time period(s).

   EQ -- Equal to. The model must achieve exactly the value listed for the constraint in the specified time period(s).

2. Budget constraints:

   Budget constraints were used to ensure financial feasibility. Budgets are in 1980 fourth quarter dollars and exclude timber purchaser credit, additional timber purchaser costs for cable logging, grazing permittee's betterment dollars, and Fire Fighting Funds.

3. Floor/Ceiling constraints:

   Floor (a lower limit) and ceiling (an upper limit) constraints were used to set lower and/or upper limits on outputs required for specific objectives in the alternatives.

4. Timber harvest constraints:

   Allowable sale quantity (ASQ) constraints set limits on the relationship between net merchantable timber volumes sold in consecutive time periods. The constraints may be: non-declining yield (NDY) which specifies that ASQ must be equal to or greater than the sale volume from the preceding period or sequential lower and upper bounds (SLUB's) which specify the maximum percent decline or percent increase that the sale volume can be from the preceding period. Allowable sale quantity in FORPLAN is the average annual net merchantable timber volume for a given time period.

   Long-term sustained-yield capacity (LTSYC) is defined by NFMA (36 CFR 219.3) as the "highest uniform wood yield from lands being managed for timber production that may be sustained under a specified management intensity consistent with multiple use objectives". The LTSYC is calculated by ECOSIM for each timber prescription used in FORPLAN. The LTSY link constraint specifies that the planned sale in any time period cannot be greater than the long-term sustained-yield capacity. This constraint is used whenever the non-declining yield constraint is used.

Perpetual Timber Harvest and Ending Inventory (EI) is defined by the NFMA Regulations in the following way: "Each sale schedule shall provide for a forest structure that will enable perpetual timber harvest which meets the principle of sustained yield and multiple-use objectives of the alternative" [36 CFR 219.16 (a)(2)(iv)].

The perpetual timber harvest (ending inventory) constraint attempts to meet this requirement by insuring that the net merchantable timber inventory for the Forest in the last period of the planning horizon is greater than or equal to the sum of the average net merchantable timber volume for the regenerated strata. The ending inventory coefficient used in the FORPLAN model is calculated by ECOSIM for each regenerated timber strata within a prescription.

Culmination of Mean Annual Increment (CMAI) as per NFMA 219.16(a)(iii), requires that in "... accordance with the established standards, assure that all even-aged stands scheduled to be harvested during the planning period will generally have reached the culmination of mean annual increment of growth."

Rotation ages applied in the ECOSIM model resulted in the seed cut and final removal cut of the shelterwood system occurring at or slightly beyond the culmination of mean annual increment (CMAI). The FORPLAN yield coefficients for timber were derived from the results of ECOSIM. The CMAI requirements are, therefore, incorporated within FORPLAN yield coefficients and are not achieved through application of specific constraints to the model.

5. Minimum management requirement constraints (MMRs):

The minimum legal and management requirements specified in the regulations for national forest land and resource management planning were described in the Prescription section of this appendix. Some of the requirements were met through prescription modifications and some were met through constraints.

Three types of minimum management requirements (MMRs) were modeled for FORPLAN as constraints: 1) MMRs for timber resource sale schedules, 2) MMRs for minimum viable populations of wildlife, and 3) MMRs for soil and watershed protection. The timber constraints were described in item 4 above. All the MMRs for wildlife, except one, were adequately met without constraints on the model. The soil and watershed protection needs were entered as constraints on all runs. None of the constraints used to meet MMRs were compounding.

The wildlife requirements were established to provide for minimum viable populations of indicator or selected species for each of the terrestrial ecosystems on the Forest. Minimum viable population estimates were based on research findings pertaining to species' reproductive characteristics, such as the sex ratio of breeding adults, the presence or absence of

overlapping generations, and the short-term survival rate of the species' genetic integrity. The minimum viable population (MVP) estimates provide for maintenance of genetic variability and long-term viability. All species were assumed to have an effective prebreeding population of 50. The MVP for each indicator species was calculated to be 1440 (see the Region 3 MVP formulas documented in a FS, R-3 2620 memo of March 18, 1982).

The species selected for each terrestrial ecosystem and the minimum habitat requirements are shown below. Habitat requirements were based on the best information available on species' home ranges and dispersal capabilities.

Grama Galleta Grasslands

Indicator species - Eastern Meadowlark
Management objective - Provide for 1 MVP on the Guadalupe R.D. (about 80 percent of the grassland is on this district.)
Habitat needs - Grama grasslands in fair or better range condition.
(Condition of the grasslands was included in the range model data and indicates the availablity of herbage.)
7 acres/pair for 1440 birds = 5040 acres.

Desert Shrub

Indicator species - Rufous-Crowned Sparrow
Management objectives - Provide for 1 MVP per district on Cloudcroft R.D. and Guadalupe R.D.
Habitat needs - Desert shrub in fair or better range condition.
1 acre/pair for 1440 birds = 720 acres/MVP.

PJ Woodland

Indicator species - Mule Deer
Management objective - Provide for 1 MVP per Forest division.
Habitat needs - 26.5 acres/deer for 1440 deer = 38,400 acres per MVP, with 60 percent in forage condition (canopy closure less than 40 percent) and 40 percent in cover condition (canopy closure greater than 40 percent).

PJ Woodland

Indicator species - Plain Titmouse
Management objective - Provide for 1 MVP per Forest division.
Habitat needs - PJ woodland with canopy closure of 40 percent or more.
1 acre/pair for 1440 birds = 720 acres per MVP.
(This requirement is inclusive in the mule deer cover requirement.)

Ponderosa Pine

Indicator species - Pygmy Nuthatch
Management objective - Provide for 1 MVP per district on Smokey Bear R.D. and Mayhill R.D.
Habitat needs - Mature and overmature ponderosa pine stands (trees greater than 16" dbh).
1 acre/pair for 1440 birds = 720 acres/MVP.

Mixed Conifer
Indicator species - Hairy Woodpecker
Management objective - Provide for 1 MVP per Forest division for the Lincoln and Sacramento Divisions.
Habitat needs - Mixed conifer with aspen in old growth condition.
2 acres/pair for 1440 birds = 1440 acres/MVP.

Mixed Conifer
Indicator species - Red Squirrel
Management objective - Provide for 1 MVP for the Forest, excluding Guadalupe R.D.
Habitat needs - Mixed conifer in multi-storied stands of cone-bearing age.
2.5 acres/squirrel for 1440 squirrels = 3600 acres, with at least 1800 acres in old growth condition and/or mature sawtimber size (greater than 16" dbh).

Mixed Conifer
Selected species - Sacramento Salamander
Management objective - Provide for 1 MVP per Forest division for the Lincoln and Sacramento Divisions.
Habitat needs - Mixed conifer in multi-storied stands in old growth condition and/or mature or overmature sawtimber size. Additional requirements are site specific.
427 total acres per MVP are needed based on different space requirements of breeding females, adults and juveniles.
(This requirement is inclusive in the hairy woodpecker requirement.)

Mixed Conifer
Indicator species - Elk
Management objective - Provide for 1 MVP on the Forest.
Habitat needs - 80 acres/elk for 1440 elk = 115,200 acres with at least 20 percent in cover condition (23,000 acres), 35 percent in forage condition (40,300 acres) and 15 percent in calving cover condition (17,300 acres).
Cover condition - all mixed conifer multi-storied stands with greater than 40 percent canopy closure.
Forage condition - all single-storied stand sizes, except immature sawtimber size; a multi-storied stand in grass/forb size; mountain grass in fair or better range condition.
Calving condition - Multi-storied stands in seedlings and saplings or post and pole size classes; single-storied stands in seedlings and sapling size class.

Mountain Grasslands
Indicator species - Mexican Vole
Management objective - Provide for 1 MVP on the Forest, not including Guadalupe R.D.
Habitat needs - Mountain grasslands in fair or better range condition.
1 acre/pair for 1440 voles = 720 acres.

The requirement for old growth conditions for the hairy woodpecker, red squirrel and the salamander on the Sacramento Division had to be entered as a constraint in the model. The perpetuation of old growth conditions was provided through a special old growth timber management prescription. (See description of this prescription in Prescription Development section of the appendix). The timber strata that presently most closely met old growth conditions was constrained to have at least 1440 acres allocated to the old growth timber management prescription.

The soil and watershed protection requirements were modeled as upper limits on the number of acres that could be harvested during any one time period. Harvest activities were estimated to disturb the ground on about 31 percent of the harvest area due to logging roads and skid trails. The ID team chose to allow no more than 10 percent of the land in each analysis area (except for three highly visible areas that could allow no more than 5 percent) to be disturbed during any one time period. The total number of acres that could be disturbed within each of the two timber divisions on the Forest were entered as upper limit constraints.

Maximum disturbed acres on Lincoln Division - 4319 acres/period
(Lincoln Division includes all the timber lands in the Smokey Bear Ranger District)
Maximum disturbed acres on Sacramento Division - 19568 acres/period
(Sacramento Division includes all the timber lands in the Cloudcroft and Mayhill Ranger Districts)

In addition, no harvest activity was allowed in the South Fork Bonito Analysis Area (1H) due to its predominantly steep slopes around an important watershed and its inaccessible location.

ANALYSIS PRIOR TO FORMULATION OF ALTERNATIVES

This section of the appendix describes the benchmark analysis that was conducted prior to the formulation of alternatives. Other analysis conducted before alternatives were formulated related to the development of prescriptions and coefficients. These are discussed in the Prescriptions and Coefficients sections of this appendix.

Benchmark Analysis

Prior to alternative development, an analysis of the management situation was completed to determine the ability of the Forest to supply goods and services. The purpose of the analysis was to evaluate all potentials for multiple use in formulating a reasonable range of alternatives. Eleven benchmarks representing a broad range of feasible options were generated through the FORPLAN model to identify opportunities for resolution of issues and concerns and to delineate the upper limits for individual resource production. Benchmark analysis established the limits of the feasible decision space within which alternatives could be developed.

Two general types of benchmark analyses were made: 1) a determination of the projected maximum present net value of the Forest's priced resources and 2) a determination of the maximum resource production potentials of the primary resources on the Forest.

The objectives of these analyses were to:

1. Explore the maximum economic and biological use and development opportunities of individual resources.
2. Evaluate capabilities between priced and nonpriced resource outputs and effects.
3. Determine the ability of the Forest to respond to major issues and concerns.

In addition to meeting the objectives, the benchmarks had to meet the following requirements:

1. Comply with the minimum legal management requirements of 36 CFR 219.27 (see Prescription and Minimum Management Requirement Constraints sections of this appendix).

2. Estimate the schedule of management activities, resource outputs, acreages of prescription assignments appropriate to achieving the purposes of the benchmark, discounted benefits and costs, and the PNV.

3. Be approximately implementable.

4. Not be constrained by budget except for the Low Intensity and Current direction benchmarks.

5. Use a Maximize PNV objective function in the FORPLAN run to obtain a final analytical solution.

The benchmark analyses and the purpose for each benchmark are explained below. All analyses, except Minimum Level, were conducted using FORPLAN. Minimum management requirements were included in all benchmarks. These were included in the low intensity prescriptions and in the constraints described in the previous section of this appendix.

1. Minimum Level: The Minimum Level defines the least cost program for keeping the Forest in public ownership. It provides for protection of soil and water resources and productivity of the land. The benchmark also provides for the protection of life, health, and safety of incidental users; the prevention of environmental damage to adjoining lands or downstream areas; and the administration of established special uses and minerals. The Minimum Level Benchmark was determined outside of FORPLAN. No management prescriptions were used. The purpose was to identify naturally occurring outputs and unavoidable costs of maintaining the Forest as part of the National Forest system. Outputs of developed, dispersed, and wildlife related recreation and water yield were estimated. Costs of administering the land at minimum level were also estimated.

2. Low Budget Benchmark: The Low Budget Benchmark displays the outputs and costs associated with managing the Forest at a reduced budget. It indicates the most cost efficient set of management prescriptions that should be used if the budget is reduced 25 percent below current level. It

does not define the lower end of the decision space for all resources, as some resources with high net benefits are favored over others with low net benefits.

3. Current Direction Benchmark: This benchmark is the "No Action" alternative that can be used to evaluate the consequences of continuing with the current management program. It is used as a basis of comparison with other benchmarks and alternatives.

4. Maximize PNV for Market Values: This benchmark specifies the management direction that can maximize PNV over the 200-year planning horizon using those outputs which have established market values. Only benefit values for timber and timber related products, permitted grazing use, and developed recreation were included in the objective function.

5. Maximize PNV for Assigned Values with Non-declining Yields: This benchmark specifies the management emphases that can maximize the PNV of those outputs that have an established market price or an assigned monetary value. The objective function includes benefit values for the following priced outputs: timber and timber related outputs; permitted grazing use; developed, dispersed, and wilderness recreation; wildlife recreation, and water yield. The Maximum PNV Assigned Value Benchmark is the Maximum PNV Benchmark used for tradeoff comparisons.

6. Maximize PNV for Assigned Values With Sequential Lower and Upper Bounds on timber harvest levels: This benchmark is similar to benchmark 5 except it imposes limits on the timber harvest volume fluctuations between decades. Volume cannot increase more than 30 percent or decrease more than 25 percent between decades. The benchmark is used to analyze the effect of the non-declining yield constraint on timber harvest and resulting PNV.

7. Maximize Timber, Period 1: This benchmark shows the effects of maximizing net merchantable timber harvest volume in the first period only, then maximizing PNV for all priced benefits while producing at least 98 percent of the maximum potential timber harvest.

8. Maximize Timber, All 8 Periods: This benchmark shows the effects of maximizing net merchantable timber harvest volume for all eight periods, then maximizing PNV for all priced benefits while producing at least 98 percent of the maximum potential timber harvest.

9. Maximize Timber - Minimize Costs All Periods: This benchmark displays the management direction and effects of minimizing total budget over all 8 periods while producing at least 98 percent of the maximum potential timber harvest volume (as determined in benchmark 8). The benchmark delineates the lower end of the decision space for all resources except timber.

10. Maximize Grazing Capacity: This benchmark shows the effects of maximizing grazing capacity for all eight periods, then maximizing PNV for all priced benefits while producing at least 98 percent of the maximum potential grazing capacity.

11. Maximize Recreation: This benchmark shows the effects of maximizing recreation visitor days (RVDs) for all eight periods for all types of recreation, except wildlife recreation; then maximizing PNV while providing at least 98 percent of the maximum potential recreation use for each type of recreation.

12. Maximize Wildlife: This benchmark shows the effects of maximizing wildlife and fish recreation visitor days for all eight periods, then maximizing PNV while providing at least 98 percent of the maximum potential wildlife RVDs.

Each of the maximum single resource benchmarks (7 to 12 above) indicate the maximum amount of a single output that could be produced from the Forest. Production of other resources is at least at the Low Intensity Level unless a higher level is included to support the featured resource. The runs use different formulations and objective functions for each featured resource.

The purpose of single resource benchmarks is to determine the maximum feasible level of production while meeting minimum management requirements. The second objective is to determine the management program that will maximize PNV of all priced benefits or minimize budget costs while providing at least 98 percent of the maximum potential single resource being emphasized. The FORPLAN run that accomplishes this is called a PNV rollover. Where no rollover is required (1 to 6 above), the objective function was to maximize PNV for 200 years.

A description of each benchmark is provided in Table 105. The description includes the objective function(s) used and the constraints by time period where applicable. Terminology used in the table is explained in the Constraints section of this appendix. Descriptions of the minimum management requirement constraints (MMRs) are also provided in the Constraints section. The prescriptions used for the benchmarks are the same as those used for the alternatives (see Prescription section of this appendix).

Table 105. Benchmark Objective Functions and Constraints

Benchmark: Low Budget Benchmark

Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Timber constraints:							
Non-declining Yield	MCF/Year						
Long-Term Sustained Yield link	MCF/Year						
Ending Inventory	MCF/Year						
Culmination Mean Annual Increment							
Minimum Management Requirements (MMRs)							
Floor/Ceiling Constraints:							
Sawtimber	MBF/Year	GE	6000	6000	6000	6000	6000
FS budget for Range Improvements	$/Year	GE	50000	49200	48413	47638	46876
Budget	M$/Year	LE	3724	3724			

Discussion: The timber harvest requirements for: 1) non-declining yield on harvest volume with harvest not to exceed the long-term sustained-yield (LRSY) capacity in any time period, 2) harvest of even-aged stands at or beyond the culmination of mean annual increment (CMAI), and 3) sale schedules that provide for perpetual timber harvests (ending inventory must be at least as much as the average regenerated inventory), comply with legal requirements specified in 36 CFR 219.16(a)(1), (a)(2)(iii), and (a)(2)(iv). Culmination of mean annual increment was incorporated in ECOSIM to require final removal of timber at or beyond CMAI. For further discussion of the timber constraints, see the Constraints section of this Appendix. The minimum management requirements (MMRs) are listed in the MMR constraint section of the appendix.

A lower limit was placed on the sawtimber harvest in order to provide for a minimum salvage operation. This constraint was binding in all periods, since the net priced benefits from timber harvest are negative and timber is produced only at the volumes needed to meet constraints. A constraint was placed on the range improvement expenditures to ensure that the current level of Range Betterment Funds, which come from grazing permittees fees, and Forest Service matching monies are spent. A 1.6 percent decline in the Betterment Fund was included in anticipation of the reduced grazing use under this management program. The Forest budget in the first two periods was constrained to be less than or equal to 75 percent of the current budget.

Benchmark: Current

Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Timber constraints:	Same as Low Budget Benchmark.						
MMRs							
Floor/Ceiling Constraints:							
Sawtimber	MBF/Year	GE	11000	13000	13000	13000	13000
		LE	11500				
Cable logging	MBF/Year	GE	2000	2000	2000	2000	2000
Harvest Acres:							
Aspen	Acre/Year	EQ	71	71	71	71	71
Lincoln Division	Acres/Period	LE	.01				
In Moderate intensity timber prescriptions - Sacramento Division	Acres/Period	LE	10000	10000	10000	10000	10000
Old Growth Mgmt.	Acres/All periods						
Lincoln Div.		GE	1100				
Sacramento Div.		GE	4750				
Budget	M$/Year	LE	4965	4965			

Prescription Controls:
Only the following prescriptions were available:
Current intensity for nontimber
All timber prescriptions, except low intensity
Max Recreation for AA 1H.

Discussion: Timber and MMR constraints are discussed in the Low Budget Benchmark section of this table. Sawtimber harvest in the first period was constrained to be slightly greater than the level indicated as the Allowable Sale Quantity (ASQ) in the Timber Management Plan of 1970-80, as revised in 1975. This constraint was binding on the upper limit. A lower limit was placed on the sawtimber for subsequent periods in order to maintain harvest levels slightly higher than the first period. This constraint was binding in all periods.

The other timber constraints were imposed to provide consistency with current management practices. A lower limit was placed on cable logging harvest levels. The cable logging constraint was binding in all periods. An average of 71 acres per year of aspen must be harvested (by clearcutting methods) in order to perpetuate the aspen type on the Forest.

No timber harvest is allowed on the Lincoln Division (Smokey Bear District) and a limit is placed on the number of acres in the Sacramento Division (Cloudcroft and Mayhill Districts) that can be managed under moderate intensity prescriptions. No low intensity prescriptions are allowed.

Additional acres in old growth management are required, beyond the MMRs, to meet management objectives for wildlife. The lower limit for the Lincoln Division was binding. The budget constraint was not binding in either period.

Benchmark: Maximum PNV for Market Values

Objective Function: Maximize PNV for all periods using market goods only

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Timber constraints:	Same as Low Budget Benchmark.						
MMRs							

Discussion: Timber constraints and MMRs are discussed in the Low Budget Benchmark section of this table. This is a monetary benchmark. The benchmark displays the most cost efficient way to manage the Forest based on resources having established market values and the costs associated with producing those resource outputs. About 60 percent of the developed recreation RVDs (the proportion of RVDs that use fee sites) are counted as a market output in the objective function. The total timber, fuelwood and grazing use output levels are included in the objective function.

Benchmark: Maximum PNV for Assigned Values W/ Non-declining Yields

Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Timber constraints:	Same as Low Budget Benchmark.						
MMRs							

Discussion: Timber constraints and MMRs are discussed in the Low Budget Benchmark section of this table. This is a monetary benchmark. The benchmark displays the most cost efficient management direction for the Forest based on resources having established market values or assigned values and the costs associated with producing those resource outputs. The PNV in this benchmark is used as the reference point to evaluate the change in PNV resulting from changes in management direction.

Benchmark: Maximum PNV for Assigned Values W/Sequential Lower and Upper Bounds
Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Timber constraints:							
Sequential Lower/	MCF/Year	LE	25%	25%	25%	25%	25%
Upper Bounds		LE	30%	30%	30%	30%	30%
Ending Inventory	MCF/Year						
Culmination Mean Annual Increment							
MMRs							

Discussion: A discussion of the ending inventory, culmination of mean annual increment and MMR constraints is provided in the Low Budget Benchmark section of this table. A sequential lower and upper bound (SLUB) on timber harvest was used in this run instead of the non-declining yield constraint. The purpose of this constraint is to allow a departure from a non-declining harvest yield per direction in 36 CFR 219.16(3) and to analyze the extent to which net public benefit might be improved. The harvest volume in this run can increase no more than 30 percent between decades and decrease no more than 25 percent between decades. The upper and lower limits represent the maximum change that would be feasible for the local mill and Forest staffing.

This is a monetary benchmark which can be compared to the Max PNV Assigned Value Benchmark to determine the opportunity cost of the non-declining yield constraint. The percent difference between PNV's was negligble.

Benchmark: Maximum Timber Volume, Period 1
Objective Function: Maximize merchantable timber volume in Period 1, then Maximize PNV all periods

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Timber constraints:	Same as Low Budget Benchmark.						
MMRs							
Floor/Ceiling Constraints for PNV Rollover:							
Net Merch. Timber Volume	MCF/Period	GE	94930				

Discussion: Timber constraints and MMRs are discussed in the Low Budget Benchmark section of this table. This benchmark maximizes timber volume harvest in the first period, then maximizes the PNV for all periods while providing at least 98 percent of the maximum

potential timber volume. The lower limit on timber volume in the first period, shown above, was binding and most of the MMR constraints were binding.

This Max Timber Benchmark was used to establish the upper limit for timber production and is shown as the Max Timber Benchmark in the Comparison of Alternatives section, Chapter 2.

Benchmark: Maximum Timber Volume, 8 Periods
Objective Function: Maximize merchantable timber volume for all periods, then maximize PNV

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Timber constraints:							
Sequential Lower/	MCF/Year	LE	25%	25%	25%	25%	25%
Upper Bounds	MCF/Year	LE	30%	30%	30%	30%	30%
Ending Inventory	MCF/Year						
Culmination Mean Annual Increment							
MMRs							
Floor/Ceiling Constraints for PNV Rollover:							
Net Merch. Timber Volume	MCF/Period	GE	72263	93942	75421	56566	46167

Discussion: Discussion of the ending inventory and culmination of mean annual increment constraints is provided with the Low Budget Benchmark. The use of SLUB's is discussed in the Maximum PNV for Assigned Values W/SLUB Benchmark. This benchmark maximizes net merchantable timber volume for all time periods, then maximizes PNV while providing at least 98 percent of the maximum potential timber volume. The lower limits on timber volume for the first 5 periods, shown above, were used as constraints on the Max PNV rollover and were binding in all periods. The SLUB constraint is dropped in the PNV rollover since the lower limits on timber volume are more constraining.

This benchmark is used to show the effect of maximizing net merchantable timber volume for all time periods without providing non-declining harvest yields. It represents the most cost efficient way to manage the Forest if the objective is to maximize the production of timber.

Benchmark: Maximum Timber Volume, Minimum Costs
Objective Function: Minimize costs, all periods

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Timber constraints:							
Ending Inventory	MCF/Year						
Culmination Mean Annual Increment							
MMRs							
Floor/Ceiling Constraints for Min Cost Rollover:							
Net Merch. Timber Volume	MCF/Period	GE	72263	93942	75421	56566	46167

Discussion: Timber and MMR constraints are discussed in the Low Budget Benchmark section of this table. This benchmark minimizes Forest budget costs over all time periods while producing at least 98 percent of the maximum potential timber volume as identified in the Max Timber - 8 Periods Benchmark. The lower limits on timber volume, shown above, were binding in all time periods, and most of the MMR constraints were binding in all periods.

This benchmark provides a basis for determining the opportunity cost associated with producing high levels of timber harvest at the least possible cost without maintaining non-declining yields. The lower end of the decision space for all nontimber resources is delineated by this benchmark since the least cost management prescriptions were selected.

Benchmark: Maximum Grazing Capacity

Objective Function: Maximize grazing capacity for all periods, then maximize PNV

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Timber constraints:							
Ending Inventory	MCF/Year						
Sequential Lower/	MCF/Year	LE	25%	25%	25%	25%	25%
Upper Bounds		LE	30%	30%	30%	30%	30%
Culmination Mean Annual Increment							
MMRs							
Floor/Ceiling Constraints:							
Sawtimber	MBF/Year	GE	6000	6000	6000	6000	6000
For PNV Rollover - Grazing Capacity	AUM/Year	GE	105900	112256	156535	176672	183722

Discussion: Discussion of ending inventory, culmination of mean annual increment and MMR constraints is covered in the Low Budget Benchmark section of this table. The use of the SLUB constraint is described in the Max PNV, Assigned Values W/SLUB Benchmark. This benchmark maximizes grazing capacity for all periods, then maximizes PNV while providing at least 98 percent of the maximum potential grazing capacity. The lower limits on grazing capacity, shown above, were applied to the PNV rollover run and were binding constraints in Periods 1, 2, and 4. The floor on sawtimber was used to provide a minimum salvage operation. This constraint was binding in all periods.

This is a resource benchmark used to determine the maximum grazing capacity on the Forest using technically feasible management practices to improve the distribution of grazing use and the production of forage cover. It indicates the range of opportunities for the other resources if the management objective is to emphasize range resource production.

Benchmark: Maximum Recreation

Objective Function: Maximize recreation RVDs for all periods, then maximize PNV

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Timber constraints:							
Ending Inventory	MCF/Year						
Sequential Lower/	MCF/Year	LE	25%	25%	25%	25%	25%
Upper Bounds	MCF/Year	LE	30%	30%	30%	30%	30%
Culmination Mean Annual Increment							
MMRs							
Floor/Ceiling Constraints:							
Sawtimber	MBF/Year	GE	6000	6000	6000	6000	6000
For PNV Rollover - Dispersed Recreation	RVD/Year	GE	590022	679568	740724	780152	818551
Wilderness Recreation	RVD/Year	GE	23946	29245	33930	37663	38931
Developed Recreation	RVD/Year	GE	616802	840394	1007220	1123300	1207621
Cave Recreation	RVD/Year	GE	6653	6920	7127	7341	7488

Discussion: Discussion of the ending inventory, culmination of mean annual increment and MMR constraints is covered in the Low Budget Benchmark section of this table. The use of Sequential Lower and Upper Bounds is discussed in the Max PNV, Assigned Values W/SLUB Benchmark. This benchmark maximizes all recreation visitor days, except wildlife-related recreation, over all time periods, then maximizes the PNV while providing at least 98 percent of the maximum potential recreation use for each type of recreation. Most of the lower limits for the recreation visitor days, shown above, were not binding. A lower limit on sawtimber harvest was used to provide a minimum salvage operation and was binding in all periods.

This is a resource benchmark used to determine the feasible upper level of recreation opportunity on the Forest. It also indicates the range of opportunity for other resources if the management objective is to emphasize recreation.

Benchmark: Maximum Wildlife
Objective Function: Maximize wildlife visitor days for all periods, then maximize PNV

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Timber constraints:							
Sequential Lower/	MCF/Year	LE	25%	25%	25%	25%	25%
Upper Bounds	MCF/Year	GE	30%	30%	30%	30%	30%
Ending Inventory	MCF/Year						
Culmination Mean Annual Increment							
MMRs							
Floor/Ceiling Constraints:							
Sawtimber	MBF/Year	GE	6000	6000	6000	6000	6000
For PNV Rollover - Wildlife Rec.	RVD/Period	GE	3467463	3682423	3793429	3643640	3382284

Discussion: Timber and MMR constraints are discussed in the Low Budget Benchmark and Max PNV, Assigned Values W/SLUB sections of this table. This benchmark maximizes wildlife RVDs, then maximizes PNV while providing at least 98 percent of the maximum potential wildlife RVDs. The lower limits for wildlife RVDs, shown above, were applied to the PNV rollover run and were binding in Periods 4 and 5. The RVDs reflect the number and types of direct habitat improvements provided by the wildlife prescriptions, not expected visitor use levels. Habitat improvements were scheduled most intensively in the first three periods, as seen by the increasing RVDs during those periods. The lower limit on sawtimber was used to provide a minimum salvage operation. The constraint was binding in all periods.

This is a resource benchmark used to determine the maximum potential management program for wildlife and fish. The wildlife recreation visitor day was used as a measure of the amount of direct habitat improvement work that was programmed in the management prescriptions. Not all of the recreation visitor days were assigned a dollar benefit value in the PNV rollover. The valuation of wildlife RVDs was discussed in the Benefits section of this appendix. This benchmark indicates the range of opportunity for other resources if the management objective is to emphasize wildlife habitat improvement.

Benchmark Results

Table 106 displays the average annual resource outputs for each benchmark. The timber outputs are shown for all eight time periods. The nontimber resources are shown for the first five ten-year time periods. Output levels of nontimber resources after the fifth period were scheduled to be the same as they were in the fifth period, with the exception of a few recreation prescriptions. The benchmarks are listed in order of increasing PNV's from Minimum Level to Max PNV, Assigned Values W/Sequential Lower and Upper Bounds (SLUB). The output units of measure are indicated by each output. The effects of applying

constraint sets to a benchmark, as shown in Table 105 can be seen by: 1) comparing the resource output levels between the benchmark and the Max PNV-Assigned Values Benchmark and 2) comparing the PNV of the benchmark from the PNV of the Max PNV-Assigned Values Benchmark. The PNVs of each benchmark are shown in Table 107.

Table 106. Resource Outputs by Benchmark

Output: Net Merchantable Timber Volume (MCF/Year)--Nonpriced Output (Allowable Sale Quantity, ASQ)

	Period							
Alternative	1	2	3	4	5	6	7	8
Minimum Level	0	0	0	0	0	0	0	0
Max Timber-Min Cost	7,226	9,394	7,542	5,657	4,617	10,849	8,470	15,700
Current	3,484	3,484	3,484	3,484	3,484	3,484	3,484	3,484
Max PNV-Market	636	636	636	636	636	636	636	636
Max Grazing Capacity	1,647	2,141	2,783	2,143	2,134	1,527	2,974	2,671
Max Timber-1st Period	9,493	9,493	9,493	9,493	9,493	9,493	9,493	9,493
Low Budget	1,963	1,989	1,989	1,989	1,989	1,989	1,989	1,989
Max Timber-8 Periods	7,226	9,394	7,542	5,657	4,617	10,849	8,470	15,700
Max Recreation	1,647	2,141	2,783	2,143	2,134	1,527	2,974	2,671
Max Wildlife Habitat	1,647	2,141	2,783	2,143	2,134	1,527	2,974	2,671
Max PNV-Assg. Values	636	636	636	636	636	636	636	636
Max PNV-Assg.W/SLUB	905	1,176	1,220	915	686	1,110	1,659	1,644

Output: Net Sawtimber (MBF/Year) (ASQ)

	Period							
Alternative	1	2	3	4	5	6	7	8
Minimum Level	0	0	0	0	0	0	0	0
Max Timber-Min Cost	27,603	35,416	27,481	12,714	19,678	51,026	30,305	74,076
Current	11,500	13,000	13,000	13,000	13,000	14,332	14,559	15,190
Max PNV-Market	1,336	883	823	399	1,448	1,820	2,981	2,225
Max Grazing Capacity	6,000	6,000	6,000	6,000	6,000	5,608	14,311	10,555
Max Timber-1st Period	37,337	30,908	36,891	38,281	39,347	35,432	42,015	37,638
Low Budget	6,000	6,000	6,000	6,000	6,000	6,549	9,081	7,802
Max Timber-8 Periods	27,073	35,174	28,014	13,044	19,611	50,698	30,384	73,974
Max Recreation	6,000	6,000	6,000	6,000	6,000	5,608	14,311	10,555
Max Wildlife Habitat	6,000	6,000	6,000	6,000	6,000	5,608	14,311	10,555
Max PNV-Assg. Values	1,336	883	823	399	1,448	1,820	2,981	2,225
Max PNV-Assg.W/SLUB	2,759	1,112	1,216	1,507	1,485	3,849	7,728	6,012

Table 106. Resource Outputs by Benchmark (con't)

Output: Net Products (MBF/Year)
(ASQ)

Alternative	Period 1	2	3	4	5	6	7	8
Minimum Level	0	0	0	0	0	0	0	0
Max Timber-Min Cost	2,682	3,957	3,546	5,956	658	1,034	3,203	626
Current	1,601	1,002	1,252	2,211	1,365	850	719	609
Max PNV-Market	562	806	867	1,083	654	398	27	186
Max Grazing Capacity	551	1,442	2,813	1,592	1,352	598	151	653
Max Timber-1st Period	3,135	4,676	3,310	4,781	2,475	3,559	1,262	1,877
Low Budget	916	1,256	1,289	1,287	1,255	1,072	128	454
Max Timber-8 Periods	2,768	4,042	3,350	5,907	691	1,100	3,183	670
Max Recreation	551	1,442	2,813	1,592	1,352	598	151	652
Max Wildlife Habitat	551	1,442	2,813	1,592	1,352	598	151	653
Max PNV-Assg. Values	562	806	867	1,083	654	398	27	186
Max PNV-Assg.W/SLUB	541	1,731	1,842	1,169	595	549	113	554

Output: Long-Term Sustained-Yield Capacity (MCF/Year)
NOTE: LTSYC occurs beyond the planning horizon, but is displayed in Period 8.

Alternative	Period 1	2	3	4	5	6	7	8
Minimum Level								0
Max Timber-Min Cost								10,477
Current								3,484
Max PNV-Market								636
Max Grazing Capacity								2,335
Max Timber-1st Period								9,493
Low Budget								1,989
Max Timber-8 Periods								10,477
Max Recreation								2,335
Max Wildlife Habitat								2,335
Max PNV-Assg. Values								636
Max PNV-Assg.W/SLUB								1,347

Table 106. Resource Outputs by Benchmark (con't)

Output: Fuelwood - PJ (MBF/Year)

Alternative	Period 1	2	3	4	5	6	7	8
Minimum Level	0	0	0	0	0	0	0	0
Max Timber-Min Cost	0	0	0	0	0	0	0	0
Current	3,463	3,421	3,394	3,647	3,821	3,821	3,821	3,821
Max PNV-Market	40	40	40	40	40	40	40	40
Max Grazing Capacity	2,568	2,568	2,568	2,568	2,568	2,568	2,568	2,568
Max Timber-1st Period	1,458	1,273	1,295	1,211	1,211	1,211	1,211	1,211
Low Budget	646	646	646	646	646	646	646	646
Max Timber-8 Periods	1,458	1,273	1,295	1,211	1,211	1,211	1,211	1,211
Max Recreation	1,568	1,568	1,568	1,568	1,568	1,568	1,568	1,568
Max Wildlife Habitat	2,192	2,192	2,192	2,192	2,192	2,192	2,192	2,192
Max PNV-Assg. Values	1,458	1,273	1,295	1,211	1,211	1,211	1,211	1,211
Max PNV-Assg.W/SLUB	1,458	1,273	1,295	1,211	1,211	1,211	1,211	1,211

Output: Fuelwood - Other (MBF/Year)

Alternative	Period 1	2	3	4	5	6	7	8
Minimum Level	0	0	0	0	0	0	0	0
Max Timber-Min Cost	10,608	11,602	10,663	7,960	6,933	8,984	8,974	9,725
Current	6,082	4,773	5,098	4,351	5,289	4,355	4,809	4,344
Max PNV-Market Values	1,488	1,461	1,388	1,406	1,750	1,181	971	975
Max Grazing Capacity	3,329	3,751	5,431	3,524	5,618	2,949	4,306	4,126
Max Timber-1st Decade	12,317	13,877	10,608	9,242	8,252	10,489	6,837	7,438
Low Budget	3,773	3,292	3,435	3,378	4,676	3,313	2,749	2,830
Max Timber-8 Periods	10,772	11,641	10,629	7,972	7,245	9,044	9,134	9,818
Max Recreation	3,329	3,751	5,431	3,524	5,618	2,949	4,306	4,126
Max Wildlife Habitat	3,329	3,751	5,431	3,524	5,618	2,949	4,306	4,126
Max PNV-Assg. Values	1,488	1,461	1,388	1,406	1,750	1,181	971	975
Max PNV-Assg.W/SLUB	2,301	2,654	2,777	1,855	1,833	1,881	2,026	2,134

Table 106. Resource Outputs by Benchmark (con't)

Output: Developed Recreation, Excluding Downhill Skiing (MRVD/Year)

Alternative	Period 1	2	3	4	5
Minimum Level	0	0	0	0	0
Max Timber-Min Cost	300.3	107.3	107.5	107.4	107.4
Current	314.7	340.1	385.9	425.2	452.6
Max PNV-Market Values	382.0	520.9	608.1	687.1	742.1
Max Grazing Capacity	389.4	530.3	630.2	706.2	772.6
Max Timber-1st Period	433.2	617.9	741.4	832.8	895.7
Low Budget	386.3	522.8	620.8	703.6	761.2
Max Timber-8 Periods	433.2	617.9	741.5	832.8	895.7
Max Recreation	429.2	613.9	739.7	831.4	894.8
Max Wildlife Habitat	429.2	613.9	752.6	833.5	897.4
Max PNV-Assg. Values	433.2	617.9	741.5	832.8	895.7
Max PNV-Assg.W/SLUB	433.2	617.9	741.5	832.8	895.7

Output: Downhill Skiing (MRVD/Year)

Alternative	Period 1	2	3	4	5
Minimum Level	142.6	157.7	167.7	173.0	173.1
Max Timber-Min Cost	142.6	157.7	167.7	173.0	173.1
Current	176.2	211.6	232.0	237.5	238.0
Max PNV-Market Values	196.2	239.6	271.2	295.3	314.8
Max Grazing Capacity	176.2	211.6	232.0	237.5	238.0
Max Timber-1st Period	196.2	239.6	271.2	295.3	314.8
Low Budget	196.2	239.6	271.2	295.3	314.8
Max Timber-8 Periods	196.2	239.6	271.2	295.3	314.8
Max Recreation	196.2	239.6	271.2	295.3	314.8
Max Wildlife Habitat	196.2	239.6	271.2	295.3	314.8
Max PNV-Assg. Values	196.2	239.6	271.2	295.3	314.8
Max PNV-Assg.W/SLUB	196.2	239.6	271.2	295.3	314.8

Table 106. Resource Outputs by Benchmark (con't)

Output: Dispersed Recreation (MRVD/Year)

Alternative	Period 1	2	3	4	5
Minimum Level	265.0	265.0	265.0	265.0	265.0
Max Timber-Min Cost	530.1	592.9	647.1	699.6	745.3
Current	577.1	653.2	728.2	778.7	816.4
Max PNV-Market Values	566.9	639.0	691.4	731.4	761.9
Max Grazing Capacity	595.5	680.3	742.4	782.5	817.0
Max Timber-1st Period	592.6	679.8	740.4	779.2	813.9
Low Budget	579.6	652.2	706.3	749.6	783.3
Max Timber-8 Periods	592.6	679.8	740.4	779.2	813.9
Max Recreation	601.9	693.3	754.6	794.2	829.3
Max Wildlife Habitat	598.7	685.1	747.0	787.2	822.7
Max PNV-Assg. Values	592.6	679.8	740.4	779.2	813.9
Max PNV-Assg.W/SLUB	592.6	679.8	740.4	779.2	813.9

Output: Wilderness Recreation (MRVD/Year)

Alternative	Period 1	2	3	4	5
Minimum Level	10.3	10.3	10.3	10.3	10.3
Max Timber-Min Cost	20.6	23.0	25.3	27.6	29.7
Current	21.3	24.2	26.0	27.8	29.5
Max PNV-Market Values	20.6	23.0	25.3	27.6	29.7
Max Grazing Capacity	22.3	25.4	27.4	29.2	31.1
Max Timber-1st Period	30.3	34.5	37.5	40.4	43.5
Low Budget	29.5	33.6	36.5	39.3	42.3
Max Timber-8 Periods	30.3	34.5	37.5	40.4	43.5
Max Recreation	25.3	30.2	34.3	37.7	39.4
Max Wildlife Habitat	23.1	26.3	28.4	30.3	32.3
Max PNV-Assg. Values	30.3	34.5	37.5	40.4	43.5
Max PNV-Assg.W/SLUB	30.3	34.5	37.5	40.4	43.5

Table 106. Resource Outputs by Benchmark (con't)

Output: Wildlife Recreation (MRVD/Year)

Alternative	Period 1	2	3	4	5
Minimum Level	348.0	235.0	219.0	204.0	190.0
Max Timber-Min Cost	348.0	348.0	348.0	348.0	348.5
Current	370.2	391.7	377.2	361.1	378.8
Max PNV-Market Values	361.4	374.3	361.7	349.3	363.0
Max Grazing Capacity	386.3	466.3	549.8	553.0	567.9
Max Timber-1st Period	386.3	466.3	549.8	626.4	639.0
Low Budget	386.3	466.3	549.8	598.3	604.1
Max Timber-8 Periods	386.3	466.3	549.8	626.4	639.0
Max Recreation	386.3	466.3	549.8	626.4	634.0
Max Wildlife Habitat	386.3	466.3	549.8	626.4	686.2
Max PNV-Assg. Values	386.3	466.3	549.8	626.4	639.0
Max PNV-Assg.W/SLUB	386.3	466.3	549.8	626.4	639.0

Output: Permitted Use (AUM/Year)

Alternative	Period 1	2	3	4	5
Minimum Level	0	0	0	0	0
Max Timber-Min Cost	150847	148447	146047	143647	141247
Current	149647	146047	156020	166105	163673
Max PNV-Market Values	149647	146047	142447	138847	135247
Max Grazing Capacity	149647	146047	189942	209671	217489
Max Timber-1st Period	149647	146047	142447	145826	147336
Low Budget	150378	147509	144640	141771	142260
Max Timber-8 Periods	149647	146047	142447	145826	147336
Max Recreation	149647	146047	142447	147346	148104
Max Wildlife Habitat	149647	146047	150594	159947	156083
Max PNV-Assg. Values	149647	146047	142447	145826	147336
Max PNV-Assg.W/SLUB	149647	146047	142447	145826	147336

Output: Grazing Capacity (AUM/Year)

Alternative	Period 1	2	3	4	5
Minimum Level	0	0	0	0	0
Max Timber-Min Cost	113331	88343	104668	124664	129955
Current	120649	124184	156020	166105	163673
Max PNV-Market Values	114439	97176	113563	130236	132950
Max Grazing Capacity	138900	145256	189942	209671	217489
Max Timber-1st Period	119388	110213	133568	145826	147336
Low Budget	117459	105183	126098	140117	142260
Max Timber-8 Periods	119388	110213	133568	145826	147336

Table 106. Resource Outputs by Benchmark (con't)

Output: Grazing Capacity (AUM/Year)

Alternative	Period 1	2	3	4	5
Max Recreation	119321	111604	135833	147346	148104
Max Wildlife Habitat	119472	119414	150594	159947	156083
Max PNV-Assg. Values	119388	110213	133568	145826	147336
Max PNV-Assg.W/SLUB	119388	110213	133568	145826	147336

The Maximum PNV Assigned Values Benchmark displays the mix of resource outputs that would provide the most cost effective management direction for the Forest. Recreation and wildlife resources are favored over timber and range. The maximum single resource benchmarks display the highest levels of particular resource outputs that could be provided if no other resource emphases were desired.

A comparison of the Maximum Timber - First Period Benchmark to the Maximum Timber - 8 Periods Benchmark shows that the first benchmark: 1) provides a lower long-term sustained-yield capacity, 2) provides less volume over the entire planning horizon (about 196.7 MMCF less), 3) provides more sawtimber harvest in the first 50 years, and 4) provides more net wood products over the entire planning period (about 103 MMBF more). The Maximum Timber - Minimum Cost Benchmark was constrained to produce as much timber as the Max Timber - 8 Periods Benchmark and the timber outputs are very similar. The nontimber outputs, however, are produced at the lowest levels of all the benchmarks. These levels represent the outputs possible with low intensity management prescriptions.

The total discounted costs and benefits of each benchmark are shown in Table 107. The benchmarks are listed in order of decreasing PNV's and are compared to the Maximum PNV Assigned Values Benchmark. The recreation and wildlife benchmarks come closest to the Max PNV Benchmark in providing net benefits. The maximum timber benchmarks provide higher net benefits than the Maximum Grazing Benchmark since the maximum timber benchmarks could produce more recreation and wildlife outputs. The Current Management Benchmark was constrained to manage all resources at current management intensities and has a much lower PNV than the Maximum PNV Benchmark.

Table 107. Comparison of Cumulative Economic Benefits, Costs and Present Net Value of Benchmarks to Maximum PNV Assigned Benchmark at 2180, Discounted at 4% to 1980, 4th Quarter M Dollars

Benchmark	Present Value Benefits	Present Value Costs	Present Net Value	Percent Difference in PNV from Max PNV assg.*
Max PNV-Assg. W/SLUB	558,828	145,789	413,039	0
Max PNV-Assg. Value *	557,185	144,221	412,964	-
Max Wildlife Habitat	572,227	163,224	409,003	-1
Max Recreation	563,615	155,454	408,161	-1
Max Timber - 8 Periods	593,883	209,984	383,899	-7
Low Budget	538,633	160,476	378,157	-8
Max Timber - 1st period	601,577	224,062	377,515	-9
Max Grazing Capacity	548,327	175,318	373,009	-10
Max PNV-Market	449,138	115,672	333,466	-19
Current	455,641	182,663	272,982	-34
Max Timber-Min Cost	421,145	205,441	215,704	-48
Minimum Level	223,672	109,395	114,277	-72

The Economic Coefficients section of this appendix explains the difference between market and assigned values for the priced outputs. Two benchmarks were developed to examine the significant effects, if any, that market versus assigned values have on output levels. The Max PNV Assigned Values Benchmark has all priced outputs with market and assigned values available in the objective function of the model. The Max PNV Market Benchmark has only market value outputs in the objective function. Table 108 displays a comparison of the two benchmarks.

Table 108. Comparison of Average Annual Outputs Having Market Prices with Outputs Having Assigned Values for Max PNV Assigned and Max PNV Market Benchmarks

Outputs	Average Annual Outputs in Period 1	Average Annual Outputs in Period 5	Average Annual Outputs in Period 8	Total Cumulative Output for 8 Periods
Outputs Having Market Value				
Net Sawtimber (MBF)				
Max PNV assg	1,336	1,448	2,225	400,156
Max PNV mkt	1,336	1,448	2,225	400,156
Percent change	0	0	0	0
Net Products (MBF)				
Max PNV assg	562	654	186	70,288
Max PNV mkt	562	654	186	70,288
Percent change	0	0	0	0

Table 108. Comparison of Average Annual Outputs Having Market Prices with Outputs Having Assigned Values for Max PNV Assigned and Max PNV Market Benchmarks (con't)

Fuelwood Sold (MBF)				
Max PNV assg	2,945	2,960	2,185	477,306
Max PNV mkt	1,528	1,789	1,015	239,256
Percent change	-48	-40	-54	-50
Developed Rec (MRVD)				
Max PNV assg	629	1,211	1,210	229,938
Max PNV mkt	578	1,057	1,057	201,101
Percent change	-8	-13	-13	-13
Permitted Use (AUM)				
Max PNV assg	149,647	147,336	147,336	29,413,430
Max PNV mkt	149,647	135,247	135,247	27,409,400
Percent change	0	-8	-8	-7
Outputs having Assigned Values				
Dispersed Rec (MRVD)				
Max PNV assg	593	814	814	158,142
Max PNV mkt	567	762	762	148,197
Percent change	-4	-6	-6	-6
Wilderness Rec (MRVD)				
Max PNV assg	30	44	44	8,387
Max PNV mkt	21	30	30	5,722
Percent change	-32	-32	-32	-32
Wildlife Rec (MRVD)				
Max PNV assg	386	639	639	95,776
Max PNV mkt	361	363	363	72,475
Percent change	-6	-43	-43	-24
Water Yield (AcFt)				
Max PNV assg	123,000	123,000	123,000	24,600,000
Max PNV mkt	123,000	123,000	123,000	24,600,000
Percent change	0	0	0	0

The present net value (PNV) of the Max PNV Assigned Values Benchmark is greater than the PNV of the Max PNV Market Values Benchmark. Market commodities, except fuelwood, are produced at nearly the same levels in both benchmarks, while the amenity goods are produced at much higher levels in the Max PNV Assigned Values Benchmark. Very little timber is produced in each of the benchmarks, since the priced benefits do not exceed the costs in most of the timber prescriptions. Pinyon-juniper fuelwood harvest levels are tied to the nontimber management

prescriptions. The Max PNV Market Benchmark favors low intensity level prescriptions for nontimber resources and, therefore, has lower PJ fuelwood yields than the Max PNV Assigned Values Benchmark. In summary, the Max PNV Assigned Values Benchmark produces as much commodity output as the Max PNV Market Benchmark and does not tradeoff market opportunities to reach the higher present net value.

Each benchmark selects different combinations of management prescriptions and different acreages assigned to various prescriptions. Table 109 shows the acres assigned to each prescription emphasis category by benchmark. The nontimber prescriptions are numbered from 1 to 10 and correspond to the prescription list in Table 90. The timber prescriptions are shown on the right-side of the table and are categorized as even-aged management or old growth (uneven-aged) management.

Table 109. Acres Assigned to Prescription Levels by Benchmark--Acres

	Non Timber Prescriptions									Timber Prescriptions	
Benchmarks	1	2/F2	3	5	7a	7b	8	9	10	Even-age	O.G.
Max Timber - Min Cost	1,071,509	0	0	0	0	21,251	0	0	0	225,415	30,642
Current	0	1,091,520	0	0	1,240	0	0	0	0	87,753	19,048
Max PNV-Mkt	863,399	18,446	0	0	189,664	21,251	0	0	0	18,884	3,364
Max Graz. Cap.	27,765	58,332	645,529	233,154	1,240	0	38,866	67,266	20,608	77,483	13,081
Max Timber-1st Per.	359,183	8,675	0	321,271	48,282	21,251	137,385	196,713	0	250,005	6,052
Low Budget	558,608	0	0	317,149	48,282	21,251	13,892	133,578	0	70,925	4,546
Max Timber-8 Per.	359,183	8,675	0	321,271	48,282	21,251	137,385	196,713	0	223,868	32,189
Max Wildlife Habitat	90,940	0	0	508,028	6,199	0	159,676	327,917	0	77,483	13,081
Max Rec	323,696	0	0	258,227	65,907	36,999	198,022	209,909	0	77,483	13,081
Max PNV-Assg.	359,183	26,647	0	303,299	48,282	21,251	137,385	196,713	0	18,884	3,364
Max PNV-assg.W/ SLUB	359,183	8,675	0	321,271	48,282	21,251	137,385	196,713	0	48,125	1,440

FORMULATION OF ALTERNATIVES

Introduction

An alternative is a feasible management strategy that attempts to satisfy specific management goals and objectives. Different alternatives are generated by varying the type or emphasis of goals. Each alternative represents a

different set of objectives, outputs, and constraints which respond to different identified public issues and management concerns and take advantage of resource management opportunities.

The stages of the planning process preceding the formulation of alternatives include: identification of ICO's, development of decision criteria, data inventory and collection, and analysis of the demand and supply capability for various resources --the analysis of the management situation (AMS).

The benchmark analyses explored a "reasonable range" of production possibilities within the parameters of expected future use and resource capabilities. The analyses provided the decision space within which integrated alternatives could be formulated. An integrated alternative is one in which individual resource objectives are compatible with the minimum legal and resource integration requirements of 36 CFR 219.13 through 219.27. In formulating alternatives, the complementary and competitive relationships among goods and services produced by the Forest are examined.

The National Forest Management Act (NFMA) implementing regulations [36 CFR 219.12(f)] specify guidelines and criteria which determine the reasonable range of alternatives. These are:

- Alternatives shall be distributed between the minimum resource potential and the maximum resource potential to reflect, to the extent practicable, the full range of major commodity and environmental resource uses and values that could be produced from the Forest. Alternatives shall reflect a range of resource outputs and expenditure levels.

- Alternatives shall be formulated to facilitate analysis of opportunity costs and the resource use and environmental tradeoffs among alternatives and between benchmarks and alternatives.

- Alternatives shall be formulated to facilitate evaluation of the effects on present net value, benefits, and costs of achieving various outputs and values that are not assigned monetary values, but that are provided at specified levels.

- Alternatives shall provide different ways to address and respond to the major public issues, management concerns, and resource opportunities identified during the planning process.

- Reasonable alternatives which may require a change in existing law or policy to implement shall be formulated, if necessary, to address a major public issue, management concern, or resource opportunity identified during the planning process [40 CFR 1501.7, 1502.14(c)].

- At least one alternative shall be developed which responds to and incorporates the RPA Program tentative resource objectives for the Forest as displayed in the regional guide.

- At least one alternative shall reflect the current level of goods and services provided by the Forest and the most likely amount of goods and services expected to be provided in the future if current management direction continues. Pursuant to NEPA procedures, this alternative shall be deemed the "No Action" alternative.

- Each alternative shall represent, to the extent practicable, the most cost efficient combination of management prescriptions examined that can meet the objectives established in the alternative.

- Each alternative shall state at least: the condition and uses that will result from long-term application of the alternative; the goods and services to be produced; the timing and flow of these resource outputs together with associated costs and benefits; resource management standards and guidelines; and the purposes of the management direction proposed.

The Chief's policy letter of October 4, 1981, and FSM 1920.85--1 through 85--3 provide direction for formulating the following types of alternatives in addition to those specified in the NFMA regulations:

1. An alternative that emphasizes market opportunities. Emphasis for the alternative is on timber, range, minerals, and other outputs that have the potential to produce income to the Government. Management for other resources will be at economically and environmentally feasible levels consistent with the emphasis on market-oriented outputs.

2. An alternative that emphasizes nonmarket opportunities. The emphasis is on recreation, wildlife and fish, water, and other amenity values. Management for other resources will be at economically and environmentally feasible levels consistent with the emphasis on amenity values.

Specific requirements to be addressed in the alternative formulation process are presented in FSM 1920.85--1 through 85--2, R-3 Supplement No.6.

Alternative Feasibility

Forest Service Manual 1920.85, R-3 Supplement No.6 specifies the range of reasonable alternatives should be within the limits established by:

1. Technical feasibility--the inherent capability of the lands and resources as modified by varying levels of management and within the limits of existing or anticipated technology.

2. Economic and financial feasibility--the amount of funds expected to be available to conduct proposed and probable activities.

3. Legal feasibility--the limits established by law, regulation, Executive Order, or Service-wide or Regional policy.

Alternative Formulation Process

A single FORPLAN solution that meets all objectives of the alternative and can be implemented administratively is very unlikely. As a result, alternatives were developed through a process of sequential incremental analysis by adding individual constraints or sets of constraints to the Maximize PNV Assigned Value Benchmark. The Max PNV Assigned Benchmark was used as the starting point for developing all alternatives except Alternative A (No Action), which was developed during the completion of the AMS.

The first step in the process of alternative formulation was to identify the management goals for the alternative and develop a list of tentative objectives for achieving the goals. The results of the Maximize PNV Benchmark were evaluated against the goals and objectives of each alternative.

An initial attempt was made to develop the objectives for the alternatives required by NFMA Regulations and the Chief's 1981 policy letter to provide separate alternatives which emphasize: current management, RPA objectives, market opportunities, and nonmarket opportunties. The Current Benchmark is the "No Action" alternative required by NEPA and NFMA. No adjustments to the benchmark were made to address issues. This benchmark became Alternative A. Alternative B was developed to provide RPA targets through constraints placed on most of the required resource outputs. One commodity emphasis alternative was developed and considered in detail. It emphasizes timber, range and some developed recreation. Three more alternatives were developed to address various combinations of nonmarket and market goods, ranging from a high level of amenity emphasis with little timber production to a moderately high level of amenity outputs with moderately high levels of timber production. Various responses to the issues, concerns and opportunities, identified in Appendix A, were established through the selection of resource output levels.

After the goals and tentative objectives for an alternative were determined, the benchmarks were reviewed on a Forest-wide basis and by individual analysis area to evaluate the Forest's ability to meet the objectives of each alternative. Evaluation was made in terms of the range of outputs determined by the benchmarks, issues and concerns to be resolved and opportunities presented, cost efficiency, and administrative feasibility. Changes were suggested for the Max PNV Assigned Benchmark to attempt to achieve better resolution of the ICO's, better attain the objectives of the alternatives, and achieve a more readily implementable program in terms of administrative feasibility. These suggestions were translated into changes in the FORPLAN model by adding or eliminating constraints to the model.

New variations of the alternatives were developed based on the implemented changes to the model. The results of the variation were compared to preceding solutions to determine if the changes accomplished what was intended. If the changes did not achieve the intended purpose, additional refinements were suggest ⊿ and a new variation was developed. This iterative process was repeated until a feasible solution was obtained which achieved the goals and objectives of the alternative. As alternative variations were analyzed, the initial objectives were further refined to better achieve resource integration

and production, cost efficiency and administrative feasibility. Further information about the incremental analysis process is available in the planning records at the Lincoln National Forest Supervisor's Ofice.

Constraints and prescription controls were applied to the FORPLAN model to control resource output levels, funding levels or selection of management prescriptions considered necessary by the ID team to best achieve the goals and objectives of an alternative and to ensure administrative feasibility. The set of constraints applied to the Maximum PNV Assigned Benchmark to achieve the goals and objectives of each alternative is shown in Table 110. A brief discussion of the constraints is provided. Each constraint set represents professional judgment concerning the most cost efficient manner of achieving the goals and objectives of the alternative. The objective function for all the alternatives was to maximize PNV in order to achieve the most economical and efficient solution within the constraint limitations placed on the model. The effects, or trade-offs made, of placing the final set of constraints on each alternative can be seen by comparing the changes between an alternative and the Max PNV-Assigned Values Benchmark in: 1) PNV, 2) total discounted costs of the major resources, and 3) total discounted benefits of the major resources. The PNV and discounted costs and benefits are displayed for each alternative and the Max PNV Benchmark in Chapter 2, Table 11.

Description of Alternatives

Alternatives considered in detail in the EIS are described below. The following objectives and constraints are common to all alternatives:

1. The minimum legal management requirements specified in 36 CFR 219.27 are met in accomplishing goals and objectives of the alternative and include: protection of soil and water resources; maintenance of habitat to assure viable fish and wildlife populations; and maintenance and improvement of T&E species habitat.

2. The timber harvest requirements specified in 36 CFR 219.16(a)(1), (a)(2)(iii), and (a)(2)(iv) are met: 1) non-declining yields on harvest volume with sales at or below the long-term sustained-yield capacity, 2) harvest of even-aged stands at or beyond the culmination of mean annual increment, and 3) sale schedules that provide for perpetual timber harvests (ending inventory is at least as great as the average regenerated inventory).

3. All alternatives recommend the establishment of three Research Natural Areas: 1) William G. Telfer Area near Ski Apache is 727 acres and features the corkbark fir ecosystem, 2) Upper McKittrick Area in the Guadalupe Mountains is 827 acres and features the mountain mahogany ecosystem, and 3) Haynes Canyon Area in the former Cloudcroft Experimental Forest is 610 acres and features the white fir timber type.

4. All alternatives provide for maintenance of wilderness quality in the wilderness study area until Congress acts on recommendations.

5. All alternatives provide for a sustained regeneration of aspen stands by clearcutting 710 acres of aspen each decade. This allows for an average rotation age of 60 years.

6. All alternatives provide for continuation of the existing electronic sites and power corridors.

The alternatives considered in detail are described below. The constraints used to achieve the objectives of each alternative are shown in Table 110.

Proposed Action - This alternative was formulated to provide a preferred or 'Proposed Action' alternative. It is designed to resolve major issues and management concerns with a mix of both market and nonmarket outputs. The objectives are to: 1) manage timber intensively in high-use recreation areas of the Forest to protect the resource values from losses caused by present insect and diseases, 2) provide more and better quality recreation and wildlife habitat improvements in the high-use areas of the Sacramento Mountains, 3) balance grazing use and capacity by the end of the fourth decade, and 4) provide other resource outputs at levels that maximize PNV. A budget constraint is imposed to reflect feasible anticipated funding levels.

The alternative was developed incrementally using the Max PNV Assigned Values Benchmark as a starting point. Each variation with associated constraints is displayed in Table 110.

Alternative A - Alternative A reflects current management direction. Pursuant to NEPA procedures, this alternative was deemed the "No Action" alternative.

The objective of this alternative is to continue the current management program consistent with existing management plans, policies, and standards and guidelines. Resource outputs are provided at levels possible within the current budget limits. The annual budget was constrained to $4,965,000 (1980 4th quarter dollars) based on the Forest's 1983 fiscal year planned budget. This alternative establishes a base for comparison with all other alternatives.

The model was constrained to select only current level prescriptions for nontimber resources, no low intensity timber prescriptions and a limited number of moderate intensity timber prescriptions. One recreation emphasis prescription was required in order to show the effects of the planned expansion of Ski Apache.

This alternative is the same as the Current Level Benchmark. The constraints shown in Table 105 for that benchmark apply to this alternative.

Alternative B - Alternative B was designed to provide resource outputs at levels that meet or exceed the targets assigned to the Forest in the Regional Guide for periods one through five. The targets were developed for the 1980 Resource Planning Act (RPA). General guidelines for developing this alternative are outlined in FSM 1920.85--2 through 85--3, R-3 Supplement No. 6.

The constraints (Table 110) are included in an effort to meet the RPA targets assigned to the Forest. The combination of constraints and objective functions resulted in an alternative that came as close as possible to meeting the RPA targets. The dispersed recreation target in the first period could not be met and was reduced 22,000 RVD/year to obtain a feasible run. The wildlife, range, and timber targets were accomplished. No cable logging was required and no constraint was added to require sawtimber harvests from steep slopes. Target levels were not assigned for support activities, such as reforestation and TSI, in order to allow production of the primary outputs at the least cost.

Alternative C - Alternative C emphasizes market opportunities, particularly timber and range. It is formulated to produce the highest levels of timber, range capacity and developed recreation possible within a constrained budget of $5,194,000 per year for the first decade. The objective for range is to bring the grazing use into balance with the capacity as soon as possible and achieve a level of permitted use that is higher than the current level. Management of other resources is provided at levels that maximize PNV.

The constraints used for this alternative (Table 110) were applied to force grazing capacity to increase to current use levels as quickly as possible, to force silvicultural prescriptions to be applied to at least half of the tentatively suitable timber acres, and to satisfy some specific Forest management concerns about wildlife and recreation needs. A few variations were required to reach an acceptable alternative.

Alternative D - Alternative D emphasizes nonmarket resources. It is designed to provide additional and better quality recreation and wildlife opportunities, to manage timber primarily for the protection of property values and visual quality in the high-use recreation areas of the Sacramento Mountains, and to bring grazing use into balance with capacity by the end of the fourth period. Management of other resources is provided at levels that can be accomplished within the budget limitations and that can maximize PNV.

Alternative E - Alternative E is designed to intensively treat the current insect and disease problem in the Sacramento Mountains and to provide greater opportunities for developed recreation. Additional objectives are to bring grazing use into balance with capacity by the end of the fourth period and to maintain wildlife habitats at relatively high levels. Management intensity levels for all of the objectives are established to provide the best mix for a multiple-use emphasis alternative. Other resources are managed at levels that can be accomplished within the budget limitations and that can maximize PNV.

Alternative F - Alternative F is patterned after the Proposed Action but with a 30 percent lower budget. Primary objectives are to protect the resources from fire and visitor misuse and to maintain the existing forest facilities, such as recreation facilities, roads, and range and wildlife improvements. Timber is managed only on the most productive areas of the Sacramento Mountains to control the present insect and disease problem. Emphasis on improving dispersed and developed recreation opportunities and wildlife habitats is similar to the PA, but those resources are managed at slightly lower funding levels. Management of

other resources is provided at levels that can be accomplished within the lower budget constraint and than can maximize PNV.

Constraints

Constraints and prescription controls are used to ensure that outputs, effects, and management intensities will be provided at the levels required to achieve the particular goals and objectives of an alternative. Table 110 displays the constraints and prescription controls used for each of the incremental stages of each of the alternatives. Terminology used in the table is the same as that used in the benchmark constraint table (Table 105) and was explained in the Constraint section of the appendix.

The discussion of minimum management requirements and constraints presented in the Prescription and Constraints sections of this appendix apply to the constraints presented in Table 110. All the alternatives used the same set of MMR constraints that was used in the benchmarks.

The timber constraints for non-declining yield (NDY), long-term sustained-yield link, perpetual timber harvest (EI) and culmination of mean annual increment (CMAI) were common to all the alternatives. Culmination of mean annual increment, while common to all alternatives, was actually incorporated into the yield coefficients through the ECOSIM model.

Table 110. Alternative Objective Functions and Constraints

Alternative: Proposed Action - Run 1
Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Timber Constraints:							
Non-declining Yield	MCF/Year						
Long-term Sustained Yield Link	MCF/Year						
Ending Inventory	MCF/Year						
Culmination Mean Annual Increment							
MMRs							
Floor/Ceiling Constraints:							
Sawtimber	MBF/Year	GE	13000	16000	18000	20000	20000
Cable Logging	MBF/Year	GE	2000	2000	2000	2000	2000
		LE	10000	10000	10000	10000	10000

Alternative: Proposed Action - Run 1 (con't)
Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Harvest Acres							
Aspen	Acre/Year	EQ	71	71	71	71	71
Lincoln Div.(D-1)	Acre/Period	LE	.01				
Old Growth Mgmt.	Acres/All Periods						
Lincoln Div.		GE	1100				
Sacramento Div.		GE	4750				
Grazing capacity minus permitted use	AUM/Year	GE				0.01	0.01
Budget	M$/Year	LE	5194				

Prescription Controls:
FW - No Low Intensity
1H - Max. Recreation
3A - No Wilderness prescriptions
All AA's - - No old Current level PJ Fuelwood harvests

Discussion: This was the initial run for the Proposed Action alternative. Timber constraints and MMRs are discussed in the Constraint section of this appendix. Lower limits had to be placed on all timber outputs because of the negative net benefits for timber management on the Forest. The first period sawtimber level was selected to be slightly higher than the 10.4 MMBF ASQ of the Timber Management Plan, 1970-80, as revised in 1975. Gradual increases in harvest levels were selected to allow increased treatment of stands infested with dwarf mistletoes or susceptible to western spruce budworm. The highest levels, selected for Periods 4 and 5, represent the ASQ called for in the original Timber Management Plan, 1970-80. In 1975, when the timber plan was revised, the local mills did not have cable logging capability, which was one reason why the original ASQ of 20 MMBF could not be harvested. Since then a local mill has acquired cable logging equipment and the Forest would like to apply some silvicultural treatment to stands on steep slopes. In order to maintain the cable logging capability in the area, lower limits were placed on timber harvests from steep slopes to ensure an adequate and steady supply of volume over time. Upper limits were also used in case the high total sawtimber requirement caused a large proportion of timber to be taken from steep slopes. It was assumed that the operator could acquire only two cable logging machines, and the maximum capability with the machines would be 10 MMBF per year. The sawtimber limits were binding in Periods 3 through 5, and the cable logging lower limits were binding in all but the fifth period.

In order to perpetuate the aspen ecosystem, a constraint was applied requiring 71 acres per year of aspen harvests which use the clearcutting method. This provides a rotation

age of 60 years. No timber harvests were desired in the Lincoln Division (Smokey Bear District) in the first period since the first period volume could be more efficiently produced on the Sacramento Division. The Lincoln Division has poorer site conditions and it would be financially impractical to provide adequate timber staffing for the Lincoln Division for the volume desired. Additional acres for old growth management, beyond the MMR requirement, were desired for wildlife objectives. A constraint was placed on the balance of grazing capacity and permitted use in order to force capacity to equal or exceed use by the fourth period. This constraint was binding in the fourth period.

The budget was limited to that required for alternatives, since this alternative was not initially identified as the Preferred alternative. Prescription controls were required to: 1) provide a forest-wide prescription that would include adequate funding for administration, fire protection and facilities construction for the enlarged programs in timber, recreation and wildlife, 2) provide for expansion of Ski Apache in Analysis Area 1H, 3) prevent wilderness prescriptions from going to the WSA (AA 3A), and 4) prevent the existing current PJ fuelwood harvest levels from being selected as these levels exceed the estimated LTSYC of the PJ.

This run appeared to hold promise as a possible Preferred alternative, but needed some adjustments. Not all the desired recreation emphasis prescriptions had been selected and the intensive range prescriptions went to areas that would not derive the best benefits from the management. None of the insect and disease control prescriptions for timber were selected, and a large proportion of timber land was allocated to low intensity prescriptions which would not treat the insect and disease problem adequately.

Alternative: Proposed Action - Run 2 - Incremental Changes
Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Sawtimber	MBF/Year	GE	12000	15000	18000	20000	22000
Harvest Acres							
I&D Control RX - Sacramento Div., Mixed Conifer	Acre/Period	EQ	27553				
Intensive Timber Mgmt. RX - Sacramento Div., Mixed Conifer	Acre/Period	GE		13776	13776		
Grazing capacity minus permitted use	AUM/Year	GE			0.01	0.01	0.01
Budget	M$/Year	LE	4973	6337	6337	6337	6337

Alternative: Proposed Action - Run 2 - Incremental Changes (con't)
Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Prescription Controls:							
(Additions)							
1A - Min of 50 percent Max Range							
1D - Min of 50 percent Max Range							
1G - Max Fuelwood, Rec. and Wildlife							
1I - Max. Recreation							
3A - Min of 50 percent Max Range							
3B - Min of 50 percent Max Wildlife							
4L - Max Range/PJ Fuelwood (50/50)							
4N - Max Range							

Discussion: The budget constraint for the Proposed Action was applied to this run per direction in FSM 1920.85--4, R-3 Supplement No. 6. A constraint was used to force at least 80 percent of the mixed conifer acres in the four high-use recreation AA's of the Sacramento Division (55,106 acres) to receive insect and disease control prescriptions in the first three periods and to be divided as follows: 40 percent to specific I&D control prescriptions with first harvest entry in the first decade, 20 percent to intensive silvicultural prescriptions with first harvest entry in the second decade, and 20 percent to intensive silvilcultural prescriptions with first harvest entry in the third decade. The constraints were binding in all periods. The lower limits on sawtimber were reduced for the first two periods in order to provide more budget for the intensive timber management and other resources. The resulting sawtimber harvest levels were higher than the constraint, however, because of the heavy harvest levels in the I&D prescriptions and the LTSY link constraint. Additional acres of timber harvests had been selected by the model to provide enough acres with LTSY capacity to prevent harvest levels from exceeding the forest-wide LTSY capacity.

An attempt was made to bring grazing use into balance with capacity by the third period. Balance was achieved, but at the expense of final permitted use levels and recreation improvements that were desired for the Sacramento Mountains. The budget constraint was binding in the first period and limited the selection of high investment prescriptions.

Alternative: Proposed Action - Run 3 - Incremental Changes
Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Budget	M$/Year	LE	6000	6337	6337	6337	6337

Prescription Controls:
(Additions)
FW - Current
1D - No Low Intensity
2E - Max Recreation/Wildlife
2F - Max Recreation/Wildlife
2H - Max Recreation/Wildlife
3A - No Low Intensity

Discussion: The budget constraint was relaxed in the first period in order to allow more intensive range and recreation/wildlife prescriptions to be selected. The constraint was binding in the first period.

Permitted grazing use levels and rates of use reduction are included in the forest-wide prescriptions. Prescription controls were applied to: 1) force the forest-wide prescription to select a less rapid rate of permitted use decline than it had in the previous run, 2) force certain areas in the Sacramento Mountains to receive intensive recreation/wildlife prescriptions, 3) force AA 1D to receive at least current level funding for needed range improvements, and 4) prevent the WSA (AA 3A) from receiving low intensity management in order to have at least current funding levels for cave resource protection.

Alternative: Proposed Action - Run 4 - Incremental Changes
Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Harvest Acres							
I&D Control RX - Sacramento Div. Mixed Conifer	Acre/Period	EQ	40267				
Intensive Timber Mgmt. RX - Sacramento Div. Mixed Conifer	Acre/Period	GE		20134	20134		
Budget	M$/Year	LE	6500	6337	6337	6337	6337

Discussion: Constraints added to this variation of the Proposed Action addressed the timber insect and disease problems. Additional analysis areas were required to be managed with intensive insect and disease control prescriptions. At least 80 percent of the mixed

conifer acres on six analysis areas in the Sacramento Division, or 80,534 acres, were constrained to receive I&D control prescriptions in the first three decades (divided as described in Run 2). The budget constraint in the first period was further relaxed to provide funds for the extra timber management. The constraint was binding in the first period.

The MMR constraint on disturbed acres became binding in Periods 1, 4, and 5 for the Sacramento Division and the lower limit on old growth management in the Sacramentos became binding. This run approximated the desired management program for a Proposed Action, but required a first period budget that was far in excess of anticipated funding levels.

Alternative: Proposed Action - Run 5 - Incremental Changes
Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Harvest Acres							
I&D Control RX - Sacramento Div. Mixed Conifer	Acre/Period	EQ	27553				
Intensive Timber Mgmt. RX - Sacramento Div. Mixed Conifer	Acre/Period	GE		13776	13776		
Grazing capacity minus permitted use	AUM/Year	GE				0.01	0.01
Budget	M$/Year	LE	5273	6337	6337	6337	6337
Prescription Controls:							
(Change)							
FW - No Low Intensity							

Discussion: Constraints applied to this run were selected by the ID team and represent tradeoffs in the multiple-use objectives in order to reduce the management costs to a level that would be within $300,000 of the budget constraint. Treatment of timber for insect and disease problems was reduced back to four analysis areas. Grazing capacity was allowed to balance use in the fourth decade and permitted use was allowed to decline at a faster rate (through a change in the forest-wide prescription control).

This run resulted in an unsatisfactory solution. Analysis of the timber prescription allocations revealed that: 1) not all of the mixed conifer strata needing treatment for insect and disease problems were receiving intensive management prescriptions and 2) the number of acres being harvested in one time period on particular analysis areas would exceed the disturbed acre limits deemed acceptable for soil and watershed protection.

Alternative: Proposed Action - Run 6 - Incremental Changes
Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Harvest Acres							
I&D Control RX - Sacramento Div. Mixed Conifer	Acre/Period						
By strata:							
MC/1304		EQ	8604				
MC/1202		EQ	2704				
MC/1303		EQ	10078				
MC/1205		EQ	2950				
MC/1401		EQ	246				
Intensive Timber Mgmt. RX - Sacramento Div. Mixed Conifer	Acre/Period						
By strata:							
MC/1304		GE		4302	4302		
MC/1202		GE		1352	1352		
MC/1303		GE		5039	5039		
MC/1205		GE		1475	1475		
MC/1401		GE		122	122		

Discussion: Constraints were added to this variation of the Proposed Action to distribute the intensive timber management prescriptions to the mixed conifer strata in the proportions that exist in the analysis areas being treated. In addition, the total mixed conifer acres to receive intensive management was reduced to 49,162 acres (60 percent of the mixed conifer acres in five analysis areas being treated.). All of the new constraints were binding, as well as the budget constraint for the first period. The disturbed acre constraint for the Sacramento Division was binding only in the fifth period.

Alternative: Proposed Action - Run 7 - Incremental Changes
Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Prescription Controls:							
(Additions)							
2G - No Low Intensity							
3C - No Low Intensity							
(Change)							
3A - Max Range and Recreation (50/50)							

Discussion: This run was made to refine the prescription allocations. Additional prescription controls were used to satisfy management concerns for certain analysis areas. Low intensity prescriptions were not allowed to be allocated to AA 2G in order to have adequate funding for trail maintenance and were not allowed for AA 3C in order to have at least current funding levels for cave resource protection. Analysis area 3A (WSA) was constrained to receive more intensive prescriptions for range and recreation to have greater funding for cave resource protection and range improvements.

Within the budget limitations, this run satisfactorily met the goals and objectives for the Proposed Action that was published in the Draft EIS and Proposed Lincoln National Forest Plan of 1985.

Alternative: Revised Proposed Action - Run 1 - Incremental Changes to draft Proposed Action
Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Floor/Ceiling Constraints:							
Sawtimber	MBF/year	Dropped the floor on sawtimber.					
Wood products	MBF/year	LE	750	750	750	750	750
Cable logging	MBF/year	GE	1500	1500	1500	1500	1500
Harvest acres	Acres/Period						
Sacramento Div..							
Mixed Conifer							
By strata:							
MC/1304			13320	6660	6660		
MC/1202			4320	2160	2160		
MC/1303			13680	6840	6840		
MC/1205			3960	1980	1980		
MC/1401			720	360	360		

Alternative: Revised Proposed Action - Run 1 - Incremental Changes to draft Proposed Action (con't)
Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
No harvest:	Acres/Period						
Aspen on D-1		GE	721	721	721	721	721
Grazing capacity minus permitted use	AUM/Year	GE			0.01	0.01	0.01

Prescriptions controls:
Delete all low intensity timber prescriptions for the five strata on the Sacramento Division being treated for insect and disease control.

(Additions)
FW - Special revised PA prescription
1C - Max. Recreation
1F - Max. Recreation
3A - Wilderness, high management

Discussion: This was the first run for the revised PA. The revised PA was modified from the draft PA to respond to public comments on the Draft EIS and the Proposed Plan, published in 1985.

Before model runs were made for the revised PA, the following changes were made to the FORPLAN data: 1) the total grazing capacity was increased by 33,000 AUMs per year to correct the range model's 'current' base level, 2) dollar benefits for grazing were placed on the grazing capacity, rather than the permitted use levels, and 3) a special Forest-wide prescription (FW revised PA) was added to the data to provide additional funding for cultural resource management, right-of-way acquisition, dispersed recreation trail maintenance, public information services, law enforcement, soil and water management, and range program management.

The first run of the revised PA started with the constraints that had been applied to the last run of the draft PA (Proposed Action - Run 7). Changes to the constraints are discussed below.

Constraints on timber harvests were changed to allow sawtimber volumes to be a function of the acres selected for I&D treatment only. The floor on sawtimber volume was dropped. The number of analysis areas to be treated for I&D was increased from five to eight and the timber management prescriptions were distributed to the mixed conifer strata in the proportions that exist in the areas to be treated. In order to meet some of the additional nontimber management needs that had been expressed by public responses to the Proposed Plan, moderate intensity silviculture prescriptions were allowed to meet the I&D treatment needs in order to free up some monies from the timber budget. In previous runs, only I&D control prescriptions and intensive prescriptions were allowed to meet the treatment needs.

A new constraint was added to limit the volume of wood products to 750 MBF/year, the highest level the Foest has sold in the last 10 years. This constraint was also desired as a way of forcing the sawtimber volume to remain steady over time rather than decline. Without this constraint, the model will shift a larger share of the total timber harvest to wood products, where possible, because the timber costs are directly tied to sawtimber, not to wood products.

The minimum cable logging harvest volume was reduced from 2 to 1.5 MMBF per year to meet some of the public's concerns about timber harvests on steep slopes. A constraint on aspen was added to prevent certain remote or steep areas on the Lincoln Division from being harvested. A constraint was placed on grazing to bring capacity and permitted use into balance by the third period.

Additional prescription controls were used to ensure: 1) the Wildernesses received intensive recreation management, 2) the WSA received Wilderness management, and 3) the special Forest-wide prescription for the revised PA (described at the beginning of this discussion) was selected.

All of the new constraints were binding, except for the wood products ceiling in the first period and the grazing capacity constraint. Sawtimber levels averaged 12.8 MMBF per year for 50 years. Several areas on the Forest in need of range improvements were allocated to low intensity prescriptions, which provide little, if any, range management.

Alternative: Revised Proposed Action - Run 2 - Incremental Changes
Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5

Prescription Controls:
(Dropped)
4L - all constraints
(Changes)
1A - No low intensity.
1J - Max of 50 percent low intensity.
2B - Max of 50 percent low intensity.
3F - No low intensity.
4O - Max of 50 percent low intensity.
4Q - Max of 50 percent low intensity.
4U - Max of 50 percent low intensity.

Discussion: Prescription controls were changed in this run to address some range management needs. Analysis areas with range allotments presently in need of improvements were restricted from receiving all low intensity prescriptions in order to provide range monies for program operations and range improvements. This run satisfied most of the needs expressed during the public comment period for the Proposed Plan.

Alternative: Revised Proposed Action - Run 3 - Incremental Changes
Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
(Dropped)							
Wood products	MBF/Year	LE	750	750	750	750	750
(Changed)							
Harvest acres, intensive RX only	Same as in Run 1 for Revised Proposed Action						
Budget	M$/Year	LE	5473				

Discussion: During the time the Proposed Action was being revised, local sawmill owners expressed dissatisfaction with the reduced sawtimber harvest levels proposed for the revised plan. This run was made to attempt to provide 15 MMBF per year of sawtimber while maintaining all the other resource programs of Run 2. The acres to be treated for I&D were forced to receive intensive silviculture prescriptions, and the constraint on wood products was dropped to allow the model to select the necessary timber prescriptions. The budget was increased in the first period by $200,000 per year.

This run produced less than 15 MMBF per year and reduced the wildlife program budget significantly.

Alternative: Revised Proposed Action - Run 4 - Incremental Changes
Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
(Changed)							
Harvest acres	Acres/Period						
Sacramento Div., Mixed Conifer By strata:							
MC/1304		GE	14493	7246	7246		
MC/1202		GE	5176	2588	2588		
MC/1303		GE	16563	8281	8281		
MC/1205		GE	4658	2329	2329		
MC/1401		GE	1035	516	516		
PP/1202		GE	3623	1812	1812		
PP/1303		GE	2588	1295	1295		
PP/1401		GE	3623	1812	1812		

Alternative: Revised Proposed Action - Run 4 - Incremental Changes (con't)
Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Budget	M$/Year	LE	5573				
(Added)							
Wood Products	MBF/Year	LE	2000	2000	2000	2000	2000

Prescription controls:
Delete the low and moderately-low intensity timber prescriptions for the strata being treated for I&D control.

Discussion: Constraints on the number of acres to be treated for I&D control were changed to attempt to produce 15 MMBF/year sawtimber. The number of analysis areas in the Sacramento Division to be treated was increased from eight to 12, and ponderosa pine strata were added to the treatment acres. Low and moderate-low intensity timber prescriptions were not allowed to be selected for the treatment acres. A constraint was added to limit the volume of wood products produced, and the first period budget was increased an additional $100,000 per year to meet the additional timber program needs.

Most of the new constraints were binding in all periods. The sawtimber harvest levels, however, did not reach 15 MMBF/year in Periods 2 - 5. The model selected acres for treatment that had the lowest timber costs, but consequently had the lower sawtimber volumes per acre. This was not the desired program, as the timber budget was rising with no concurrent rise in harvestable volume.

Alternative: Revised Proposed Action - Run 5 - Incremental Changes
Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
(Dropped)							
Wood Products	MBF/Year	LE	2000	2000	2000	2000	2000
(Added)							
Sawtimber	MBF/Year	GE	15000	15000	15000	15000	15000
(Changed)							
Harvest Acres	Acres/Period	Same as in Run 1.					
Budget	M$/Year		5373				

Discussion: In previous runs, increasing the number of timber acres for I&D treatment did not result in the desired increase in sawtimber volume. In practice this would result in higher road costs and more ground disturbance for an unappreciable increase in harvest volume. Therefore, a constraint was added to the model to require a minimum sawtimber volume of 15 MMBF/year. In addition, the constraint on acres to be treated for I&D was kept, but

the number of analysis areas was reduced back to eight and the ponderosa pine stands were not included. The budget was reduced back to 5373 M$/year, a level just $100,000/year higher than in the draft proposed plan.

The sawtimber volume constraint was binding in all periods and most of the constraints on I&D treatment acres were binding. The total timber budget was lower than in previous runs, although the sawtimber volumes were higher. The added constraint on volume caused the model to find more efficient prescriptions for obtaining volume. Additional volume was selected primarily from ponderosa pine strata, where the net benefits are greater than in the mixed conifer strata.

A couple problems with the timber prescription allocations were found. Old growth prescriptions were not well distributed among the different timber strata, i.e., much of the old growth was allocated to mixed conifer in the Lincoln Division and ponderosa pine in the Sacramento Division. More old growth was desired for mixed conifer in the Sacramento Division where the wildlife needs are greater. A second problem was the allocation of timber production to ponderosa pine stands in remote or very steep areas that are not practical to manage.

Alternative: Revised Proposed Action - Run 6 - Incremental Changes
Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
(Added)							
Old Growth Mgmt.	Acres/All periods						
Lincoln Div.		GE	5600				
In ponderosa pine		GE	720				
Sacramento Div.							
In mixed conifer		GE	8325				
In MC/1205		GE	2500				
In MC/1304		GE	1600				
In MC/1202		GE	1600				
In MC/1303		GE	1600				
Sacramento Div.							
In ponderosa pine		GE	925				
No harvest	Acres/All periods						
Sacramento Div. in pond. pine							
In PP/1202, low slopes		GE	187				
In PP/1303		GE	182				
In PP/1303, low slopes		GE	102				
In PP/1401		GE	3343				
In PP/1401, low slopes		GE	3068				

Discussion: This run satisfied the timber objectives. With the budget constraint relaxed by $100,000/year, some additional nontimber management programs were selected in range and

recreation. These were considered unessential, and a final run was made with the budget constrained to 5273 M$/year.

The results of the final run achieved the goals and objectives of the Proposed Plan as of April 15, 1986. The issue of management direction for the Guadalupe Escarpment Wilderness Study Area was reviewed and discussed at public meetings after April 15. As a result of public comments and discussions with members of the New Mexico Congressional delegation, the WSA was recommended for nonwilderness designation. The model was not rerun to reflect the new status of the area. Management emphasis on cave protection was still considered important and the prescription for high recreation management was chosen for the area by the ID team. Changes to outputs, e.g., recreational uses, and to costs were made outside the model. An additional 30 M$/year was added to the budget to meet the new prescription costs.

Alternative: A (Current Level)
Objective Function: Maximize Present Net Value

See Table 105, Current Level Benchmark constraints.

Alternative: B (RPA) - Run 1
Objective Function: Minimize Budget Costs

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Timber Constraints:	Same as Proposed Action - Run 1.						
MMRs							
Floor/Ceiling Constraints:							
Sawtimber	MBF/Year	GE	9000	10000	10000	10000	12000
Cable logging	MBF/Year	GE	2000	2000	2000	2000	2000
Harvest Acres							
Aspen	Acre/Year	EQ	71	71	71	71	71
Lincoln Div.	Acre/Period	LE	.01				
Old Growth Mgmt.	Acres/All Periods						
Lincoln Div.		GE	1100				
Sacramento Div.		GE	4750				
Developed Recreation	RVD/Year	GE	530600	690000	700000	800000	885000
Dispersed Recreation	RVD/Year	GE	600000	660000	690000	720000	750000

Alternative: B (RPA) - Run 1 (con't)
Objective Function: Minimize Budget Costs

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Caves Recreation	RVD/Year	GE	5900	5900	5900	5900	5900
Grazing capacity minus permitted use	AUM/Year	GE				0.01	0.01
Budget	M$/Year	LE	5194				

Prescription Controls:
1H - Max. Recreation
3A - No Wilderness

Discussion: This was the initial run for the RPA Alternative. Discussion of timber constraints and MMRs is covered in the Constraints section of this appendix. The purpose of this run was to assess the ability of the Forest to produce the resource outputs assigned as RPA targets in the Regional Guide, by using the least cost management prescriptions to do so. The first period constraints represent the average annual output targets from the first 10-year period (1981-1990) in the Regional Guide. The lower limits for sawtimber, developed recreation and dispersed recreation are needed to meet the targets. Targets for grazing use and wildlife habitat improvements are met without constraints.

The constraints on aspen harvest, Lincoln Division timber management, and old growth management are the same as the Proposed Action and are discussed in the Proposed Action - Run 1 section of this table. A lower limit for cave recreation use was applied to ensure that current levels of cave use were provided as a minimum. Grazing capacity and permitted use were constrained to balance by the end of the fourth period. Prescription controls were used to provide for expansion of Ski Apache and to prevent wilderness prescriptions from being allocated to the WSA.

All of the timber constraints were binding, except old growth management. The grazing constraint was binding in the fourth period, and the dispersed and cave recreation were binding in the first period.

Alternative: B (RPA) - Run 2 - Incremental Changes
Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Floor/Ceiling constraints:							
Sawtimber	MBF/Year	EQ	9000	10000	10000	10000	12000
Developed Recreation	RVD/Year	GE		690000			
		LE	541738	690000	820036	909395	981563
Dispersed Recreation	RVD/Year	GE	600000				
		LE	600000	696582	757782	796859	831434
Cave recreation	RVD/Year	GE	5900				
		LE	5900	6197	6383	6575	6706

Prescription Controls:
(Addition)
FW - No Low Intensity
All AA's - No old current PJ fuelwood harvest levels.

Discussion: The purpose of this run was to determine the prescription allocations needed to meet the RPA targets and to maximize PNV for other resource management. Only a 1 percent additional output level was allowed on those outputs that exceeded the targets. The upper limits on developed recreation outputs in Periods 1 and 5 were binding indicating the ceiling was arbitrarily keeping the PNV lower than necessary.

Alternative: B (RPA) - Run 3 - Incremental Changes
Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Dropped the following constraint:							
Cable logging	MBF/Year	GE	2000	2000	2000	2000	2000

Discussion: The cable logging constraint was dropped from this run in order to determine whether the required sawtimber volume could be provided less expensively from low slopes exclusively.The model selected a small amount of cable logging to meet the aspen regeneration constraint and to apply intensive management to about 600 acres in a ponderosa pine strata. Timber management costs were reduced in most time periods.

The combination of constraints and objective functions for Run 1, 2 and 3 resulted in an alternative that comes as close as possible to meeting RPA targets in the most cost efficient manner and within budget limitations.

Alternative: C (Commodity Emphasis) - Run 1
Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Timber Constraints:	Same as Proposed Action - Run 1.						
MMRs							
Floor/Ceiling Constraints:							
Sawtimber	MBF/Year	GE	15000	20000	22000	24000	26000
Cable Logging	MBF/Year	GE	2000	2000	2000	2000	2000
		LE	10000	10000	10000	10000	10000
Aspen Harvest	Acre/Year	EQ	71	71	71	71	71
Old Growth Mgmt.	Acres/All Periods						
Lincoln Div.		GE	5000				
Sacramento Div.		GE	5800				
Old growth and/or no harvest	Acres/All Periods						
Lincoln Div., Ponderosa Pine		GE	1440				
Grazing capacity minus permitted use	AUM/Year	GE			0.01	0.01	0.01
Budget	M$/Year	LE	5194				

Prescription Controls:
- FW - No Low Intensity
- 1H - Max Recreation
- 2E - Max Recreation
- 2H - Mod Recreation/Max Range
- 3A - No Wilderness

Discussion: Timber constraints and MMR constraints are discussed in the Constraint section of this appendix. The other constraints used in this run are to satisfy the objectives of this alternative to emphasize commodity outputs. Sawtimber production was constrained to supply about 90 percent of the maximum 50-year potential yield as determined in the Maximum Timber-8 Periods Benchmark. The high production was constrained to increase gradually from Periods 1 to 5.

An experimental run of Alternative C was made to determine if the sawtimber volume could be harvested from low slopes only, allowing the model to select the most cost efficient timber prescriptions. Timber harvests were selected for steep slopes in all time periods, except Period 2. The cable logging volumes, however, were erratic over time.

Since cable logging would be required to achieve the total timber targets, a lower limit was placed on the cable volume in each time period in order to supply a steady and adequate supply of volume for the local mill operator to maintain a cable logging capability. Upper limits were also used in case the high total sawtimber requirement caused a large proportion of timber to be taken from steep slopes. It was assumed that the operator could acquire only two cable logging machines, and the maximum capability with two machines would be 10 MMBF/year. The upper limits were found to be unncessary, although the cable logging volume in the fifth period did increase above the minimum needed.

Additional acres for old growth management, beyond the MMR constraints, were needed for wildlife. It was anticipated that fewer acres would be allocated to unharvested timber land due to the increased sawtimber production. The lower limits for old growth were raised above those used in the Proposed Action to ensure that enough old growth acres would be available after 50 years.

A constraint was applied to balance grazing use with capacity by the end of the third period. This constraint was binding. The budget in the first period was limited to that allowed for alternatives, and it was binding. Prescription controls were used to: 1) provide a forest-wide prescription that would include adequate funding for administration and fire protection for the enlarged timber and range programs, 2) provide for expansion of Ski Apache, and 3) prevent wilderness prescriptions from being allocated to the WSA.

This run resulted in an unsatisfactory solution. Because of the higher net benefit values available from intensive recreation or wildlife prescriptions, the model maximized PNV by selecting several of those prescriptions and balanced the grazing use with capacity by selecting the most rapid rate of decline for grazing use. This run did not meet the objective of providing grazing capacities higher than current use levels.

Alternative: C - Run 2 - Incremental Changes
Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Prescription Controls:							
(Addition)							
FW - Current							

Discussion: The only change applied to this run was the addition of a prescription control to force the permitted grazing use to decline at a moderate rate, rather than a rapid rate. This in effect caused the grazing use and capacity to balance in the third decade at a level close to current use levels. The sawtimber yields declined slightly in the first two periods, and the recreation and wildlife outputs dropped significantly.

Alternative: C - Run 3 - Incremental Changes
Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Old Growth Mgmt.	Acres/All Periods						
Lincoln Div.		GE	4000				
Sacramento Div. Total		GE	6800				
Mixed Conifer		GE	1000				
Ponderosa Pine		GE	1500				

Prescription Controls:
(Change)
2H - Mod Recreation/Max wildlife
(Additions)
1G - No Low Intensity
1I - No Low intensity, no Max Wildlife
2D - No low intensity
4N - Max. Range
All AA's - No old current level PJ fuelwood harvests

Discussion: This run was made to incorporate Ranger/Staff concerns for specific management needs on certain analysis areas and attempt to maintain the timber and range output levels from the previous run. In addition, corrections were made to the old growth requirements for wildlife, and a prescription control was added to prevent the existing PJ fuelwood harvest levels from being selected.

Sawtimber production and grazing capacities remained the same, but wildlife and developed recreation outputs dropped to allow specific analysis areas to receive better than low intensity management. The budget constraint compelled the same number of analysis areas to be allocated to low intensity prescriptions, but the distribution was more acceptable to Forest staff.

The grazing capacities in the FORPLAN model were those from the range model and were lower than the final adjusted capacities. (See discussion of range capacity determination in Yield Coefficients section of this appendix.) The earlist period for balancing use and capacity, using the range model data, was the third period. As a result of the adjustments made to grazing capacities after the FORPLAN run, permitted use still did not balance capacity until the third period. A Forest management decision was made to provide a more rapid rate of permitted use reduction than was available in the FORPLAN data. This was done to force use and capacity to balance by the end of the first period. The final version of Alternative C provides for a 15 percent reduction in permitted use in the first period. An additional $100,000 per year was budgeted for the first period in order to implement the rapid reduction in permitted grazing use.

Alternative: D (Amenity Emphasis) - Run 1
Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Timber Constraints:	Same as Proposed Action - Run 1.						
MMRs							
Floor/Ceiling Constraints:							
Disturbed Acres	Acres/Period						
Lincoln Div.		LE	4019	4019	4019	4019	4019
Sacramento Div.		LE	19086	19086	19086	19086	19086
Sawtimber	MBF/Year	GE	11000	11000	11000	11000	11000
Cable Logging	MBF/Year	GE	2000	2000	2000	2000	2000
Harvest Acres							
Aspen	Acre/Year	EQ	71	71	71	71	71
Lincoln Div.	Acre/Period	LE	.01				
Old Growth Mgmt.-	Acres/All Periods						
Sacramento Div. Total		GE	13750				
Mixed Conifer		GE	5000				
Ponderosa Pine		GE	4000				
Old growth and/or No harvest -	Acre/Period						
Lincoln Div. Total		GE	14440				
Ponderosa Pine		GE	1440				
Sacramento Div.		GE	2500				
Grazing capacity minus Permitted Use	AUM/Year	GE				0.01	0.01
Budget	M$/Year	LE	5194				

Prescription Controls:
1H - Max Recreation
3A - Wilderness - Max. Recreation

Discussion: This was the initial run of the amenity emphasis alternative. Timber constraints and MMRs are discussed in the Constraint section of this appendix. Fewer acres were allowed to be disturbed by harvest activities than were allowed in the Minimum Management Requirements. This was constrained to provide greater protection of the visual quality in the South Capitans (1D) and Alamo (2B) Analysis Areas. The other constraints on the

run were selected to provide greater benefits to wildlife and produce timber at a level that would be compatible with an amenity emphasis alternative.

Sawtimber yields were constrained to maintain current harvest levels and were binding in all periods. The timber requirements for cable logging, aspen harvests, and Lincoln Division harvests are the same as the Proposed Action and are discussed in the Proposed Action - Run 1 section of this table. Grazing use is constrained to balance capacity by the end of the fourth period and was allowed to choose the least cost way of doing so. The old growth requirements were selected to provide more and better distribution of old growth conditions on the Forest. The lower limits for old growth in the Sacramento Division were binding. Prescription controls were used to provide expansion of the Sierra Blanca Ski Area and to force the WSA to be managed intensively for wilderness recreation.

This run did not provide a satisfactory distribution of recreation and wildlife management prescriptions. The existing wildernesses received current recreation management levels, but intensive wildlife management. Several other high-use recreation areas received current or low intensity level management for the recreation facilities.

Alternative: D - Run 2 - Incremental Changes
Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints 1	2	3	4	5

Prescription Controls:
(Additions)
FW - No Low Intensity
1C - Max Recreation
1E - Max. 50 percent Low Intensity
1F - Max Recreation
1G - Max Recreation/Wildlife/Fuelwood (PJ)
1J - " " "
2D - Max Recreation/Wildlife
2H - " "
3F - " "
All AA's - No old current PJ fuelwood harvest levels

Discussion: Prescription controls were added to force the model to select intensive recreation and wildlife management prescriptions for those areas of the Forest where new facilities or improvements could best respond to need and demand. A control was placed on the forest-wide prescription to ensure adequate funding for fire protection and facility construction to support the enlarged recreation program.

Timber production did not change, but the grazing capacity declined slightly due to budget limitations. Grazing use was balanced with capacity in the fourth period by reducing the permitted use levels at a faster rate than the previous run. The resource output levels were considered acceptable, but the timber management prescription allocations did not address the potential problem of visual quality degradation in and around the high-use recreation areas of the Forest. No insect and disease control prescriptions had been selected.

Alternative: D - Run 3 - Incremental Changes
Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Dropped the following constraints:							
Sawtimber	MBF/Year	GE	11000	11000	11000	11000	11000
Old growth and/or No Harvest	Acres/All Periods						
Lincoln Div. Total		GE	14440				
Sacramento Div. Total		GE	2500				
Added the following constraints:							
Harvest Acres							
I&D Control RX - Sacramento Div. Mixed Conifer by strata:	Acre/Period						
MC/1304		EQ	8604				
MC/1202		EQ	2704				
MC/1303		EQ	10078				
MC/1205		EQ	2950				
MC/1401		EQ	246				
Intensive Timber Mgmt. Rx - Sacramento Div. Mixed Conifer by strata:	Acre/Period						
MC/1304		GE		4302	4302		
MC/1202		GE		1352	1352		
MC/1303		GE		5039	5039		
MC/1205		GE		1475	1475		
MC/1401		GE		122	122		
Prescription Controls: (Addition) 3C - No Low Intensity							

Discussion: Constraints were added to this run to force at least 60 percent of the mixed conifer acres in the five high-use recreation analysis areas of the Sacramento Division (49,162 acres) to receive insect and disease control prescriptions in the first three periods, with 30 percent of the acres to receive specific I&D control prescriptions and 30 percent to receive intensive silvicultural prescriptions. The prescriptions were divided over time as described in the Proposed Action-Run 2 of this table. In addition, the prescriptions were constrained to be distributed to the mixed conifer strata in the proportions that exist in the analysis areas to be treated.

The lower limits on sawtimber production were dropped, since the primary objective for timber management in this alternative is to protect the resource from losses due to insects and disease and not to produce timber as a market good. It was anticipated that the constraints on intensive timber prescriptions would supply at least current levels of timber yields. Some of the old growth constraints were unnecessary and were dropped. One additional prescription control was included to satisfy Ranger/Staff needs for range and wildlife management.

All of the timber prescription constraints were binding and some of the old growth minimum needs were binding. Sawtimber yields dropped slightly in periods 1, 2 and 5, but this was considered acceptable for an amenity emphasis alternative. There were also some reductions in developed recreation and wildlife outputs due to budget limitations, but the distribution of intensive recreation and wildlife management prescriptions was satisfactory. This run achieves the goals and objectives of the amenity emphasis alternative as well as possible within the budget limitations.

Alternative: E (Insect & Disease Control Emphasis) - Run 1
Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Timber Constraints:	Same as Proposed Action - Run 1.						
MMRs							
Floor/Ceiling Constraints:							
Cable Logging	MBF/Year	GE	2000	2000	2000	2000	2000
		LE	10000	10000	10000	10000	10000
Harvest Acres							
Aspen	Acre/Year	EQ	71	71	71	71	71
Lincoln Div.	Acre/Period	LE	.01				
Old Growth Mgmt.	Acres/All Periods						
Lincoln Div.		GE	5000				
Sacramento Div.		GE	5800				
No harvest RX -	Acre/Period						
Sacramento Div.		GE	6100				
Old Growth and/or No harvest RX - Lincoln Div. Ponderosa Pine	Acre/Period	GE	1440				
I&D Control Rx - Sacramento Div. Mixed Conifer	Acre/Period	EQ	27553				
Intensive Timber Mgmt. RX - Sacramento Div. Mixed Conifer	Acre/Period	GE		13776	13776		
Grazing Capacity minus Permitted Use	AUM/Year	GE			0.01	0.01	

Prescription Controls:
- FW - No Low Intensity
- 1H - Max. Recreation
- 3A - No Wilderness
- All AA's - No old Current PJ fuelwood harvest

Discussion: Alternative E was developed to meet several multiple-use objectives and emphasize treatment and prevention of insect and disease outbreaks on the timber resource. The purpose of this initial run was to determine the cost of applying intensive or specific I&D control prescriptions to 80 percent of the mixed conifer acres in four of the high-use recreation areas of the Sacramento Mountains.

The timber constraints and MMRs are discussed in the Constraints section of this appendix. The constraints on cable logging, aspen harvest and Lincoln Division harvests are the same as the Proposed Action and are discussed in the Proposed Action - Run 1 section of this table. The old growth and 'no harvest' constraints for wildlife are the same as Alternative C and are discussed in the Alternative C - Run 1 section of this table. Grazing capacity was forced to balance permitted use by the end of the fourth period.

Prescription controls were used to: 1) provide a forest-wide prescription that would include adequate funding for administration, fire protection, and facilities construction for the enlarged programs in timber and recreation, 2) provide for expansion of Ski Apache, 3) prevent wilderness prescriptions from being allocated to the WSA (AA 3A), and 4) prevent the existing PJ fuelwood harvest levels from being selected.

The lower limits on cable logging and old growth management were binding. The balance of grazing capacity and use was binding in the fourth period, but the rate of decline for permitted use was only moderate.

This run did not provide a satisfactory mix of resource outputs, and the total annual budget in the first period was $423,000 higher than the recommended level of $5,194,000. Sawtimber yields were below current levels from periods 2 to 5. The recreation outputs were higher than the amenity emphasis alternative, since there was no budget constraint.

Alternative: E - Run 2 - Incremental Changes
Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Dropped the following constraint:							
No Harvest RX - Sacramento Div.	Acres/All Periods	GE	6100				
Added the following constraints:							
Sawtimber	MBF/Year	GE	12000	12000	12000	12000	12000
Budget	M$/Year	LE	5194				

Discussion: A constraint on sawtimber yields was applied to this run to provide at least current levels of production. The constraints for total sawtimber yield and cable logging were binding in all periods except the first. The I&D control prescriptions required in the first period have large harvest volumes.

The budget limit recommended for the alternatives was applied to the first period and was binding. Nontimber resources were produced at levels that maximized PNV and stayed within the budget constraint.

Analysis of the timber prescription allocations revealed that: 1) not all of the mixed conifer strata needing treatment for insect and disease control were receiving intensive management prescriptions and 2) the number of acres being harvested in one time period on particular analysis areas would exceed the disturbed acre limits deemed acceptable for soil and watershed protection. Recreation and wildlife output levels were still relatively high for a multiple-use alternative and the ID team felt that greater emphasis should be placed on managing the timber resource.

Alternative: E - Run 3 - Incremental Changes
Objective Function: Maximize Present Net Value

Constraints	Units Measure	Operator	Constraints by Period 1	2	3	4	5
Dropped the following constraints:							
Sawtimber	MBF/Year	GE	12000	12000	12000	12000	12000
Budget	M$/Year	LE	5194				
Changed/added the following constraints:							
Old Growth Mgmt.	Acres/All Periods						
Lincoln Div.		GE	4000				
Sacramento Div. Total		GE	6800				
Mixed Conifer		GE	1000				
Ponderosa Pine		GE	1500				
Harvest Acres							
I&D control RX - Sacramento Div. by strata:	Acre/Period						
MC/1304		EQ	13320				
MC/1202		EQ	4320				
MC/1303		EQ	13680				
MC/1205		EQ	3960				
MC/1401		EQ	720				

Alternative: E - Run 3 - Incremental Changes (con't)

Objective Function: Maximize Present Net Value

Constraints	Units Measure	Operator	Constraints by Period 1	2	3	4	5
Intensive Timber Mgmt. RX - Sacramento Div. by strata:	Acre/Period						
MC/1304		GE		6660	6660		
MC/1202		GE		2160	2160		
MC/1303		GE		6840	6840		
MC/1205		GE		1980	1980		
MC/1401		GE		360	360		

Discussion: The purpose of this run was to determine the cost of treating mixed conifer stands on eight analysis areas in the Sacramento Division. The analysis areas were selected from high-use recreation areas and good potential timber production areas. Only 60 percent of the timber land in those areas could be treated because of the intensive harvest levels associated with the insect and disease control prescriptions and the need to limit the number of disturbed acres that occur in any given time period. Constraints were added to this variation of Alternative E to distribute the intensive timber management prescriptions among the mixed conifer strata in the proportions that exist in the analysis areas being treated. The lower limit on sawtimber yield was dropped in anticipation of higher volumes being produced from the I&D prescriptions.

The old growth constraints were adjusted to provide more old growth management in the Sacramento Division in anticipation of more acres being diverted from the unmanaged condition to an intensive even-aged management condition. The budget constraint was dropped to allow all the necessary timber management prescriptions to be selected.

All of the timber constraints were binding in all periods. Sawtimber yields stayed at or about 30 percent above current levels in all time periods. Other resources were produced at the Maximum PNV levels, being unconstrained by budget.

Alternative: E - Run 4 - Incremental Changes
Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Budget	M$/Year	LE	5373				

Prescription Controls:

(Additions)

1A - Min of 50 percent Max Range
1D - Min of 50 percent Max Range
1G - Max Recreation/Wildlife/Fuelwood (PJ)
1I - Max Recreation
2E - Max Recreation
2F - Mod Recreation/Max Wildlife
2H - Mod Recreation/Mod. Wildlife
3A - Min of 50 percent Max Range
3B - Min of 50 percent Max Wildlife
3D - No Low Intensity
4L - Max Range/PJ Fuelwood (50/50)
4N - Max Range

(Changes)

1H - No Max Recreation

Discussion: Constraints were added to this run to provide a financially feasible program that would meet several multiple-use objectives and retain the timber management of the previous run. A budget constraint was selected to be about $180,000 higher than the recommended $5,194,000 per year. All of the timber constraints were binding in all periods.

Prescription controls were added to force the model to select intensive recreation and wildlife prescriptions for those areas of the Forest where new facilities or improvements could best respond to the demand and needs. Some of the controls were used to satisfy Forest Ranger/Staff concerns about adequate funding for the management of the other resources. Expansion of Ski Apache was dropped in order to shift the recreation emphasis to the Sacramento Division.

This run achieves the goals and objectives for an insect and disease emphasis alternative and satisfies several other resource objectives as well as possible within the budget limitations. Sawtimber yields are maintained at levels at or above the current production. Recreation and wildlife outputs are near the amenity emphasis alternative, and grazing use is balanced with capacity by the end of the fourth decade.

Alternative: F - Run 1
Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Timber Constraints:	Same as Proposed Action - Run 1.						
MMRs							
Floor/Ceiling Constraints:							
Cable logging	MBF/Year	GE	1500	1500	1500	1500	1500
Harvest Acres							
Aspen	Acre/Year	EQ	71	71	71	71	71
Lincoln Div.	Acre/Period	LE	.01				
For I&D treatment, Sacramento Division by strata:	Acres/Period						
MC/1304		GE	7499	3750	3750		
MC/1202		GE	1785	893	893		
MC/1303		GE	6249	3125	3125		
MC/1205		GE	1786	893	893		
MC/1401		GE	536	267	267		
Old Growth Mgmt.	Acres/All Periods						
Lincoln Div.		GE	1100				
Sacramento Div.		GE	4750				
No harvest - Aspen, Lincoln Div.	Acres/All Per.	GE	721				
Grazing Capacity minus Permitted Use	AUM/Year	GE			0.01	0.01	0.01
Budget	M$/Year	LE	4600	4436	4436	4436	4436

Alternative: F - Run 1 (con't)
Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5

Prescription Controls:
Deleted low intensity timber prescriptions for the mixed conifer strata being treated for I&D control.

FW - Special low budget RX
1A - No low intensity and Min. 50 percent Max Range
1D - No low intensity and Min. 50 percent Max Range
1F - Max Recreation
1G - No low intensity and Min. 50 percent Max Recreation/Wildlife/Fuelwood (PJ)
1H - Max Recreation
1I - Max Recreation
2E - No low intensity and Min. 50 percent Max Recreation/Wildlife
2H - Max Recreation/Wildlife
3A - Wilderness, high management
3B - Min. 50 percent Max Wildlife
3C - No low intensity
4N - Max Range
All AA's - No old Current PJ fuelwood harvest prescriptions

Discussion: Alternative F was developed to be a reduced budget alternative to the Proposed Action. It was designed to meet the most important management objectives of the PA with 70 percent of the PA budget.

Several model runs were made to attempt to apply silviculture treatment to mixed conifer stands on five analysis areas (those selected in the draft PA) and provide most of the other nontimber objectives of the PA. The runs were infeasible due to the limited budget.

This run was the first feasible run, and it applied silviculture treatment to only three analysis areas. All types of timber prescriptions were allowed to be used for I&D treatment, except the low intensity. Also, the budget was relaxed about 1 MM$/year in the first period to allow the model to meet the timber needs in order to determine the required timber costs. Constraints on cable logging, aspen harvests, and grazing capacity were the same as in the PA. Prescription controls were similar to those in the PA: the White Mountain Wilderness AA (1F) was required to receive intensive recreation management, but not the Capitan Wilderness; expansion of Ski Apache and Ski Cloudcroft were required; about 75 percent of the recreation developments in the PA were required in this run, and range improvements were requested for two areas on the Smokey Bear District and one area each on the Guadalupe and Mayhill Districts.

All of the constraints were binding, except for the grazing capacity constraints. Sawtimber harvest volumes were about 8 MMBF/Year. Since the budget was not constrained to the appropriate level, the results of this run could not be used for the Low Budget Alternative.

Alternative: F - Run 2 - Incremental Changes
Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
(Changed) Budget	M$/Year	LE	3690				

Prescription Controls:
(Changed)
1A - No low intensity
1D - No low intensity
1I - No low intensity and Min. 50 percent Max Recreation
2B - No low intensity
2D - Max. 50 percent low intensity
2E - Min. 50 percent Max Recreation
2F - No low intensity
2H - Mod Recreation/Wildlife
3A - Wilderness, moderate management
3B - Dropped control
3D - No low intensity
4J - No low intensity

Discussion: The correct budget constraint was applied to this run. Timber needs were maintained at the same levels as the previous run, but controls on the nontimber prescriptions were reduced. Intensive range management was not required on the Smokey Bear District, but low intensity prescriptions were not allowed on several areas in order to protect the range improvements installed in the last 20 years. The number of new recreation facilities was reduced on both the Smokey Bear and Cloudcroft Districts and intensive wildlife management was not required on an area in the Guadalupe District. In order to maintain the Karr Canyon Picnic Area, AA 2F was constrained not to receive a low intensity prescription. A few other areas were constrained not to receive all low intensity prescriptions to allow at least current level management of wildlife habitats.

Results of this run revealed some unsatisfactory budget appropriations. The general administration (GA) budget was higher than a 'low budget' program would need. The right-of-way acquisition budget was lower than desired to meet part of the PA objective to improve access to the Forest. The range operating budget was considered to be too low to process the permitted use reductions that would be required to balance grazing capacity and use in the third period.

Alternative: F - Run 3 - Incremental Changes
Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Floor/Ceiling Constraints:							
(Changed)							
Grazing capacity minus permitted use	AUM/Year	GE					0.01

Prescription Controls:
(Changed)
1J - No low intensity
2D - No low intensity
4L - Max. 50 percent low intensity
4K - No low intensity

Discussion: The special low budget Forest-wide prescription was modified prior to making this run. Changes to the FW prescription data were the following: 1) the GA budget was reduced about 30 percent from the 'current' level that had been used, 2) the ROW acquisition budget was increased about 30 M$/year for the first two periods, and 3) the rate of reduction in permitted grazing use was changed to the slow rate of 2400 AUM/decade.

The constraint on the balance of grazing capacity and permitted use was relaxed to allow use to exceed capacity until the fifth period. However, prescription controls were chnaged to prevent four additional areas from receiving low intensity prescriptions in order to increase the operating budget for range and the improvement budget for wildlife.

The grazing capacity constraint was not binding, but two unconstrained analysis areas that have significant range opportunities were allocated to low intensity prescriptions. Other management allocations were satisfactory.

Alternative: F - Run 4 - Incremental Changes
Objective Function: Maximize Present Net Value

Constraints	Units of Measure	Operator	Constraints by Period 1	2	3	4	5
Prescription Controls:							
(Additions)							
2C - Max. 50 percent low intensity							
3F - Max. 50 percent low intensity							
(Changes)							
1J - Max. 50 percent low intensity							
3C - Max. 50 percent low intensity							
4N - Min. 75 percent Max Range							

Discussion: Adjustments to prescription controls were made to refine the range management allocations. Two additional analysis areas (2C and 3F) were prevented from receiving all low intensity prescriptions. The controls on three other areas that had needed range improvements (1J, 3C and 4N) were relaxed to provide the additional money needed for AA 2C and 3F. This run achieved the goals and objectives of the reduced budget alternative as well as possible within the budget limitations.

Alternative Results

Results of the final variations of the alternative runs are discussed in Chapter 2 of this EIS. The resource ouputs for the first five ten-year time periods are displayed in Table 7, and the costs, benefits and present net value of each alternative are presented in comparative form in Tables 8, 9, 10 and 11. The environmental consequences of each alternative are discussed in Chapter 4 of this EIS.

Adjustments made to the FORPLAN yield results included: 1) adding the 'current' level wildlife RVDs to the RVDs from FORPLAN (FORPLAN RVDs represent the change from current only) to get the total RVDs for dollar benefit calculations, 2) adding in the dollar benefits for current water yields to the total benefits, 3) increasing the total Forest grazing capacity by 33,000 AUMs per year to correct the range model's 'current' base level, and 4) increasing the permitted grazing use to match capacity when use fell below capacity. The last two adjustments only affect the period of balance for grazing capacity and use, and have no effect on other resource outputs or prescription allocations. Before the revised PA and Alternative F were modeled, the last two adjustments were incorporated into the FORPLAN data. All of the adjustments are reflected in the tables displayed in Chapters 2 and 4.

Departure Analysis

In the formulation of alternatives, a departure from the non-declining yield constraint on timber harvest volumes may be evaluated to determine if net public benefits would be increased by allowing a decrease in harvest levels between consecutive time periods. None of the alternatives considered in detail used a departure from non-declining yields.

Most of the timber prescriptions on the Forest have a negative present net value. The Maximum PNV benchmarks, which had no floor constraints for timber outputs, allocated very few acres to timber prescriptions and the average annual timber yields were less than one million board-feet. The Proposed Action departure run produced timber volumes in the first five periods that were below current harvest levels. The Proposed Action long-term sustained-yield capacity volume was provided by harvests that occurred after the first 50 years in order to have the least negative effect on PNV. The harvestable sawtimber was provided by old growth management prescriptions which have no harvests in the first 50 years.

Timber management objectives for most of the alternatives are to apply better silvicultural practices to as much of the timber resource as possible in order to improve the age-class distribution, control the losses from present insect and disease infestations, and provide more disease resistant stands for the future. None of these objectives can be met by allowing economic efficiency

criteria drive the prescription allocation process for the timber resource. In the departure alternative, fewer acres of timber land were allocated to even-aged management (about half as many as in the Proposed Action).

In addition to the above reasons for eliminating departure alternatives, the following criteria in favor of departures were not satisfied:

1. RPA timber targets were not met by the departure run, but are met by all the other alternatives, except Alternative D in the fifth period.
2. The base sale schedule of timber from the departure alternative would have an adverse impact on the local community due to the unsteady flow of sawtimber to the local mill with volumes below current levels for the next 50 years.
3. Age-class distribution was not improved, since fewer acres were allocated to even-aged management.
4. Overall multiple-use objectives were not better met.

SOCIAL & ECONOMIC IMPACT ANALYSIS

Social Overview

Social impact analysis is defined in FSM 1973 as "the estimation of how Forest Service policies and actions affect the quality of life or social well-being. The primary goal is to help managers take into account social concerns in making decisions." Social impact analysis is accomplished by comparing current social conditions in an area influenced by Forest Service actions with conditions likely to occur as a result of implementing management alternatives.

Social impact analysis is to be initiated only if the potential social effects of Forest Service policies or actions are important to the decisions being made. Preliminary analysis was made of the potential for affecting social conditions in the area influenced by the Forest. The following steps were used in the analysis:

- The geographic zones of influence were delineated. The first zone is the primary zone which is made up of the multi-county area surrounding the Forest (See Chapter 3). The secondary zone of influence comes from outside the primary zone and consists of non-local and generally amenity resource users. A third zone of influence is from the Mescalero Apache Tribe which occupies lands located between Smokey Bear Ranger District and the Sacramento Division.

- Eight social variables that may be affected by changes in Forest management were considered: Employment, Income, Population, Community lifestyle, Social organization, Minority groups, Land use patterns, Attitudes, beliefs, and values.

The potential social impacts of any alternative on the people in the three zones of influence were considered to be negligible and further analysis was not made. Chapter 3 of this EIS provides a discussion of the social environment

around the Forest and the Economic and Social Considerations section of Chapter 4 describes the expected impacts on the communities.

Economic Overview

Evaluation of the alternatives included an analysis of the economic impacts on the surrounding communities per direction in 36 CFR 219.12(g). Economic impact analysis is defined in FSM 1972 as the determination of "short-term effects (those occurring in the first 10 years) of continuing or changing Forest Service programs on the economic conditions in impact analysis areas in which the planning area occurs." The effects are to be measured in terms of population, income and industry sector employment within the impact analysis area.

The economic effects of the various alternatives were measured with an economic input-output model, IMPLAN, developed for the U.S. Forest Service, Region 3 (USDA 1982). The model was designed to provide determinations of the direct, indirect and induced effects of changes in Forest output levels on jobs and income for various industry sectors in different county areas (impact analysis areas). Flexibility was built into the model to allow selection of analysis areas that would represent the primary impact areas of the Forest under study. The economic effects of the benchmarks were not evaluated since the benchmarks were not considered to be feasible alternatives.

Three counties surrounding the Forest were chosen as the areas most likely to be affected by changes in Forest management activities. These were Lincoln, Otero, and Eddy counties. The local sawmill is in Otero County and most of the Forest recreation and wildlife use occurs within the three county area.

The current (1980) Forest resource output levels are entered into IMPLAN to determine how much of the total county employment and income is attributable to Forest production. The IMPLAN model was developed with 1977 base data. Changes in employment and income from this base are determined by entering the expected changes in Forest output levels associated with each alternative. The following Forest outputs were entered into IMPLAN and distributed to the three counties as indicated:

Sawtimber (MMBF) - 95 percent to Otero, 5 percent to Lincoln Co.
Timber Products (MMBF) - 95 percent to Otero, 5 percent to Lincoln Co.
Fuelwood, Commercial (MMBF) - D-1 yields to Lincoln, D-2 and D-4 yields to Otero, D-3 yields to Eddy Co.
Fuelwood, Personal (MMBF) - distributed the same as commercial fuelwood
Picnicking (MRVD) - D-1 RVDs to Lincoln, D-2 and D-4 RVDs to Otero, D-3 RVDs to Eddy Co.
Camping, developed (MRVD) - distributed the same as picnicking
Downhill Skiing (MRVD) - D-1 RVDs to Lincoln, D-2 RVDs to Otero Co.
Dispersed, Nonmotorized Recreation (MRVD) - D-1 RVDs to Lincoln, D-2 and D-4 RVDs to Otero, D-3 RVDs to Eddy Co.
Dispersed, Motorized Recreation (MRVD) - distributed the same as dispersed nonmotorized recreation

Wildlife RVDs in FORPLAN are estimated to be 50 percent consumptive and 50 percent nonconsumptive. Only consumptive RVDs (half of the total RVDs) were entered into IMPLAN as -

Hunting, Big Game (MRVD) - 94 percent of D-1 RVDs to Lincoln, 94 percent of D-2 and D-4 RVDs to Otero, 94 percent of D-3 RVDs to Eddy Co.

Hunting, Small Game (MRVD) - 4.5 percent of D-1 RVDs to Lincoln, 4.5 percent of D-2 and D-4 RVDs to Otero and 6 percent of D-3 RVDs to Eddy.

Fishing (MRVD) - 1.5 percent of D-1 RVDs to Lincoln, 1.5 percent of D-2 and D-4 RVDs to Otero Co.

Livestock, Cattle (MAUM) - 33 percent permitted use (P.U.) to Lincoln, 33 percent to Otero, and 31 percent to Eddy Co.

Livestock, Yearling (MAUM) - none

Livestock, Sheep (MAUM) - 3 percent P.U. to Eddy Co.

FS Employee Compensation (MM$) - D-1 costs to Lincoln, D-3 costs to Eddy, all remaining costs to Otero Co.

FS O & M and Investment (MM$) - distributed the same as employee compensation.

(Note: D-1 is Smokey Bear Ranger District, D-2 is Cloudcroft Ranger District, D-3 is Guadalupe Ranger District, D-4 is Mayhill Ranger District.)

Economic effects of each alternative were estimated for the first ten years for each county for about 50 different industry sectors. The sectors most affected by Forest activities were the tourism and timber businesses. The results of the economic impact analysis are discussed in Chapter 4 of the EIS.

C. Guadalupe Escarpment Wilderness Study Area and Three Adjacent Study Areas

ISSUES

Issues concerning the Guadalupe Escarpment Wilderness Study Area (GEWSA) and three Bureau of Land Management Wilderness Study Areas (BLM WSAs) - Devil's Den Canyon, McKittrick Canyon and Lonesome Ridge - adjacent to it were identified through public involvement efforts associated with: (1) Roadless Area Review and Evaluations I and II, (2) a Guadalupe Escarpment Wilderness Proposal and Draft Environmental Impact Statement, 1978, (3) public scoping meetings concerning the three BLM WSAs, 1982, (4) an Environmental Assessment concerning oil and gas leasing, 1983, and (5) the proposed Forest Plan.

These issues were grouped according to similarity in content as follows:

-More wilderness should have been designated.

-A combined wilderness with the National Park wilderness is desirable.

-There is enough (or too much) wilderness already; no further areas should be designated.

-Management of the cave resource could be adversely affected in a wilderness.

-The designation of wilderness would interfere with oil and gas development.

-Wilderness designation would stop vehicle access to the area and deny its use to many people.

Comments made concerning the GEWSA are found in the planning records on file in the Forest Supervisor's Office, Lincoln National Forest, Alamogordo, New Mexico. Comments concerning the BLM WSAs are on file at the Roswell District Office, Roswell, New Mexico.

HISTORICAL PERSPECTIVE

The Guadalupe Escarpment WSA was identified as a potential wilderness following studies started in 1971. Its primitive characteristics caused it to be included in the first Forest Service Roadless Area Review and Evaluation (RARE) in 1973. The purpose of RARE was to identify and inventory roadless and undeveloped areas which might be suitable candidates for inclusion in the National Wilderness Preservation System (NWPS).

In 1977 a subsequent review, RARE II, was implemented to identify: (1) areas suitable for inclusion in the NWPS; (2) areas needing no further consideration for wilderness; and (3) areas that should be studied further. As a result of RARE II review, the GEWSA was recommended to Congress for inclusion in the NWPS. However, Congress formally established the Guadalupe Escarpment Wilderness Study Area in the New Mexico Wilderness Act (Public law 96-550), December 19, 1980. The Act requires the Secretary of Agriculture to review the GEWSA and make a recommendation as to its suitability or unsuitability for

inclusion in the NWPS, in conjunction with the requirements of the National Forest Management Act of 1976.

Three areas adjacent to the GEWSA but administered by the USDI, Bureau of Land Management (BLM), were identified for possible inclusion in the NWPS as a unit with the GEWSA. The BLM areas were removed from consideration by a decision of the Secretary of the Interior on December 30, 1982. The decision was subjected to litigation, and subsequent decisions made in 1985 by a U.S. District Court and the Secretary of the Interior resulted in the reinstatement of the following three areas to WSA status; Devil's Den Canyon, McKittrick Canyon and Lonesome Ridge. A wilderness recommendation for the three BLM WSAs, which together do not meet the 1964 Wilderness Act minimum criteria of being greater than 5,000 acres, is dependent on the recommendation for the GEWSA.

On December 16, 1985, the Supervisor of the Lincoln National Forest and the BLM's Roswell District Manager signed an Interagency Agreement for the joint study and development of wilderness recommendations for the three BLM WSAs and the GEWSA. This report describes all four WSAs and discusses their suitability for wilderness, as well as alternatives to wilderness designation. In order to simplify the discussion, statements made herein will apply to all four study areas unless specific areas are mentioned.

The primary reason Congress gave for designating the Guadalupe Escarpment as a WSA was the question of oil and gas reserves. The following reason is quoted from the legislative history as found in the Congressional Record:

> "On the Texas-New Mexico border, the substitute designates a 21,000-acre Guadalupe Escarpment Wilderness Study Area. Although this area, which links Carlsbad Caverns and Guadalupe Mountains National Parks, was recommended for wilderness by the Forest Service, it was agreed that further study is a preferable designation at this time. Wilderness study will allow time to determine whether the area has a high potential for oil and gas."

On August 25, 1983 the Regional Forester recommended to the BLM that no additional portions of the GEWSA be leased for oil and gas exploration (approximately 200 acres adjacent to the northern boundary are under existing leases). The decision was made to provide adequate interim protection for the unique cave resource of the area. Also, an alternative will be evaluated in the Environmental Impact Statement for the Lincoln National Forest Plan that will recommend to the Administration that GEWSA be designated wilderness. Alternatives which contain a recommendation for non-wilderness designation must provide for protection of wilderness values until the four areas are designated wilderness or non-wilderness.

This summary of information relating directly to the WSAs is taken from: a Guadalupe Escarpment Wilderness Proposal and Draft Environmental Impact Statement, filed October 18, 1978; the Environmental Assessment and Decision Notice addressing oil and gas lease applications, dated August 25, 1983; and Forest and Roswell District planning records.

DESCRIPTION

The GEWSA encompasses about 21,300 acres at the south end of the Guadalupe Ranger District, Lincoln National Forest. It is bounded on the south by the Guadalupe Mountains National Park and the Lonesome Ridge WSA, and on the east by Carlsbad Caverns National Park. All National Park lands adjacent to the WSA are designated wilderness. Figure 2 shows the general location of the four WSAs and their proximity to National Park lands.

Road access to the GEWSA is from the northeast along US Highway 285, State Route 137, and Forest Road 540. Trail 201 follows the northern boundary of the WSA and connects to trails leading into it. Access from the south and east is through the National Parks and BLM lands via several trails and canyons.

Lonesome Ridge WSA is located adjacent to the GEWSA on the southeast and includes the lower end of Big Canyon drainage. This WSA contains 3,505 acres of public land. It is bounded on the north and west by the GEWSA and on the south and east by public, state and private land. Road access is provided over about 13 miles of unimproved roads west from Eddy County Road 418 south of White City, New Mexico.

Devil's Den Canyon (320 acres) and McKittrick Canyon (200 acres) WSAs are located adjacent to the GEWSA on its western border. Road access to Devil's Den Canyon WSA is via an unimproved road across private land. There is no road access to McKittrick Canyon WSA.

Physiography

The WSAs are severely dissected in a dendritic pattern by deep rocky canyons and high ridgetops. Elevation ranges from 4,800 feet to 7,500 feet; slopes greater than 40 percent compose 72 percent of the area. Abrupt drops of as much as 1,200 feet occur in the incised canyons of the south-east section while elevation change occurs gradually along the northern boundary.

Drainage of the entire area is to the east except for Devil's Den Canyon and part of McKittrick Canyon WSA, which drain to the west. The major drainages are North McKittrick Canyon, Big Canyon, Black River, Gunsight Canyon, and Double Canyon. The main ridges are Guadalupe Ridge, which forms the northern boundary of the GEWSA, Camp Wilderness Ridge, and Lonesome Ridge.

Climate

Notable climatic variations occur within the area. Summer temperatures may exceed 100°F at lower elevations, while the highlands remain relatively cool. The area's limited rainfall comes mainly in summer, often in the form of electrical storm downpours that can cause dangerous and destructive flash flooding. During the winter months, higher elevations are subject to inclement weather. Detailed climatic statistics are not available for the area.

Vegetation

The WSAs contain three major vegetation types: southwestern desert shrub, mountain shrub, and coniferous woodland. The lower elevations border the Chihuahuan Desert. A number of distinct and fragile habitats occur within these zones. In addition, a transitional zone occurs which provides an area containing a wide variety of flora and fauna. This variety makes the area ideal for scientific study, or for casual observation. The western-most portion of

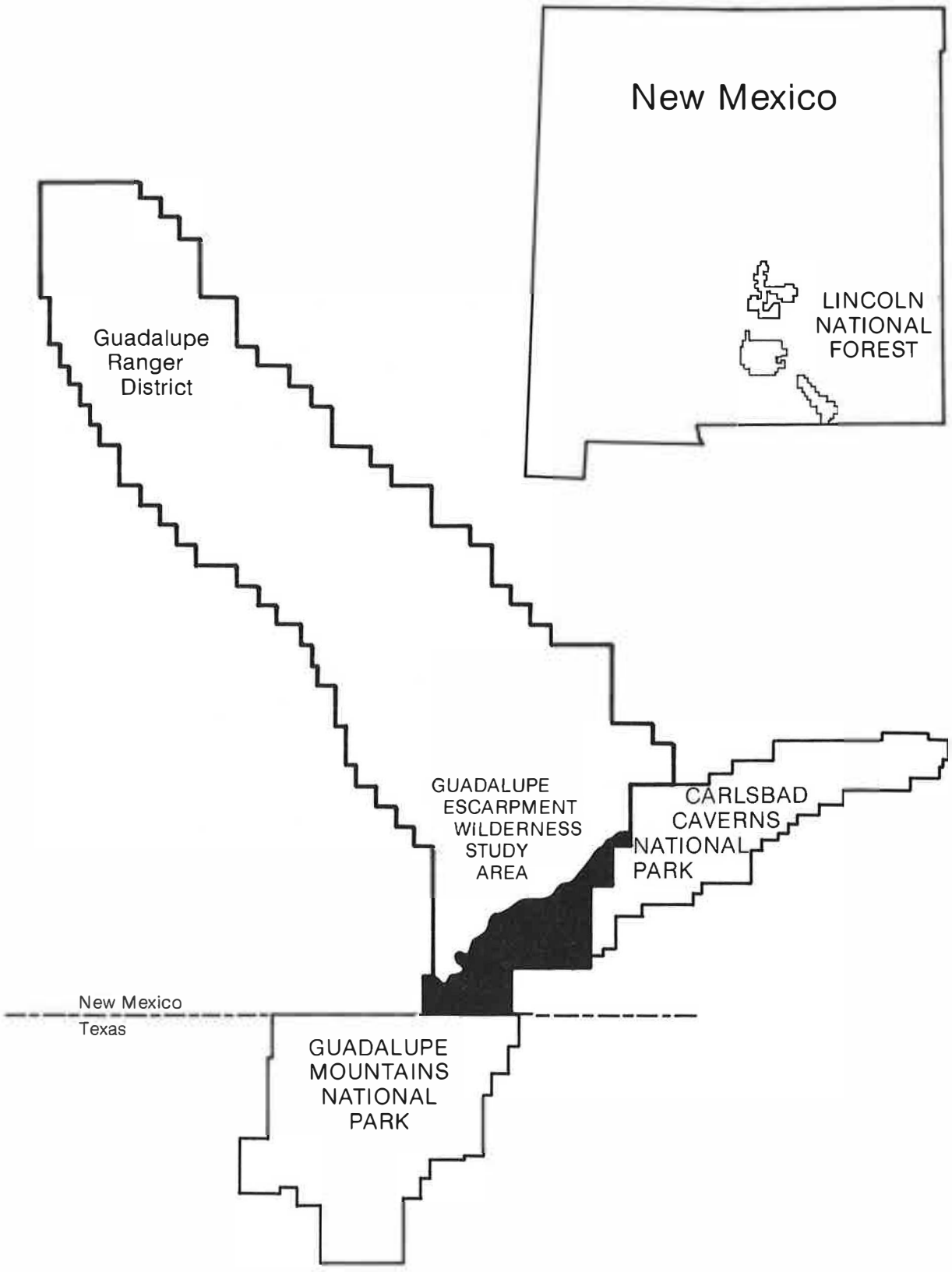

Figure 2. Wilderness Study Area and Vicinity

the GEWSA, about 827 acres, has been proposed as the North McKittrick Research Natural Area.

Among the succulent or semi-succulent plants are sotol, ocotillo, prickly pear cactus, cholla, lechugilla, agaves, and yuccas. Tree species include alligator juniper, gray oak, soapberry, netleaf hackberry, Mexican buckeye, desert willow, Texas walnut, Texas madrone, wild cherry, big tooth maple, pinyon pine, ponderosa pine, and Douglas-fir. Shrubs include redberry juniper, Southwestern candalia, Apache-plume, littleleaf sumac, catclaw mimosa, and skeleton goldeneye. Those particularly valuable for deer browse are mountain mahogany and desert ceanothus. Numerous grass species occur within the area.

Geology

The major uplifting of the Guadalupe Mountains probably occurred in the late Pliocene (5 million years ago) and early Pleistocene times (1 million to 2 million years ago), resulting in a fault-block mountain mass. The mountain range tilts slightly to the northeast and has as its westerly margin a fault-scarp.

The area encompasses the central part of the Capitan Reef which was formed during the Permian geologic time period. An extensive cavern system has developed in this ancient reef. Approximately 80 major and 37 minor caves are known within the area, the most well-known being Cottonwood Cave. Geological evidence strongly suggests that there are many more undiscovered caves.

Soils

Soils have developed mostly from limestone, dolomite, and sandstone. They are generally shallow (1 to 20 inches deep), very cobbly, and on moderately steep to steep slopes. Table 111 lists the important features of each soil unit.

Table 111. Soil Resource Potential.

Number	Unit Name	Percent of Slope Range	Percent of Area	Erosion Hazard	Herbage Potential
101	Limestone Rockland	40-200	34	High	Very low
104	Dolomite and Sandstone Rockland-Mabrey Complex	0-20	1	Low-Moderate	Low
105	Lozier-Mabrey Rockland Association	40-120	2	High	Very low
154	Vamer Cobbly loam	0-40	11	Low-high	Moderate-High
266	Mabrey-Rockland Complex	30-150	51	Moderate-High	Low
	Ector-Reagan Association	0-40	1	Moderate	Moderate

CURRENT USES

Recreation

Dispersed recreation, the major use of the WSA's, generated approximately 7,800 Recreation Visitor Days (RVDs) in 1980, of which 4,000 RVDs were from cavers. The cave resources are known internationally and are repeatedly visited by numerous individuals and organized groups. Caving is a year-round activity. Although most of the non-caving RVDs are related to hunting, the area is also used for sightseeing, dispersed camping, hiking and horseback riding. There are excellent opportunities for rock climbing and photography.

The WSAs have been mapped using the Recreation Opportunity Spectrum (ROS) classification. Currently, the areas contain 5,378 acres of semi-primitive motorized opportunities, 19,409 acres of semi-primitive non-motorized opportunities and 489 acres of roaded natural which was present when the WSAs were designated.

The visual landscape of the WSAs vary from deep rocky canyons to flat-topped ridges. Pinyon pine and juniper are predominant tree species which add to the characteristic landscape. In canyon bottoms and along water courses, areas of ponderosa pine and other conifers can be found. Very little water exists in the area. About 49 percent of the WSAs can be characterized as having distinctive or outstanding scenic quality. The remainder is classed as common (40 percent) or minimal (11 percent).

The WSAs have been mapped for visual qualities using the Forest Service's Visual Management System and BLM's Visual Resource Management (VRM) System. Visual quality levels (VQL) describe the degree of acceptable alteration of the natural-appearing landscape based upon the importance of esthetics. The visual quality level for the GEWSA is "Preservation", which allows only natural ecological changes. The three BLM WSAs are tentatively classified as VRM Class II, which is almost comparable with a VQL of Preservation except that allowable changes caused by an activity can be seen but must not attract attention.

The visual absorption capability, the ability of the land to visually absorb modifications, has not been mapped. The anticipated result of such mapping is that much of the area has a low visual absorption capability because of the arid climate, rugged terrain, shallow soils, minimal forest cover, and slow vegetative growth.

Cultural Resources

Little is known of the cultural resources in the WSAs. Known archaeological sites indicate that prehistoric use of the Guadalupes was generally seasonal in nature, with people occupying different portions of the area as different food resources became available. This usage on a temporary basis for hunting and gathering activities endured for thousands of years. Sites present in the area are mainly ceramic scatters, chipping debris, food processing materials and vegetal roasting pits. Rock art sites also have been recorded and some caves and rock shelters were occupied. Apaches are known to have occupied the region by at least the mid-1500's. Their adaptation was similar to earlier prehistoric peoples. The Apache presence in the Guadalupes prevented occupation of the area by non-Apaches until the late 1800's.

Range

Parts of four National Forest and three BLM grazing allotments are located within the WSAs. About three-fourths of the area is classed as non-suitable for livestock grazing due to steep terrain and lack of available forage. Present acreage used for livestock grazing, about 4,230 acres, is limited to ridge tops in the coniferous woodland vegetation (GEWSA and BLM WSAs), and lower slopes and canyon bottoms (BLM WSAs). Another 4,000 acres of potentially suitable range could be grazed if water were made available. Range improvements within the WSAs include seven livestock waters, about a half mile of pipeline, and about 3 miles of fence.

Timber

There are no tentatively suitable timber lands in the WSAs. The small numbers of ponderosa pine, and the Douglas-fir stringers in canyon bottoms, can not be economically harvested or regenerated within five years if harvested. Coniferous woodland species (pinyon pine and juniper) occur along ridge tops, but due to difficult access there has been little pressure for fuelwood cutting. The area has an existing volume of fuelwood (7 inches in diameter or greater) of 9,500 cords. Two thousand six hundred acres with slopes less than 40 percent are available for potential fuelwood harvest.

Water

One perennial source of water, Devil's Den Spring, is located within the GEWSA near the northwestern boundary. No perennial streams exist within the boundaries. No reliable sources of potable water exist. Several small stretches in McKittrick and Big canyons contain surface water for most of the year. Because the majority of the annual precipitation comes in the form of intense, short-duration summer thunderstorms, all canyons are subject to flash flooding.

Water Quality

Present water quality meets all State and Federal standards. Flash flood flows characteristically contain large sediment loads.

Minerals

The presence of locatable minerals in the WSAs is unlikely because of the limestone geological formations. There is, however, one abandoned copper mine. The nearest oil and gas wells are located 15 to 20 miles north-east of the area. Existing oil and gas leases cover 140 acres in the GEWSA and have a primary term expiration date of 1987. In Lonesome Ridge WSA, 2,382.45 acres are currently leased, but only 395 acres would be subject to surface occupany for drilling. These leases expire between 1988 to 1992.

There are 16 oil and gas lease applications pending covering essentially the entire GEWSA. Based on favorable geological conditions, the U.S. Geological Survey (USGS) and Bureau of Mines recognized the possibility of oil and gas occurence but neither agency has verified occurrence in the field. Nevertheless, the GEWSA has been classified by the USGS as Inferred Identified Economic Oil and Gas Potential, i.e., it may be expected to contain economic deposits, and efforts to verify quantity and quality can be expected within ten years.

No demand for caliche or other road-building material is expected because existing pits outside the WSAs are sufficient to meet demand.

Lands

All lands within the WSAs are administered by the Forest Service or BLM. For the most part, man's influence within the area has been limited to rangeland use and dispersed recreation activities.

There are two special use permits issued to the New Mexico Department of Game and Fish for wildlife water trick tanks.

There are two withdrawals from mineral entry, one of 280 acres to protect Cottonwood Cave, and another of 40 acres for the Dark Canyon Lookout Administrative Site.

Facilities

Access to the northern boundary of the GEWSA is provided by two Forest Roads, 540 and 69A, and by Crest Trail (#201). There are approximately 14 miles of primitive roads and 16 miles of trails within the boundaries. Some parts of Trail #201 are double tracked and provide additional motorized access to the northern boundary of the WSA. Other trails include Lonesome Ridge (#56), Devil's Den (#202) and the Ussery Trail (#203).

Air Quality

Air quality over the WSAs is very high because of distance from population, farming, and industrial areas. The Pecos Valley to the east produces some pollutants from industrial and farming activities but they are carried to the northeast by prevailing winds. The only other controllable source of air pollutants in the area is smoke from prescribed burning for hazard reduction and wildlife habitat improvement. Any such burning would usually occur in the spring and summer months. The biggest effect on air quality is dust due to strong winds which occur during the spring from the prevailing southwest winds.

The adjacent National Parks are managed as mandatory Class I Federal Air Quality areas, and the National Park Service maintains air quality monitoring stations in cooperation with the U.S. Environmental Protection Agency.

Fire

Fires caused by either man or lightning have been rare in the recent past. The low visitation rate during the main fire danger period is one reason for infrequent man-caused fires, and few lightning fires have occurred even though thunderstorms are frequent in the summer.

A 1985 lightning-caused fire managed as a prescribed fire burned part of the northeastern portion of the GEWSA. In 1974, a wildfire burned several hundred acres, also in the northeast portion of the GEWSA. Fires in the early part of this century burned much of the WSAs, helping create the vegetation composition present today. There is a possibility of large fires because of buildup of fuels.

Appearance

The WSAs are primarily natural in character, showing little evidence of man. Because of the rugged topography and limited access, the few primitive trailways exist only along ridge tops. These trailways and the few stock and wildlife improvements present are non-obtrusive.

Opportunity for primitive or unconfined recreation is moderate. Most of the terrain is too steep and rugged for cross-country travel even for serious hikers in good physical condition. Because of the topography, most hiking and hunting

is confined to ridgetops and canyon bottoms. Numerous areas provide opportunities for adventure, solitude, and self-reliance.

Surroundings

The area surrounding the WSAs has for the most part remained in a primitive state. Carlsbad Caverns National Park lies to the East, and the Guadalupe Mountain National Park is to the South. The Guadalupe Escarpment, consisting of rugged, steep slopes and cliffs rising from the desert floor, forms the western and southern boundary. To the north of the WSAs, the bulk of the Guadalupe Ranger District is managed primarily for grazing and recreation. It contains roads, ranch facilities, stock tanks, fences and other improvements.

Dark Canyon lookout and three radio towers are located on the northern border of the GEWSA. Electrical service to these facilities is provided by a powerline. Another line provides service to a ranch located about a mile from the northern boundary of the GEWSA.

ATTRACTIONS

Wildlife

Elk were introduced in 1928 after extinction of the native herd. The barbary sheep, an exotic species, has extended its range south to include this area. Native large animals include deer, black bear, and mountain lion. Native small mammals include gray fox, coyote, bobcat, pocket gophers, jackrabbits, cottontail rabbits, skunks, ringtails and raccoons. Some caves are inhabited by various species of bats during warm portions of the year. Common birds include the wren, logger-head shrike, cave swallow, scaled quail, and the roadrunner. Reptiles in the area include several species of rattlesnakes and numerous species of non-poisonous snakes such as the rat snake, whipsnake, and gopher snake. Amphibians include queen toads and spade foot toads. Insects, tarantulas, scorpions, and centipedes are plentiful in the area.

Portions of the WSAs are historical habitat for desert bighorn sheep, an extirpated native species, and are possible sites for reintroduction pending completion of suitability studies conducted by New Mexico Department of Game and Fish in cooperation with the Forest. With the reintroduction of this species, the area would approach natural wildlife species composition.

The area provides habitat for javelina. However, this species has been nearly extirpated from southeast New Mexico.

Threatened and Endangered Plants And Animals

Habitats for two wildlife species listed as endangered (Federal Register, 41:208, Oct. 27, 1976), occur in the WSAs: the American peregrine falcon (Falco peregrinus anatum), whose nests occur in the neighboring National Parks, and the Southern bald eagle (Haliaeetus leucocephalus leucocephalus), which is observed in the area on rare occasions.

The mottled rock rattlesnake (Crotalus lepidus lepidus), which is on the State of New Mexico's endangered animal list, occurs in the WSAs. The following plants may occur. The following plants are currently being proposed for or have been nominated to federal and state lists of threatened and endangered plants:

Aquilegia chaplinei
Aster laevis var. guadalupensis
Chaetopappa hersheyi
Chrysothamnus nauseosus spp. texensis
Valeriane texana
Streptanthus carinatus
Hedeoma apiculatum
Polygala rimulicola
Salvia suma
Sophora gypsophila var. guadalupensis
Coryphantha sneedii var. sneedii

Scenic Landmarks

McKittrick Canyon, in the southwest part of the area, is recognized as one of the most beautiful spots in the Guadalupe Mountains and receives some recreation use, primarily originating from the adjacent Guadalupe Mountains National Park. This canyon is characterized by high, sheer walls and a wide variety of riparian vegetation growing along the spring-fed stream. In 1977 a cooperative agreement (memorandum of understanding) for the management of North McKittrick Canyon was entered into between the National Park Service and the Forest Service to provide joint cooperation in the management of the canyon. The agreement specifies the management constraints imposed on National Park and Forest Service portions of the canyon by the respective agencies. The agreement was updated in 1978 and 1983.

Caves in the Guadalupe Mountains are extremely well decorated and contain massive and delicate features that are unsurpassed. These caves are recognized by knowledgeable speologists as unique, and among the most delicate in the world. They contain many secondary deposits that are rare because of their size, density and mineralogy. Several of the caves have been equipped with lockable gates to prevent vandalism and for public safety.

Caves discovered to date are irregularly distributed but there is seldom more than a mile between entrances. Many caves are large and extensive both horizontally and vertically. Gravitometer studies suggest that many caves exist without surface openings. The subsurface appears to be a giant network of underground passages.

WILDERNESS SUITABILITY

Suitability for wilderness designation is a function of the physical and biological environment of the WSAs and adjacent area. This chapter describes the various environmental factors related to this suitability determination.

Standards to be met by areas in the NWPS were established in the 1964 Wilderness Act. Forest Service and BLM policies require that an area's wilderness capability, availability, and need be evaluated prior to determining the suitability for inclusion in the NWPS.

Capability

Capability indicates the degree to which an area possesses the basic characteristics necessary for wilderness designation and manageability without regard to availability or need for wilderness. Indicators of wilderness capability include:

- -Manageability of the area as wilderness.
- -The natural integrity and apparent naturalness of the area.
- -Opportunities for solitude.
- -Opportunities for primitive recreation and challenging experiences.
- -Supplemental attributes such as the presence of outstanding ecological, geological, scenic, or historical features, rare and endangered species and other wildlife, and scientific study.

Wilderness capability is analyzed without regard to either the need for more wilderness or the availability of the area for wilderness designation. It is determined by both the degree to which an area possesses the basic characteristics necessary for wilderness designation as well as the degree to which an area can be managed for wilderness.

Manageability and Boundaries

The WSAs contain approximately 25,300 acres. The boundaries generally follow land ownership or well-defined topographic and manmade features that are relatively easy to locate and post, but because of the relatively gentle topography along the northern and southeastern boundaries, somewhat difficult to enforce on the ground. Boundary relocation could easily be accomplished and would have little effect on total acres.

Natural Integrity and Apparent Naturalness

Natural integrity refers to the extent to which long-term ecological processes are intact and operating. Apparent naturalness refers to the degree to which a visitor would be aware of impact or disturbance to the natural integrity. Both natural integrity and apparent naturalness have been preserved on sideslopes and canyons by the rugged terrain and lack of access to these areas. The natural integrity of the relatively flat ridgetops has been compromised by the presence of primitive travelways, but these same travelways are relatively unobtrusive, and have had only slight negative impacts on apparent naturalness.

Opportunities for Solitude

Opportunities for solitude refers to the size or physical characteristics to permit isolation from the sights, sounds, and presence of others and from the developments and evidence of man. The WSAs afford such opportunities. The area is characterized by a predominantly natural environment. Sideslopes and canyons have been preserved by rugged terrain and lack of access. These canyons and sideslopes provide a high probability of experiencing isolation from the sights and sounds of other humans. Once the user leaves the primitive travelways confined to the ridge tops, there is little evidence of man's use, and interaction between users is low.

Opportunities for Primitive Recreation and Challenging Experiences

Primitive and unconfined types of recreation activities refer to meeting nature on its own terms, without comfort and convenience facilties. This rugged terrain provides the user with a sense of independence and closeness to nature while presenting opportunities to demonstrate outdoor skills in an environment that offers challenge and risk.

Special Features

Special features and areas provide opportunities for special or unique activities or experiences. Caves and McKittrick Canyon, which were discussed above under Scenic Landmarks, are the WSA's most outstanding special features.

Availability

Availability indicates the degree to which an area can be committed to wilderness purposes in light of competing demands for other resource uses of the area. Indicators of wilderness availability include:

-The value of the area as wilderness or nonwilderness (Resource Potentials).

-Existing constraints and encumbrances on the land.

-The effect of wilderness designation and management on adjacent resources.

Resource Potentials by Alternative

Resource potentials which would result from implementing alternatives considered in the DEIS for the Forest Plan are outlined in this section. The five major resource outputs are discussed first. Because the range of outputs is limited by topography and low commodity values, the only benchmarks used for comparison were those for maximum recreation and low intensity. For the same reasons, the alternatives which contain a recommendation for non-wilderness designation produce similar outputs and therefore have similar tradeoffs. Recommendation for or against wilderness does not insure allocation to that use; however, in order to compare alternatives, it is assumed that the recommendation contained in each alternative will be accepted by Congress.

The relationship between management alternatives for the three BLM WSAs and alternatives evaluated in the EIS for the proposed Lincoln National Forest Land and Resource Management Plan are as follows:

-Preferred Alternative (Proposed Plan). Part of Lonesome Ridge (2,990 acres) would be protected from surface disturbance, designated as VRM Class I, and managed as an Outstanding Natural Area. Devil's Den Canyon and McKittrick Canyon WSAs would be managed as VRM Class II areas to retain existing scenic qualities.

-Alternative A. Part of Lonesome Ridge (2,627 acres) would be managed in accordance with an existing land use plan which restricts surface disturbing activities and retains primitive values. No special management would be applied to Devil's Den Canyon and McKittrick Canyon WSAs.

-Alternative B. Same as PA.

-Alternative C. Same as Alternative A.

-Alternative D. The entire Lonesome Ridge WSA (3,505 acres) would be recommended for wilderness designation, as would 160 acres in Devil's Den Canyon, and 200 acres in McKittrick Canyon.

-Alternative E. Same as Alternative A.

-Alternative F. Same as PA.

Recreation

Table 112 shows the recreation outputs for Dispersed Recreation, Wildlife, and Caves under the alternatives and selected benchmarks.

Table 112. Annual estimates of recreation use (in RVDs) by alternative, and by maximum recreation and low intensity benchmarks.

Type	Period	PA	A	B	C	D	E	Max. Rec.	Low Int.	Max. PNV
Dispersed	1	4887	760	9014	746	8209	760	9014	746	8209
	2	7497	1778	14128	835	9358	866	14128	835	9358
	3	7789	1991	14607	918	10480	970	14607	918	10480
	4	8034	2133	15068	1000	11535	1000	15068	1000	11535
	5	8034	2247	15068	1000	12797	1000	15288	1000	12797
Wildlife	1	5850	5850	5850	3050	3195	3050	5850	3050	3195
	2	9590	9590	9590	3050	3578	3050	9590	3050	3578
	3	9590	9590	9590	3050	3936	3050	9590	3050	3936
	4	9590	9590	9590	3050	4290	4452	9590	3050	4290
	5	9590	9590	9590	3050	5633	4853	9590	3050	5633
Caves	1	4594	4195	4992	4152	4195	4195	4992	4152	4195
	2	4778	4363	5192	4320	4678	4363	5192	4320	4678
	3	4921	4494	5347	4451	4818	4494	5347	4451	4818
	4	5069	4629	5508	4540	4963	4629	5508	4540	4963
	5	5170	4721	5618	4586	5044	4721	5618	4586	5044
Totals	1	15331	10805	19856	7948	15599	8005	19856	7948	15599
	2	21865	15731	28910	8205	17614	8279	28910	8205	17614
	3	22300	16075	29544	8419	19234	8514	29544	8419	19234
	4	22693	16352	30166	8590	20788	10081	30166	8590	20788
	5	22693	16558	30276	8636	23474	10574	30496	8636	23474

Under the PA and alternatives A, B, C, E and F, a recommendation for non-wilderness designation would be made. The WSAs would be managed for the following existing ROS experiences; 19,409 acres of semi-primitive non-motorized recreation; 5,378 acres of semi-primitive motorized recreation, and 489 acres of roaded natural recreation. With maximum development of recreation facilities (maximum practical potential), the area could accommodate 54,000 RVDs per year by the fifth period while meeting recreation objectives and protecting resource values. Dispersed nonwildlife recreation could generate 25,000 RVDs, wildlife could generate 12,000 RVDs, and caving use could approach 17,000 RVDs. The projected total annual potential value of use in the fifth period is $820,000.

The maximum recreation benchmark, which would emphasize developed and dispersed recreation, develops about 56 percent of the maximimum practical potential in the fifth period, with most (about 58 percent) of the use coming from dispersed recreation.

Under Alternative D, which recommends wilderness designation, the WSAs would be managed for the following ROS experiences: 20,536 acres of semi-primitive non-motorized recreation and 4,768 acres of transition areas adjacent to trailheads and boundary roads. The maximum use the WSAs could accommodate by the fifth decade, while still maintaining wilderness integrity and protecting resource values, is 28,000 RVDs per year distributed as follows: recreation, approximately 15,000; hunting, 7,000; and caving, 6,000. Based upon the Resource Planning Act (RPA) 1980 values for wilderness and hunting, and placing the same value on caving RVDs as on dispersed recreation RVDs, the projected practical potential use as wilderness is worth $477,000 annually.

Actual projected use varies widely among the alternatives, both in amount and in type. Overall, the PA and Alternative B develop the most RVDs, with a large proportion coming from dispersed recreation associated with vehicle use. Wildlife and cave uses are also high in these alternatives. Alternatives D and E develop 85 percent and 62 percent, respectively, of the RVDs generated by the PA and Alternative B by the end of the planning period. Not only is the level of use less, but the type of use is different. Dispersed recreation use in alternative D is associated entirely with wilderness. The assumption was made that wilderness designation would, in itself, significantly increase dispersed recreation use. At the same time, restrictions on access would limit increases in wildlife and cave uses. Total use in this alternative approaches the maximum practical potential for wilderness by the end of the fifth period. Under Alternative E, wildlife habitat improvement is emphasized. As a result, most of the use in this alternative is associated with wildlife.

The other three alternatives develop significantly fewer RVDs over the planning period than the PA and alternatives B and D, ranging from 34 to 42 percent of the PA and Alternative B. Dispersed recreation use would continue to grow under alternative A, although at a low rate. Under Alternatives C and E, dispersed use would not increase after the fourth period. Wildlife use would increase slightly in Alternative A, but not in Alternatives C and E because of lack of funding. Cave use would increase only slightly under all three alternatives.

Cave Resource

The caves are an outstanding feature of recreational, scientific and educational value not found in any existing National Forest wilderness. Approximately 70 percent of caving-generated RVDs in the Guadalupe Mountains comes from caves located in the GEWSA. In 1980, there were 4,113 RVDs recorded in the GEWSA. Accurate estimates of cave use in the Lonesome Ridge WSA cannot be made because they are not under a permit system.

Caves not only provide outstanding recreation opportunities for the caving enthusiast, they also contain unique mineral formations. Protection of this non-renewable resource is a management concern and measures to protect them would be taken under all alternatives. Lockable gates at cave entrances, strict application of the permit system, limits on the numbers of permits, and

increased surveillance are measures used by the Forest Service to protect caves. Wilderness designation would adversely affect management of cave resources by limiting access for construction of protective devices and administrative purposes, although the adverse effects would be somewhat offset by reduced access for cavers.

Until cave resources are accurately located and their extent is known, measures to protect them will be difficult to implement. However, the greatest management concern is possible destruction of caves or structures within caves by activities associated with oil and gas leasing. The study directed by the Regional Forester answers some of the questions related to the cave resource, so that the possibility of conducting oil and gas exploration and development activities without damaging the cave resource is increased. The study is summarized below under Minerals. The PA and Alternatives B, D and F would remove this cause of damage by prohibiting oil and gas leasing.

The special status of caves in the southern Guadalupe Mountains is recognized in the PA and alternative B. Alternative B contains provisions for administratively declaring the GEWSA and about 10,000 acres to the north of it as a Special Geologic Area. The PA emphasizes cave protection and management in the GEWSA and on about 5,260 acres to the north of it, but without a special area designation. Under these alternatives, and Alternative F, the area would be withdrawn from mineral leasing and managed specifically to emphasize the uniqueness of the cave resource.

Wildlife

Effects of alternatives on wildlife are difficult to predict. An increase in human activities, as proposed in the alternatives recommending nonwilderness designation, causes adverse impacts to wildlife proportional to the intensity of the activity. Since the extent of developments (except those for wildlife habitat improvement) and level of use will continue to be low under these alternatives, the adverse impacts on wildlife should not be significant. The six alternatives recommending non-wilderness designation would allow activities such as fuelwood harvesting and prescribed burning projects to be used to improve wildlife habitat. In addition, Alternative E contains provisions for significant increases in direct habitat improvement. Opportunities for any needed habitat improvement through vegetation manipulation would be foregone under Alternative D. This alternative, and alternatives C and F, would not have any major effect on present species composition or population levels.

Range

Most of the WSAs are classed as nonsuitable for livestock grazing due to steep terrain and lack of available forage and water. If the areas are designated wilderness, as recommended in Alternative D, additional range improvements designed to increase grazing would be permitted only if they would cause no adverse impacts on wilderness values such as plant communities, primitive recreation, and wildlife populations or habitat. The intensity of grazing would not approach that found outside the wilderness. This restriction could have the effect of preventing the utilization of some unused forage in the GEWSA. As a result, possible overstocking of those portions of allotments outside the GEWSA could be only partially mitigated by shifting use to portions inside the GEWSA, and might result in a slight decrease in the total number of cattle grazed on the four allotments in the GEWSA.

The other alternatives would allow water developments to increase AUMs. However, the lack of water sources in the area would limit such developments. None of the alternatives would affect current livestock forage production in the GEWSA. Alternative D would restrict the use of vehicles by permittees, but would not prohibit traditional access to existing range improvements.

Minerals

Alternatives differ considerably in their effects on mineral exploration and development. With wilderness or geologic area designation, or withdrawal as proposed in the PA and Alternative F, additional mineral leasing would not be allowed, and exploration and development could only take place on leases already issued and still valid. Reclamation of disturbed sites to a condition suitable for wilderness would mean returning them to a visual quality level of preservation and restoring natural ecosystems. This degree of restoration might not be economically feasible or possible in the short term. It could involve the importation of topsoil to reshape, revegetate, and restore land to production. Restoration of natural ecosystems and visual quality in the short term may be technologically infeasible on sideslopes. With wilderness designation, there is a possibility that mineral discoveries will be foregone.

Reclamation of disturbed sites to a condition satisfactory for semi-primitive motorized, semi-primitive non-motorized and roaded natural recreation under the non-wilderness alternatives is feasible and reasonable except on side slopes, but productivity would be considerably reduced for a long time. Exploration and development may be limited by the cost of access as well as environmental constraints and necessary mitigation measures. There is a possiblity that mineral discoveries will be foregone if exploration and development are impossible without damage to the cave resource.

On August 25, 1983, the Regional Forester recommended that leasing of oil and gas be prohibited in the GEWSA to protect its unique cave resource until a cave resource study and mineral resource data collection are completed.

The relationship of caves and oil and gas drilling was examined in a study finished in January, 1986. The Forest Service invited interested parties to participate in an analysis of locations and methods for conducting oil and gas exploration without risking damage to known or suspected caves. Assumptions were made that oil and gas drilling in areas having caves would result in unacceptable damage to those caves, and that drilling should be limited to areas having slopes less than 40 percent to prevent damage to surface resources.

As a result of the above limitations, about 5,000 acres of the GEWSA were found to be suitable for surface occupancy for drilling without risk of damage to cave resources. The area where drilling could be accomplished is located near the northern boundary of the WSA and on the tops of major ridges reaching into the GEWSA from Guadalupe Ridge.

Water

None of the alternatives would have any significant impact on water quality or water yield for the area. Management activities would be confined to ridge tops where little or no water exists.

Vegetation

Under the PA and alternatives B, D and F, vegetation within the WSAs would continue to be influenced mainly by natural ecological forces. Dispersed recreation and livestock grazing would continue to be the major impacts. Under the other alternatives, vegetation could be modified by oil and gas exploration and development as well as range and wildlife improvements, recreation activities and fuelwood harvesting. However, these activities would, for the most part, be limited to ridgetops.

Timber

Commercial timber species within the WSAs are limited to ponderosa pine and a few Douglas-firs located in canyon bottoms. Because of limited supply and low volume, timber harvest of these species is considered economically infeasible. Coniferous woodland species (pinyon pine and juniper) are located along ridge tops. Due to poor access there is little use of these species for fuelwood, nor is use expected to increase. Under the PA and alternatives B, D and F, management direction would not change significantly.

Cultural and Historical Resources

Impacts to both prehistoric and historic resources should be limited under all alternatives. Under the alternatives recommending nonwilderness, sites discovered during planning for ground-disturbing activities would be protected.

Land Status

Implementation of the PA or alternatives B, D and F would result in withdrawal of the GEWSA from mineral entry and leasing. Under the PA, and alternatives B and F, Lonesome Ridge WSA would be withdrawn from mineral entry but not mineral leasing. Leases would be issued with a no surface occupancy stipulation to protect the Outstanding Natural Area. This would make existing withdrawals for cave protection and the administrative site in the GEWSA unnecessary. These withdrawals would continue under the other nonwilderness alternatives.

Wilderness

The WSAs have been managed to retain their wilderness character since their consideration for inclusion into the NWPS. The current levels of vehicular use, and wildlife and range management activities which are limited to the ridges, have not eroded the wilderness characteristics. If a person leaves the ridge area, there are opportunities for solitude or primitive and unconfined types of recreation. Caving represents a unique type of experience not presently available in any other designated wilderness managed by the Forest Service.

Under the alternatives recommending nonwilderness status, vehicle use, fences, range and minerals management activities, fuelwood harvesting and roads would reduce opportunities for solitude and affect the scenic values which presently characterize the area.

Under alternative D, the WSAs would continue to be managed as wilderness. Uses and values now in the area which would benefit from the protective status of wilderness designation include scenic vistas, caves (because oil and gas leasing would be prohibited), and wilderness values in the nearby Guadalupe Mountains National Park and Carlsbad Caverns National Park wildernesses. These resources would benefit from the reduction of surface disturbance and mechanized human activities in the area.

Visual Resource

The PA and alternatives B, D and F would maintain a charactistic landscape, allowing only natural changes. The other alternatives would allow

ground-disturbing activities which could adversely affect the existing visual quality, although only oil and gas exploration and extraction would have any significant effects.

Threatened and Endangered Plants and Animals

The WSAs contain habitat for a number of threatened or endangered plant and animal species. Under all alternatives, management policy will be to protect and enhance T&E habitat.

Soils

The PA, and Alternatives B, D, and F would have little or no effect on the soils resource. Erosion and sedimentation, as well as other natural forces that are presently acting in the area, would continue with no major increase, and may possibly decrease over the long term.

The other three alternatives would allow a number of potential soil disturbing practices. Soils on slopes less than 15 percent could support most activities with little damage. Most soils on these slopes are moderately productive and could recover from disturbances if properly mitigated.

Management Considerations

A modified fire suppression policy will be used under all alternatives. Wildfires will resume a natural role in the ecology of the area. Suppression of wildfires will generally be restricted to non-mechanical means, and cost of suppression will be commensurate with predicted value of resources lost.

Wilderness designation would have no effect on insects and diseases. Prevention and control of insect and disease outbreaks using integrated pest management would be limited to extremely rare situations in which non-wilderness values in adjacent lands are threatened. Dwarf mistletoe occurs in areas containing ponderosa pine. However, no treatment is planned.

There is no private land located in the WSAs. Effects of any alternative would be minimal on the four parcels of private land, totalling 570 acres, which exist within two miles of the GEWSA's northern boundary and private lands adjacent to the three BLM WSAs.

Neither current Class II air quality designation nor air quality protection requirements would be affected by wilderness designation. Air quality could increase due to lack of activities.

NEED

Socio-economic Setting

The WSAs are located within the Guadalupe sub-area, one of three areas of analysis for social and economic impacts to the Forest. The present population of the sub-area is 143,623, and it is expected to increase to 169,800 by the year 2000. The economy is based on ranching, farming, phosphate mining, recreation, and increasingly upon oil and gas exploration. With a work force of about 45,000 persons, the per capita income is $4,917, just under the State average. Unemployment was 7.4 percent in 1980. Racial composition is about 92 percent white, of which about one-fourth are of Spanish heritage; six percent is black and 2 percent is native American.

In general, the lifestyle of local residents can be characterized as determined by traditional values and a conservative philosophy emphasizing individual rights. Community stability is important in the sub-area, and with the exception of Carlsbad, most local residents are reluctant to change or to accept change at a rapid rate.

The Forest is used by local residents as well as by the regional population, primarily from west Texas. These people value the Forest as open public land and for climate relief.

Wilderness designation for the WSAs would have limited social and economic effects on the surrounding area. Currently, none of the alternatives would have any significant effect on population, employment or income within the vicinity. However, with the prospect of oil and gas exploration, population and employment would have the potential to increase slightly. None of the alternatives would significantly alter lifestyles in the area.

Some people in the area fear Federal lands may not be available for recreation including primitive road vehicle use. It is believed that further wilderness classification might restrict use of the Forest, although the desire for a wilderness to preserve the area's esthetics is also present. Some persons are concerned that establishment of a new wilderness may reduce land available for oil and gas exploration. A certain amount of polarization and resentment would result from implementing any alternative.

An economic efficiency analysis was done to determine an incremental present net value of wilderness designation for the GEWSA. This involved estimating resource outputs from the area under each alternative, and placing dollar values on these outputs. Prices and time frames used were the same as those used in the Forest-wide planning effort. Results of the analysis are shown in Table 113. "Incremental" refers to the net difference between the PNV's of Alternative D, and the other alternatives.

Table 113. Cost-Efficiency of the Guadalupe Escarpment WSA Using a Discount of Four Percent. (All figures are in thousands of 1980 dollars.)

	Alternatives						
	E	D	PA	B	A	C	F
Present Net Value (PNV)	5270	5023	3340	3340	2483	2446	2307
Incremental PNV Compared to Alternative D	+247	0	-1683	-1683	-2236	-2577	-2716

The incremental present net value (PNV) of Alternative E is positive relative to Alternative D. Incremental PNV of all other alternatives is negative relative to Alternative D. It must be recognized that certain intangible benefits and costs, for which quantification was not possible, were not included in this analysis. An example of such an intangible benefit would be the vicarious satisfaction derived by some individuals in knowing that the area is protected under a wilderness designation, even though they may have no intention of ever visiting the area themselves. Minerals benefits were not included in the analysis because of lack of accurate data on resources and dollar values

involved. For the same reasons, information for the BLM WSAs was not included. However, inclusion would not change the relative rankings.

Distance From Populated Centers

The WSAs lie in Eddy County about 50 air miles southwest of Carlsbad, New Mexico, and 90 air miles northeast of El Paso, Texas. They are well within the reach of these urban areas. Inhabitants of other population centers who customarily use the Forest must travel long distances to reach the WSAs and the two wildernesses adjacent to them. The four WSAs and two wildernesses offer the closest, most convenient opportunity for wilderness experience for most of the Forest's users.

Relationship to Wildernesses in the Vicinity

Prior to 1980, there was a total of 121,758 acres in four wildernesses located within a 150 mile radius of the WSAs, one administered by the Forest Service, two by the National Park Service, and one by the Fish and Wildlife Service. With the passage of the New Mexico Wilderness Act of 1980, Congress increased the size of the existing National Forest System Wilderness and established a new one of 34,513 acres. As a result, there are now five wildernesses within a 150 mile radius of the WSAs, containing 173,354 acres. Figure 3 shows the location of the five wildernesses; two are contiguous to the WSAs and three are approximately 115 miles from them.

Table 114 lists wildernesses within a 150 mile radius of the WSAs including size and relative use levels for the area. The present use level of all wildernesses is low, except for the White Mountain Wilderness, which receives moderate use. As a result, additional wilderness is not now needed to relieve visitor pressure on other wildernesses in the vicinity.

Table 114. Wildernesses within a 150-mile radius of Guadalupe Escarpment Wilderness Study Area and adjacent Bureau of Land Management wilderness study areas, showing acres, average annual use, average annual use per acre, and relative use ratings.

Administrating Agency	Acres	RVDs/ Year	RVDs/ Acre	Use Rating[1]
White Mountain Forest Service	48,366	19,700	0.41	Moderate
Capitan Mountains Forest Service	34,513	5,600	0.16	Low
Guadalupe Mountains National Park Service	48,850	6,474	0.13	Low
Carlsbad Caverns National Park Service	33,125	2,874	0.09	Low
Salt Creek Fish and Wildlife Service	8,500	N/A[2]	N/A	Low[3]
TOTAL	173,354			

[1] Relative Use Ratings Based On:

Low	0.00 to 0.35 Recreation Visitor Days/Acre/Year
Moderate	0.36 to 0.70 Recreation Visitor Days/Acre/Year
High	0.70+ Recreation Visitor Days/Acre/Year

[2] Data not available

[3] Relative use rating estimated

Although the potential opportunities for unconfined outdoor recreation experiences, both dispersed and caving, are moderately high in the WSAs, these opportunities can be found in nearby wildernesses.

Ecological Considerations

Natural ecological forces will continue relatively undisturbed under all alternatives. Plant and animal species native to the area will be maintained under all alternatives. With the exception of the possible re-introduction of the desert bighorn sheep, no species has been identified that would require a wilderness environment for survival.

The WSA's ecosystem composition is not unique relative to the two adjacent wildernesses. Although the landform is characterized by outstanding scenery, rugged mountains, and extensive system of caves, these attributes are all represented to some degree in the two wildernesses.

OPPORTUNITIES FORGONE

Effects of Wilderness Designation

Availability of an area for wilderness designation is determined, in part, by a comparison of the value of the wilderness resource with the value of non-wilderness resources foregone if the area is designated wilderness. In theory, the values of the wilderness resource, both tangible and intangible, should be greater than the values foregone if Alternative D is implemented. However, the highest and best use of an area for wilderness in economic terms is difficult to assess because of the difficulty of establishing acceptable monetary values for the intangible benefits involved.

Wilderness values of the WSAs include the potential to provide opportunity for wilderness recreation experience upwards to 24,000 RVDs, and protection of natural ecosystems, wildlife, water quality and other resources to a larger degree than with non-wilderness designation.

Fuelwood harvest would be forgone under Alternative D, and mineral extraction would be prohibited under the PA and alternatives B, D and F. Actual grazing use under Alterntaive D would depend on grazing's effects on wilderness resources. Costs of maintaining range improvements would increase slightly under Alternative D because of constraints on additional motorized use.

The USGS found the GEWSA to have a moderate potential for oil and gas. Exploratory drilling, the only way to quantify the values involved, has not been done. The potential for minable metal deposits is low. If the area is designated nonwilderness, mineral exploration would be allowed under appropriate safeguards. With wilderness designation, significant minerals exploration would be foregone as a result of the December 31, 1983, deadline on new claims and leases established by the Wilderness Act of 1964, unless designating legislation establishes different standards. Exploration and development can take place until 1987 on approximately 200 acres, and until 1988 on approximately 395 acres, currently under lease.

Although recreation would constitute a major use of the WSA if made wilderness, the type of recreation, by its very nature, results in a much lower capacity

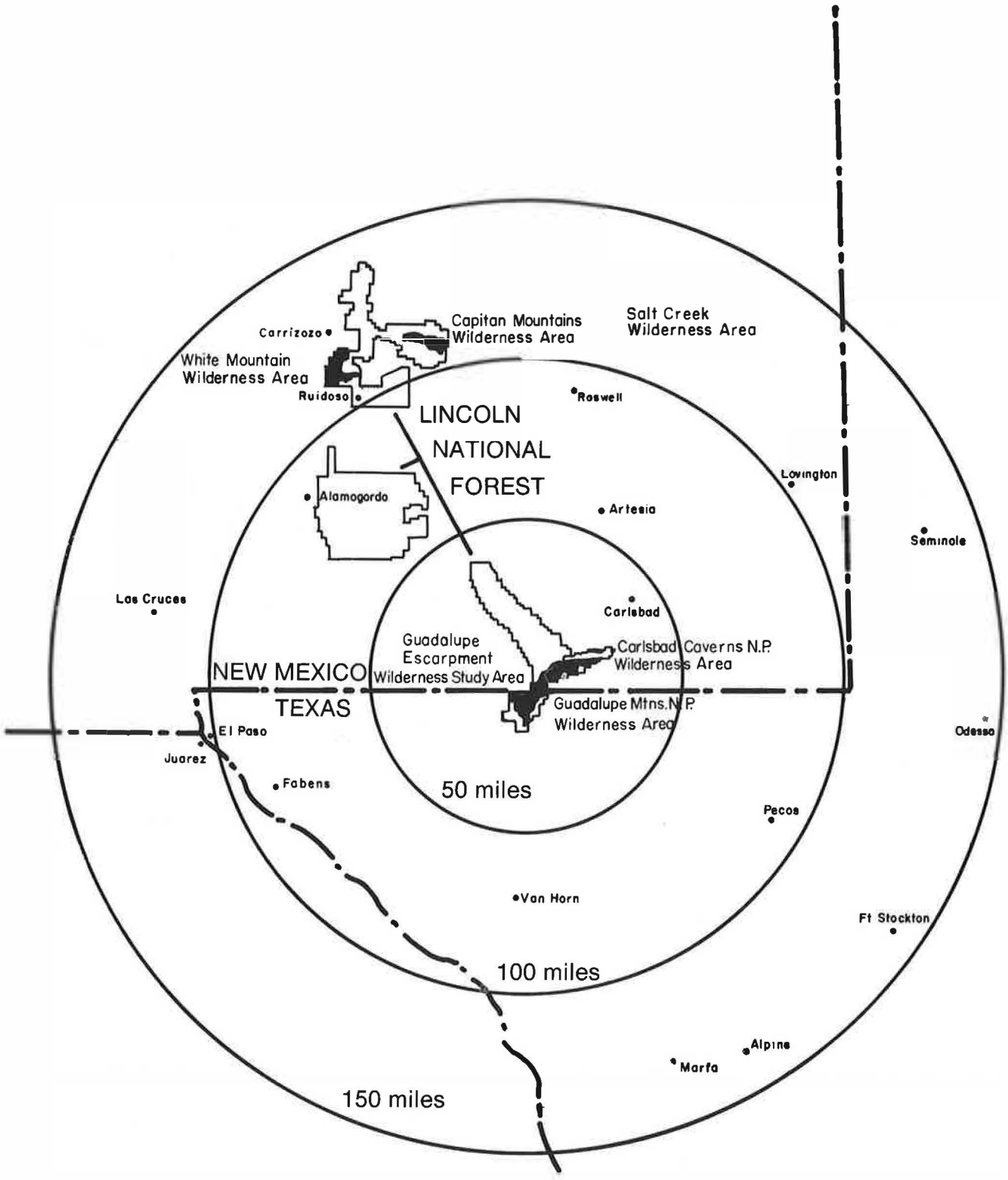

Figure 3. Other Wilderness Areas within 150 miles of the Wilderness Study Area.

than if the area were designated nonwilderness. However, the greater use that could take place with the latter designation is offset by the greater value assigned to a potential wilderness RVD, resulting in very similar net recreation values for all alternatives.

Wilderness designation would decrease the opportunity to construct wildlife water storages and related facilities in the WSA since water improvements in wilderness for other than grazing require Presidential approval.

Wilderness designation would have no effect on creation and administration of the North McKittrick Research Natural Area.

Effects of Nonwilderness Designation

A nonwilderness designation will leave the area open to some degree of multiple use and development. Such development and use could result in significant changes to the landscape under alternatives A, C, E and F. Potential surface and subsurface disturbances could have a severe impact on cave resources, scenic quality, and opportunity for solitude.

Slight and temporary effects on air quality, wildlife, and water quality might result from management activities. The construction of access roads and drillpads could cause the opportunity for future wilderness designation to be lost.

Livestock operations would continue as in the past, with opportunity to construct new range improvements to better utilize available forage. Primitive roads on ridgetops would be available for vehicular travel. If gas and oil development takes place, access roads and drillpads will cause temporary visual impacts on the characteristic landscape. These impacts may be permanent in some areas.

PRESCRIPTION ALLOCATION

Table 115 displays the prescriptions, and the acreage assigned to each, for all alternatives and selected benchmarks.

Table 115. Wilderness Study Area Prescription allocation for Alternatives and benchmarks by assigned acreage.

Alternative	Prescription	Acres
PA	Max. Recreation (Dispersed)	All
A	Current	All
B	Dispersed Rec. Emphasis	All
C	Low Intensity	All
D	High Level Wilderness	All
E	Range Emphasis	10625
	Wildlife Emphasis	10625
F	Moderate Recreation	All
Benchmarks		
Max. Rec.	Dispersed Rec. Emphasis	17625
	High Level Wilderness	3626
Min level	Low Intensity	All
Max. PNV	High Level Wilderness	All

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