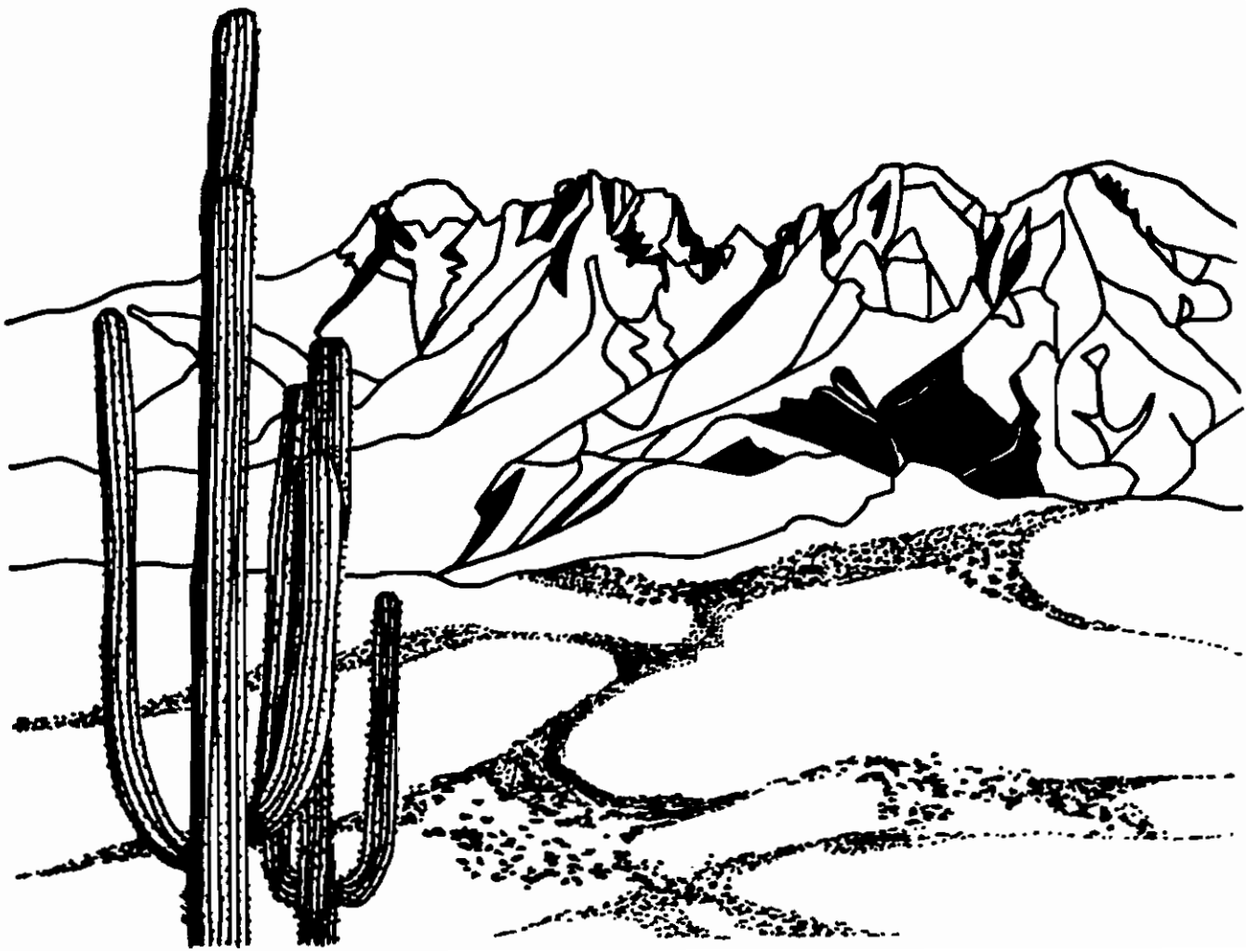
United States
Department of
Agriculture

Forest Service

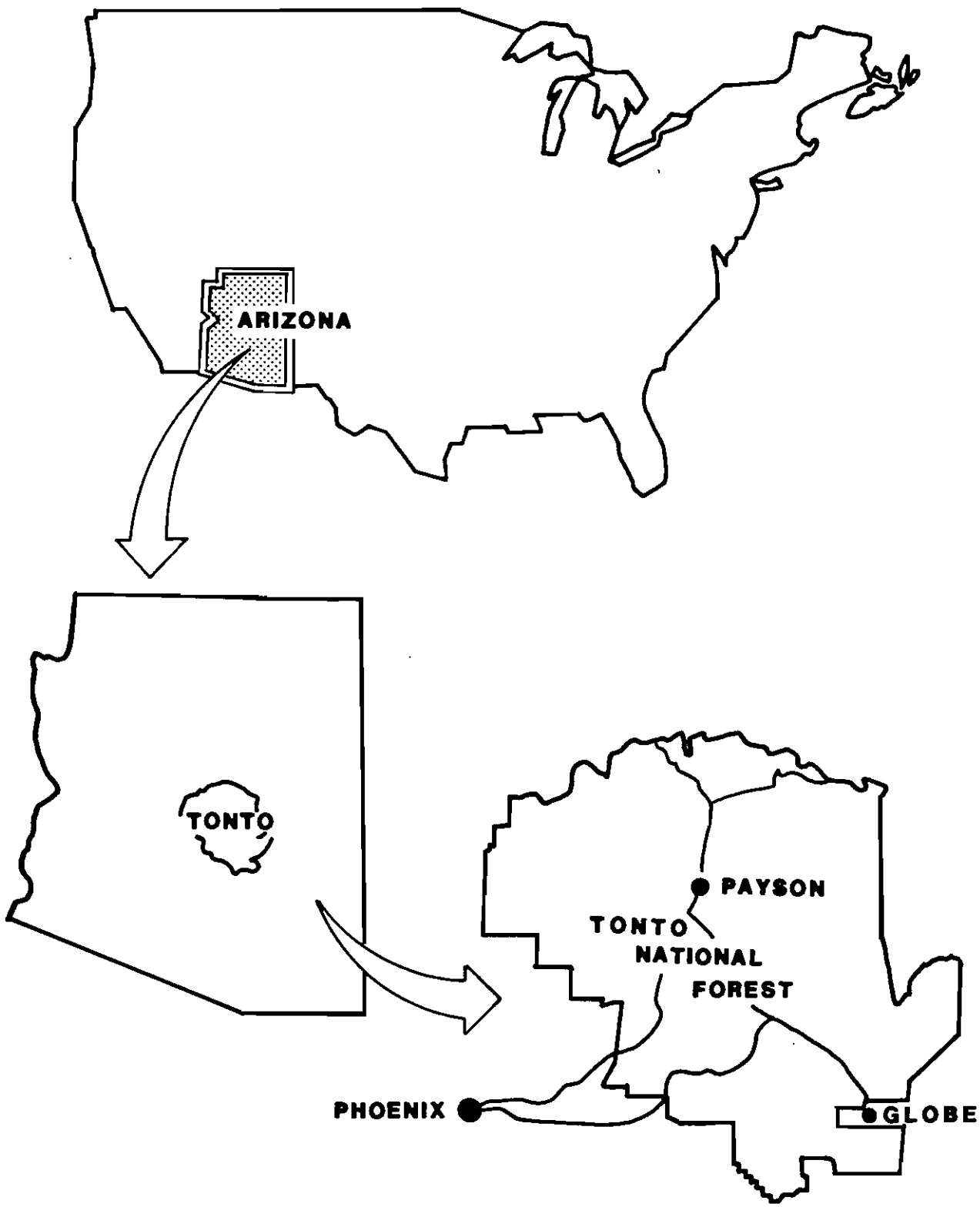
Southwestern
Region

October 1985

Environmental Impact Statement, Tonto National Forest Plan



Vicinity Map



Final Environmental Impact Statement

Tonto National Forest Land Management Plan
Gila, Maricopa, Pinal, and Yavapai Counties, Arizona

03-12-85-1

Type of Action	Administrative
Lead Agency	USDA Forest Service
Responsible Official	Sotero Muniz, Regional Forester
For Further Information	James L. Kimball, Forest Supervisor Tonto National Forest 2324 East McDowell Road P. O. Box 5348 Phoenix, Arizona 85010

Abstract

A Proposed Action and eight alternatives to the Proposed Action for a Land and Resource Management Plan for the 2,873,292 acre Tonto National Forest, are described and compared. The Proposed Action and alternatives are:

PA. (10) Provides for a moderate to high degree of issue resolution within a budget constrained to reflect anticipated appropriations.

4 Projects current resource management, and is the No Action alternative as required by National Environmental Policy Act regulations. This alternative provides a high degree of response to the grazing issue. It fails to adequately respond to most other issues.

3 Responds well to all issues but fails to meet Resource Planning Act Objectives in developed recreation.

1 Emphasizes opportunities to increase water yield through intensive management of the chaparral and Ponderosa-pine vegetative types. Provides for partial resolution of issues.

2 Emphasizes watershed condition. Fails to adequately respond to issues.

6 Manages the Forest at a low investment level. Fails to adequately respond to issues.

7 Stresses developed recreation Forest-wide. Provides for good resolution of issues with exception of grazing.

8 Stresses wildlife habitat enhancement Forest-wide. Provides for good resolution of issues with exception of grazing.

9 Manages the Forest for market value resources in the most cost efficient manner: 1) Forage, 2) wood products, 3) developed recreation. This alternative fails to adequately respond to issues.

Alternative 10 constitutes the Forest Service preferred alternative. The Plan 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 objective is contingent upon programmed funding by Congress.

TONTO NATIONAL FOREST

Land and Resource Management Plan
Environmental Impact Statement

Table of Contents

LIST OF TABLES

Purpose of and Need for Action

1

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 Tonto National 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].

An initial EIS was published in January of 1983. Due to a court decision regarding the wilderness issue and the need to re-evaluate roadless areas, a Notice of Intent was published in the Federal Register on July 12, 1983. The draft EIS and Plan were published in January 1985, and circulated for review and comment. After the close of the comment period, the Plan was revised as necessary, and the final EIS was prepared, filed with the Environmental Protection Agency, and made available to the public. The Regional Forester used this EIS in making a decision under NFMA for approval of the Plan [36CFR219.10(c)]. The Regional Forester's decision is documented in a Record of Decision which accompanies the Forest Plan, and will not become effective until at least 30 days after the Notice of Availability for the Environmental Impact Statement, and the Record of Decision appears in the Federal Register.

ROADLESS AREA ANALYSIS

The Ninth Circuit Court of Appeals, a Federal Court in California whose jurisdiction extends over Arizona, made a major decision affecting Forest Plans in Arizona. The Ninth Circuit Court upheld a lower court decision in ruling against the Federal Government in the State of California v. Block lawsuit dealing with the adequacy of the Roadless Area Review and Evaluation (RARE II) EIS. In their October 1982 ruling, the Court confirmed the District Court ruling that found the major deficiencies of the EIS were: failure to adequately address site-specific impacts, lack of an adequate range of alternatives, and failure to provide sufficient opportunities for public comment.

Purpose of and Need for Action

Congress enacted wilderness legislation for Arizona through Public Law 98-406 in August, 1984. Therefore, all roadless areas previously inventoried during the RARE II study have been included in the National Wilderness Preservation System or released for other multiple use management. The analysis of alternatives considered in detail in the EIS was complete prior to passage of the Arizona Wilderness Act. The alternatives were adjusted to reflect the results of the Act. However, new computer runs were not made.

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 Plan will guide management of the Forest until it is revised. Management practices and standards and guidelines in the Plan are not irreversible. When the Plan is revised, all aspects of the Plan will be re-evaluated based on improved data, monitoring results, and new or revised issues, concerns, and opportunities. The Plan will normally be revised at 10 year intervals but must be revised at least every 15 years. Provision for revision 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 it is revised committing the Forest to a course of action no longer than 15 years.

The Plan either incorporates, supersedes, 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)].

Purpose of and Need for Action

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 limited context and intensity [40 CFR 1508.27(a) and (b)], to produce little or no effects, individually or cumulatively, to either the biological or physical components of the human environment [40 CFR 1508.14] [FSM 1951.2], 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.

Purpose of and Need for Action

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 Forest Plan.

Coordination of Planning

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

There are 95,020 acres of private land within the proclaimed Forest boundary. Many scattered tracts are homestead or mineral patents, while many of the tracts in the Payson, lower Tonto Creek, and Roosevelt Lake areas have been subdivided and are occupied by permanent residences or second homes. The communities of Payson, Young, Pine, Strawberry, Superior, and Punkin Center/Tonto Basin are the largest blocks of community/residential land. Copper mining operations occupy a large block of patented land just northwest of Miami.

Private lands vary from high density development in local communities and subdivisions, to sparsely developed ranches and mines, to undeveloped rangelands. Coordination efforts are as varied as the development. Primary coordination includes fire and forest pest management control through State and private programs of the Forestry Division of the Arizona State Land Department and rural fire departments; range management with County agents and local grazing associations; solid waste and sewage disposal, land adjustment, and road rights-of-way acquisition with County commissions and private owners.

Notification of private landowners, as well as other public, was attempted through numerous news releases to all electronic and print media in Arizona and supplemental news releases to local print and electronic media within and adjacent to the Tonto National Forest. Full-page advertisements announcing the public meetings in Arizona were published in Flagstaff and Phoenix newspapers. Posters announcing the meetings were placed in strategic locations in appropriate cities and towns.

Five Indian reservations share approximately 105 miles of common property boundary with the Forest. The Tonto-Yavapai Apache Tribe lives on an 85-acre reservation within the Forest, immediately south of Payson. All other reservations are adjacent to the Forest. The tribes involved are:

Reservation	Primary Coordination
Fort Apache	Fire management, rafting on the Salt River
San Carlos	Fire Management, fire crews
Ft. McDowell	Recreation management, range management
Salt River	Recreation management
Tonto - Yavapai Apache	Fire management, utility and road corridors

All Native American groups mentioned above were notified during the initial scoping phase and were contacted by a follow-up letter asking for comments or concerns they might have regarding management of the Forest. No replies were received. Further efforts to involve these tribes were made during the public review period for the EIS and Forest Plan. One response was received, following the initial EIS, from the White Mountain Apache Tribe.

Federal, State, County, and local agencies were contacted through letters and personal contacts during the inital public involvement phase (Fall, 1980) and since that time. Contacts were made with:

U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service was involved with the selection of management indicator species and descriptions of future conditions, and especially involved in Section 7 of the Endangered Species Act consultation relative to effects of the proposed action on Threatened and Endangered Species.

Formal consultation was done with the Fish and Wildlife Service, and it was determined that the Tonto Forest Plan would not endanger the six Federally listed Threatened and Endangered Species on the Tonto but would promote their conservation, and therefore was deemed a beneficial action. The Biological Evaluation is on file in the Tonto Forest Supervisor's office. The Biological opinion is included as part of the Public Response Document which accompanies this EIS.

Bureau of Land Management

There are 20 miles of common adjacent boundary with the Bureau of Land Management (BLM), all of which is managed by the BLM Phoenix District Office. Coordination with the BLM is primarily in regard to fire and recreation management.

Primary consultation has been through review of the Environmental Impact Statement and Forest Plan.

Bureau of Reclamation and Salt River Project

Six reservoirs on the Salt and Verde Rivers are managed by the Salt River Project (SRP) for the benefit of downstream water users. These dams and reservoirs are located on National Forest System lands withdrawn for reclamation purposes and operated under authority granted by the Bureau of Reclamation. National Forest resource management and development activities within the reclamation withdrawals are planned and coordinated with the Bureau of Reclamation and Salt River Project to assure compliance and coordination with these agencies. Consultation has taken place through the scoping phase and with review of the Environmental Impact Statement and Forest Plan.

National Park Service

The Tonto National Monument is located on 1,120 acres of National Park Service land within the Forest. There are six miles of common boundary with the Monument. Coordination involves recreation, range, and fire management.

Primary consultation has taken place through review of the Environmental Impact Statement and Forest Plan.

Central Arizona Water Control Study

The Final Environmental Impact Statement (EIS), Regulatory Storage Division, Central Arizona Project (CAP), which was filed February 10, 1984, describes six alternatives for the proposed construction and operation of the Regulatory Storage Division of CAP.

Purpose of and Need for Action

"The alternatives described provide for CAP Regulatory Storage, flood control for the Salt and Gila Rivers through the Phoenix metropolitan area, and concurrent and coincident aspects of the Safety of Dams program. A No Action alternative is also described. This EIS also fulfills the requirements of Executive Order 11988 (Floodplain Management) and Executive Order 11990 (Protection of Wetlands), and the requirements of the Nationwide Permit in accordance with the provisions of Section 404 of the Clean Water Act."

"The alternative actions described in this EIS have three principal purposes. These are:

1. To increase the operating efficiency of the CAP through the conservation of Salt, Verde, and Agua Fria River flows, and through regulation of Colorado River water deliveries from the Granite Reef Aqueduct.

2. To provide facilities and means to meet the flood control needs on the Salt and Gila Rivers through the Phoenix metropolitan area.

3. To provide for the structural safety of existing Bureau of Reclamation dams on the Salt and Verde Rivers."

The portion of CAP which directly affects the Tonto National Forest includes flood control, additional water conservation, and safety of dams at the proposed Cliff Dam Site and Roosevelt and Stewart Mountain Dams. Conceptual recreation plans include additional sites at Cliff and Roosevelt Dams.

The CAP Environmental Impact Statement and technical reports are incorporated by reference in their entirety. The EIS and technical reports covering all aspects of the Central Arizona Water Control Study planning, design, public involvement, social and environmental impact assessment, economics, and hydrological analyses are available for review at the Arizona Projects Office of the Bureau of Reclamation.

In the Tonto EIS, Appendix F summarizes the significant environmental consequences of the six alternatives studied in detail, and mitigation measures to reduce or avoid impacts. Adverse impacts which could not be completely mitigated in Plan 6 (preferred alternative) included loss of bald eagle habitat, and distruction of prehistoric and historic cultural resources.

Resources which would be affected by project actions but were determined not to be significant to the choice among alternatives were air quality, aesthetics, noise, geology/soils, and land resources. Impacts to these resources are not summarized in Appendix F, but are described in a technical report titled Environmental Impacts and Effects of Plans, Volumes 1-7, which are available at the Arizona Projects Office of the Bureau of Reclamation.

State Lands

Seventy-two miles of common boundary are shared with the State of Arizona. All adjacent State lands are managed by the State of Arizona Land Department except Lost Dutchman Park which is administered by the Arizona Parks Board. Coordination involves recreation, fire, range, and wildlife management.

Primary consultation has taken place through review of the Environmental Impact Statement and Forest Plan.

Arizona Game and Fish Department

The State agency most affected by planning and management activities on the Forest is the Arizona Game and Fish Department. Throughout the planning process, close contact and coordination has been maintained with this agency to assure incorporation of State of Arizona Comprehensive Wildlife Plan objectives. Approximately 30 meetings and workshops were held with the Arizona Game and Fish Department to produce several studies such as the Fisheries Inventory, Fishing Effort and Harvest by Arizona's Licensed Resident Anglers, 1981 Angler Preference Survey, and Cold and Warm Water Plans. These studies were, in turn, used as source documents. The Arizona Game and Fish Department also helped with the selection of management indicator species, descriptions of desired future conditions, outputs, and species density information, and water inventories.

Arizona Rangeland Advisory Council

Two meetings were held to discuss issues and concerns, development of alternatives, and the proposed plan.

State Natural Areas Advisory Board

The Tonto National Forest facilitated a field trip to all proposed research natural areas.

Arizona Outdoor Recreation Coordinating Committee

Three meetings were held to discuss the land management planning progress.

Governor's Council on Arizona Environment

Several meetings were held to discuss the land management planning progress.

County Governments

Coordination with Gila, Maricopa, Pinal, and Yavapai Counties primarily includes recreation management, law enforcement, solid waste and sewage disposal, land adjustment, and road system management. Since nearly 56 percent of the land area of Gila County is National Forest, coordination with that County has been particularly active. This includes continuous consultation with the County Board of Supervisors throughout the planning process and status reports at Board Meetings. The purpose of these contacts was to obtain their evaluation of effects of alternative on County programs and budgets.

Phoenix Area Recreation Planners

Informal meetings were held to discuss the land management planning progress.

Maricopa County Parks and Recreation

One meeting was held to discuss the land management planning progress.

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

Planning Area

The Tonto National Forest is located in central Arizona immediately north and east of the Phoenix metropolitan area. The Forest Headquarters is in Phoenix, the State capital. The Forest contains 2,873,292 acres of National Forest Land. The Forest is divided into six Ranger Districts. These are the Cave Creek Ranger District located in portions of Gila, Yavapai, and Maricopa Counties; Globe Ranger District located in portions of Pinal, Maricopa, and

Purpose of and Need for Action

Gila Counties; Mesa Ranger District located in portions of Pinal, Maricopa, and Gila Counties; Payson Ranger District located in portions of Gila and Yavapai Counties; Pleasant Valley Ranger District located in Gila County; and Tonto Basin Ranger District located in portions of Gila and Maricopa Counties.

The vicinity map depicts the location of the Forest.

PUBLIC ISSUES

Issue Development

Early public involvement concentrated on identification of issues and concerns and on presenting an overview of the planning process and highlighting how the public could continue to be involved.

Issue-concern identification was developed in two phases: (1) Preliminary issue identification; (2) supplementary-issue identification through direct involvement of the public.

Preliminary issues and concerns were identified by the ID and Management Teams of the Tonto National Forest, and other State and Federal agencies. These issues were derived from:

1. Past public involvement activities over the past two years,
2. Existing plans (both Forest Service and other agencies),
3. National Forest Management Act (NFMA) regulations,
4. Political activity related to the Forest in recent past,
5. Letters and inquiries from the public during the recent past,
6. Appeals concerning Forest Service actions during the recent past, and
7. National and Regional issues and concerns.

Thirty-eight problem statements were developed as a result of the preliminary analysis.

Phase II involving the public was carried out during October, November, and December, 1980. This phase generated twenty thousand comments. These comments were the result of 5 statewide public meetings, 21 local public meetings (statewide), 2 statewide scoping sessions for other agencies and organized user groups, and distribution of 22,000 response booklets.

After public comments were received, they underwent content analysis to determine the nature of public response. Comments were categorized and entered into a computer data base by resource element and geographic area of concern.

Using the content analysis data base, the Tonto National Forest Interdisciplinary Team screened responses for inclusion in the final public issues and opportunities.

The following criteria were used:

1. Was comment Forest-wide in scope? (Generally pertaining to two or more Ranger Districts).
2. Was comment within the Forest Supervisor's legal or delegated authority to resolve?
3 Was comment within the land's physical and biological capabilities?

4. Could comment be resolved through plan implementation, rather than before implementation?

After the ID Team screened the public comments, issue statements were written by resource element. The Forest Management Team reviewed these statements and the public comments and provided some additional public issue statements and management concerns.

As the final step in the process, the issue and concern statements were categorized by the seventeen management concerns listed in the Planning Regulations [CFR 219.10], and refined further into thirteen issue and six opportunity statements to be addressed in the Environmental Impact Statement.

The issues, concerns, and opportunities to be addressed in the planning process were approved by the Regional Forester on June 23, 1981. They establish the scope of the EIS [40 CFR 1501.7 and 1508.25].

With the issuance of the Initial EIS, January, 1983, the public was asked to comment on the alternatives and proposed action, and to verify the identified issues. One new issue, mining, surfaced through this phase of public involvement.

Following the issuance of the Initial EIS, the change in economic conditions and production from private plantations reduced demand for commercial harvesting of Jojoba beans to less than one-percent of total production. Conflicts between commercial use of jojoba bean and wildlife/livestock needs was an issue identified in the Initial EIS. Because there are no longer conflicting demands between commercial harvesting and the browsing needs of wildlife and domestic livestock, jojoba management was not analyzed in detail in this EIS.

Direction from the Secretary of Agriculture prompted another public involvement phase relative to the wilderness issue and the re-evaluation of roadless areas. During August, 1983, two statewide and 28 local meetings were held on various Arizona National Forests. A total of 210 people attended the meetings. By conclusion of the comment period on September 30, 1983, 102 letters had been received relative to the roadless area re-evaluation.

Refer to Appendix A for a detailed discussion of public involvement.

Issues and Opportunities Addressed

Management concerns and public issues are called Issues and are described below along with opportunities addressed in the EIS and Forest Plan. They establish the scope of the EIS [40 CFR 1501.7 and 1508.25].

1. Recreation Diversity and Supply

   Demand for developed recreation opportunity exceeds supply. Quality of dispersed recreation opportunities is declining.

2. Wilderness Opportunity and Management

   Heavy use by people, non-compatible resource uses, and nonconforming structures are reducing wilderness values. Use in parts of the Superstition Wilderness periodically exceeds wilderness carrying capacities and management standards.

3. Fuelwood Availability

   Demand for fuelwood exceeds accessible supply. Available fuelwood is not located in areas preferred by the public.

   The Forest lacks a comprehensive fuelwood inventory.

4. Forage Production and Use

Existing forage production and management is inadequate to support current livestock and wildlife grazing, resulting in declining site productivity, increased soil loss, and declining wildlife populations.

Permitted use has resulted in over-utilization of the forage resource. Balancing permitted numbers of livestock to range capacity and implementing proper methods of management is a major task. Many of the public think this balance must be done through adjustments in permitted numbers. Ranchers who graze livestock on the Forest think improvement of the range is dependent on coordination between the resource managers and themselves as well as development of structural range improvements and vegetative type conversions to grassland.

5. Water Quality and Quantity

Demands for water use on and off the Forest exceed the supply. Limited opportunities exist in the chaparral vegetation type to increase water yield. Some impacts on other resources are anticipated if water yield is increased.

Forest management activities have the potential to significantly alter water quality. Physical, chemical, and biological qualities of water can limit its uses. Currently, isolated pollution problems on and off Forest produce conflicts with water uses.

6. Transportation System Management

The Forest is not meeting prescribed minimum standards for road and trail maintenance.

There is a continuing conflict between providing user access to Forest resources and minimizing road density.

7. Wildlife Habitat

Existing wildlife habitats are currently inadequate to supply basic food and cover requirements. Present levels of integration of wildlife habitat management prescriptions have failed to provide the basic needs, especially in riparian habitat, where conflicts with other resource needs are amplified.

8. Riparian Habitat

Riparian areas on the Forest are heavily impacted by livestock grazing, and recreationists. Many roads and recreation sites are located in riparian areas. Livestock tend to concentrate in and overuse riparian vegetation. Riparian areas provide essential habitat requirements for a variety of wildlife.

9. Off-road Vehicle (ORV) Use

Vehicle use on the land, trails, and primitive roads directly provides, or is integral to needed recreation for some users. ORV use on the Forest continues to increase. ORV use damages the environment in some areas and results in conflicts with other users. In some areas, under the right conditions, the use is compatible and acceptable.

10. Timber Management Intensity

Current timber harvest levels may be exceeding productive capability of the timber resource. Allocations to other resource emphases may reduce the amount of available timber.

11. Unauthorized Use

The level of Forest Service law enforcement is generally perceived as inadequate to handle the problems associated with burgeoning unauthorized use on the Tonto. The level of enforcement does not meet public expectations. Officials of Gila County think the Forest Service cooperative law enforcement program is inadequate and therefore the visitors and problems on the Forest belong to the Forest Service. Protection of cultural resources, ORV use, occupancy trespass, fuelwood theft, and vandalism are the major problems identified.

12. Soil Productivity and Stability

Land use and geologic conditions have created some areas on the Forest that have unacceptable soil erosion and watershed conditions. Soil productivity is being threatened in these areas.

13. Mineral Development

Conflicts exist between proponents of mineral development, and other resource considerations, which constrain both the opportunity for and method of mineral exploration and development.

Several opportunities have been identified through public involvement and during the planning process. These are:

1. Fire Management

There are opportunities to provide innovative strategies in fire management which allow natural fire to play a more significant role in ecosystem management. The use of prescribed fire for vegetative management and fuel/hazard reduction can benefit all resources.

2. Land Ownership Adjustment

Land ownership adjustments within and adjacent to local communities need a continuing emphasis to significantly increase efficiency in resource management and to satisfy the needs of expanding communities.

3. Special Area Designations

Opportunities have been identified to provide areas for scientific study and protection through establishment of research natural areas, botanical areas, or designation as natural areas under the Arizona Parks Board Natural Area Program. Among others, proposals have been presented to provide protection to the Picket Post Mountain area adjacent to the Boyce Thompson Arboretum, to an area of Sonoran desert to be managed cooperatively with the Desert Botanical Garden, and to provide an area for development of a museum and interpretive facility near the Superstition Mountains.

4. Cultural Resources

With the wealth of cultural resources on the Forest, opportunities exist to provide interpretation of prehistoric and historic sites as a developed recreation experience.

5. Recreation Site Design

There is an opportunity to meet the needs of handicapped visitors during construction and reconstruction of recreation sites.

Purpose of and Need for Action

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 presents the environmental impacts of the proposed alternative compared to other alternatives, defines the issues, and provides a basis for choice among the various options.
Chapter 3	Affected Environment. This chapter describes the environment of the area affected by the alternatives under consideration 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, Native Americans, individuals, local governments and/or officials, State agencies and/or officials, and others that received the EIS and Plan.
Glossary	Provides an alphabetical listing of special terms or words and their definition used.
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, and a listing of the issues.
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	Lists Threatened and Endangered species.
Appendix D	Lists management indicator species.
Appendix E	Describes the process for achieving regulated Forest management.
Appendix F	Summarizes the environmental consequences of the Central Arizona Water Control Study.

Table 1, lists the resources, uses, and activities evaluated and displayed in the Plan and EIS. 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 in order 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 developed recreation. Developed site capacity in people at one time (PAOT) are listed as units of measure for evaluating developed recreation. The reader will see a comparison of the PAOT capacity for each alternative in Chapters 2 and 4 and the existing 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.

Purpose of and Need for Action

The issues, opportunities and regulatory requirements in [36 CFR 219] are addressed in Chapters 2, 3 and 4. A summary of units of measure 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 [1/]	Connection to ICO's & 36 CFR 219, 40 CFR 1500
Recreation Diversity and Supply		CFR 219.21 Issue 1
Developed Recreation	RVD, people at one time (PAOT), % demand satisfied, narrative	
Dispersed Recreation	RVD, recreation opportunity spectrum (ROS), acres, narrative	
Visual Resource	Visual quality objectives (VQO) acres, narrative	
Wilderness Opportunity and Management	Recreation visitor days (RVD), acres, narrative	CFR 219.17 Issue 2
Fuelwood Sold	Millions of board feet (MMBF), narrative	CFR 219.15 CFR 219.27 Issue 3
Timber Management Intensity		CFR 219.14-16 CFR 219.27 Issue 4
Harvest Rates	Millions of board feet (MMBF), acres, basal area, cubic feet, narrative	
Silvicultural Treatments	Narrative	
Suitable Timber Land	Acres, narrative	
Snag Management	Snags per acre	
Forage Production and Use		CFR 219.20 Issue 5
Range Condition and Trend	Narrative	
Permitted Use	Thousand animal unit months (MAUM) and narrative	

1/ See Glossary for definitions of unit of measure.

Table 1. Reader's Guide (cont'd)

Headings and Evaluation Items Used In Chapters 2, 3, & 4	Unit of Measure	Connection to ICO's & 36 CFR 219, 40 CFR 1500
Capacity	MAUM and narrative	
Management Intensity	Acres and narrative	
Improvements	Range Improvement Investment In dollars	
Water Quality and Quantity	Thousand acre feet and narrative (MACFT)	CFR 219.23 CFR 219.27 Issue 6
Soil Production and Stability		CFR 219.23 CFR 219.27 Issue 7
Watershed Condition	Acres and narrative	
Transportation System Management		CFR 219.18 CFR 219.23 CFR 219.21 CFR 219.27 Issue 8
Road Maintenance	Maintenance levels, miles, narrative	
Trail Construction, Reconstruction and Maintenance	Miles and narrative	
Wildlife Habitat		CFR 219.19 CFR 219.27 Issue 9
Cold Water Fish Habitat	Narrative	
Warm Water Fish Habitat	Narrative	
Threatened and Endangered Species	Narrative	
Wildlife Habitat Diversity	State wildlife comprehensive plan goals and narrative	
Management Indicator Species	Populations and narrative	
Diversity	Narrative	

Table 1. Reader's Guide (cont'd)

Headings and Evaluation Items Used In Chapters 2, 3, & 4	Unit of Measure	Connection to ICO's & 36 CFR 219, 40 CFR 1500
Wildlife Use	Thousand recreation visitor days (MRVD)	
Riparian Habitat	Acres and narrative	CFR 219.20 CFR 219.27 Issue 10
Off-Road Vehicle Use	Thousand of acres open or closed and narrative	CFR 219.21 Issue 11
Unauthorized Use	Narrative	Issue 12
Minerals		CFR 219.22 Issue 13
Withdrawals and Lease Recommendations	Acres and narrative	
Fire Management	Narrative 1/	Opportunity 1
Land Ownership Adjustment	Narrative	Opportunity 2
Special Area Designations	Narrative, acres	CFR 219.25 Opportunity 3
Cultural Resources	Narrative	CFR 219.24 Opportunity 4
Recreation Site Design, Handicapped Visitors	Narrative 1/	Opportunity 5
Economic and Social Considerations	Narrative, dollars present net value (PNV), budget costs, revenue	CFR 219.12
Resource Planning Act	Targets	CFR 219.12

1/ Resource management standards and guidelines, Chapter 4, Land and Resource Management Plan.

Alternatives Including the Proposed Action

2

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 Appendices. The comparisons displayed were selected because they address the issues, concerns, and opportunities (ICO's) 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 ICO's in varying degrees. The alternatives display different ways of managing the lands and resources of the Tonto 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".

Outputs and benefits are displayed by periods. Periods 1-5 are each 10 years in length and represent the first fifty years in the planning horizon.

REGULATORY REQUIREMENTS

The process of formulating alternatives considered in Forest Planning 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 which 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 that reviewers may evaluate their comparative merits.
>
> Include reasonable alternatives not within the jurisdiction of the lead agency.
>
> Include the alternative of No Action.
>
> Identify the agency's preferred alternative.
>
> Include appropriate mitigation measures not already included in the Proposed Action or alternative.

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

Alternatives Including the Proposed Action

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 trade-offs 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 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: 1) The condition and uses that will result from long-term application of the alternative; 2) the goods and services to be produced, the timing and flow of these resource outputs together with associated costs and benefits; 3) resource management standards and guidelines; 4) the purposes of the management direction proposed.

ALTERNATIVE DEVELOPMENT PROCESS

A broad range of alternatives were developed and evaluated by an interdisciplinary Team using a specific and structured analysis process as required in the planning regulations [36 CFR 219.12(e) and (f)].

Analysis Areas

For analysis purposes the forest was subdivided into smaller 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 may contain lands that are subject to laws committing them to specific uses. These prior commitments were not changed in any alternative.

These areas are:

Mazatzal Wilderness	-	205,233 acres
Pine Mountain Wilderness	-	11,450 acres
Superstition Wilderness	-	124,117 acres
Sierra Ancha Wilderness	-	20,850 acres
Sierra Ancha Experimental Forest	-	12,579 acres

Four Peaks*	-	53,500 acres
Hell's Gate*	-	36,780 acres
Mazatzal Additions*	-	46,670 acres
Salome*	-	18,950 acres
Salt River Canyon*	-	32,800 acres
Superstition Additions*	-	35,640 acres
Verde Wild & Scenic River*	-	Tonto portion includes one-half mile corridor from Forest boundary to confluence of Red Creek and Verde River.

*Included in the Arizona Wilderness Act.

Management Prescriptions

Management prescriptions are combinations of management practices, activities, 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 existing laws, regulations, and policies. Different management prescriptions were developed to emphasize individual resource potentials, continue current management, manage at a reduced intensity, and resolve 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 area. Outputs were estimated for 18 resource categories and costs were estimated for 47 practices and activities for each analysis area/management prescription combination. Refer to Appendix B for a complete listing of the resource outputs and cost categories which were used in analysis.

Cost estimates for different management prescriptions were developed from historical records of Forest Service costs. Non-Forest Service costs for private permittee investment necessary to carry out range allotment agreements, were also included in the analysis because of their potential significant impacts.

The resource outputs that have an existing market value and are sold, as well as those resource outputs which could potentially be sold, were assigned benefit values in the analysis and are called "priced benefits". Timber, recreation, grazing, water yield, wildlife and fish, and minerals outputs were assigned benefit values and were used in the analysis. All benefit values were based on the same point in the production process for each resource output, i.e., where and when the output is removed from the Forest or grassland. 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 scenic beauty, threatened and endangered species, quality of recreation experience, changes in income and employment, or community lifestyles. These kinds of outputs produce "nonpriced" benefits that were also considered in the analysis. Nonpriced benefits were considered in the analysis as constraints or restrictions on production of priced benefits.

Present Net Value (PNV)

The priced benefits and the costs of all management practices and activities associated with producing priced and nonpriced benefits were used to calculate the present net value (PNV) of all alternatives 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% interest rate. PNV is a relative

Indicator of economic efficiency which was used as a means to develop and compare alternatives. Since by definition, an alternative is the most economically efficient combination of management prescriptions that will achieve a given set of priced and nonpriced goals and objectives, the objective in development of each alternative was to maximize PNV subject to a set of constraints that reflect nonpriced goals and objectives.

Present Net Value is a means of comparing several different investment opportunities to see which would be the best investment. 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 costs necessary to produce all of the priced and nonpriced outputs. The process is roughly equivalent to a private firm (or family) estimating its income and expenditures over a period of years.

Since the dollars that are being added occur over a period of years, some adjustment must be made so they are comparable. A dollar in income now is not worth the same as a dollar in income 10 years from now. The mechanical process by which all of these dollars are adjusted back to the present year so they can be compared is called "discounting." Discounting is necessary for the very same reasons that a bank charges interest on loans. The discount rate, four-percent, can be thought of as the opposite of an interest rate charged for bank loans. The discount rate used in Forest Planning was established by the Chief of the Forest Service.

Net Public Benefits (NPB)

The NFMA Regulations [36 CFR 219.1.] describe how land and resource management planning is to be conducted 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 by 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. 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 53 analysis areas having an average of nine possible prescriptions levels, millions of possible combinations had to be considered. This is 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 from 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, impacts on environmental quality, or the practical limits of budgets often caused an infeasibility. The ID Team then modified the objectives and constraints of the FORPLAN model, and made other "runs" of the computer model to find the particular combination of lands, activities, and schedule 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 and constraints used.

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. It is a point of departure and/or a standard of comparison. 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, and they define the range within which integrated alternatives will be developed.

Some benchmarks are economically based, while others indicate the maximum phyical 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 also described further 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. This 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 Interdisciplinary Team formulated alternatives by:

- Developing 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 resolved and opportunities presented; cost efficiency; and financial feasibility.

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

Each alternative had to meet NFMA regulation requirements:

- Each alternative identified is a technically and legally feasible system of management for the Tonto National Forest.

- Alternatives were formulated to address issues and concerns raised in the scoping process. In addition, each alternative takes into consideration possible future changes in demand for resources.

Each alternative provides for an integrated mix of resource uses at different levels within the Forest's capability rather than a mix that maximizes some uses to the exclusion of others.

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 benchmark analysis levels or as departures from nondeclining timber yield.

All of the alternatives described below were eliminated from further study. The reasons they were not considered in detail are presented. Appendix B summarizes constraints and modeling techniques used for alternatives not considered in detail.

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 satisfactorily 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.

Low Budget Level

The purpose of this benchmark was to determine outputs and costs associated with managing the Forest at a low investment/low intensity level. This level of management does not respond to the issues and concerns, or provide an integrated mix of resource outputs.

Alternatives Including the Proposed Action

Except for the rehabilitation cost, the basic objectives and outputs of the low intensity benchmark and Alternative 6 are the same; therefore, the benchmark was eliminated from detailed study to prevent duplicate analysis.

Maximum Single Resource/Maximum Present Net Value

Benchmark levels which maximize single resource output while providing maximum present net value were modeled for timber, range permitted use, recreation, wildlife water yield, and watershed condition. Other outputs and allocations were based on achieving highest present net value after assigned single resource outputs were maximized.

Benchmark levels for maximum wildlife, maximum recreation, maximum water yield, and maximum watershed condition were considered in further detail as Forest alternatives. These alternatives are displayed later in the document as Alternatives 8, 7, 1 and 2, respectively. Analyses for maximizing timber and range capacity under a maximum present net value strategy were eliminated from detailed study; because, based on benchmark analysis it was evident a sufficient range of timber and grazing outputs could be achieved in other alternatives; thus, eliminating duplicate analysis.

Alternative 5

Alternative 5 was developed to compare the effect of no additional wilderness in Alternative 5 with the addition of all potential wilderness to Alternative 9 on market value outputs of forage, wood products, and developed recreation. When the Arizona Wilderness Bill was signed by the President, this negated the need to consider Alternative 5 any further.

Departures From Base Sale Schedule

Deviation from nondeclining yield was considered for the Proposed Action. The departure was not considered in detail because it did not significantly alter PNV or permit better attainment of overall multiple-use objectives. See Appendix E for evaluation of departure criteria.

ALTERNATIVES CONSIDERED IN DETAIL

Alternatives presented in this section are based on analyses of alternatives examined in the AMS. The AMS identified the (supply) potential to respond to issues and concerns, and Regional and National direction as expressed through the Regional Guide. The AMS helped the Interdisciplinary Team (ID Team) understand the implications of making one management decision versus another.

NFMA regulations require that each alternative represent, to the extent practicable, the most cost efficient combination of management practices [36 CFR 219.5(f)(1)(v)]. The most cost efficient combination of prescriptions was selected for each alternative by maximizing present net value (the difference between discounted benefits and discounted costs).

Alternatives described below are based on management prescriptions which have been selected and scheduled on areas of land to provide goods and services. Issues and concerns 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 prescriptions among alternatives. The Proposed Action, RPA alternative, and the No Action alternative are identified.

Each alternative described has a schedule of resource outputs that is shown in Table 6 and Appendix B. Resource outputs were projected for 200 years. The allowable sale quantity and timber sale program quantity for all alternatives is displayed in Table 6, Table 48, Table 73, Appendix E Tables 88 through 99.

Alternatives Including the Proposed Action

The Proposed Action and other alternatives are illustrated on maps in the packet which accompanies this document. The maps show management area groupings for each alternative.

Range of Alternatives Considered

The alternatives considered were developed within the resource production levels, both minimum and maximum, established by the benchmarks. The Low Intensity Benchmark established the base level with subsequent alternatives providing outputs at or above this level. The maximum single resource benchmarks formed the cutoff level for outputs at the upper end of the decision space. As objectives for alternatives were formulated, the 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 or decision space established by the benchmarks. The alternatives considered represent a broad range of reasonable alternatives.

The Final Environmental Impact Statement (EIS), Regulatory Storage Division, Central Arizona Project (CAP), which was filed February 10, 1984, describes conceptual recreation plans for additional developed sites at Cliff and Roosevelt Dams under Plan 6 (Preferred Alternative). When the Secretary of Interior issued the Record of Decision, it was stipulated that additional studies be made on the Cliff Dam proposal.

An objective of the following nine alternatives is to cooperate with the Bureau of Reclamation in construction of recreation facilities proposed for Roosevelt Lake in Plan 6.

Table 2 in this chapter recognizes the effect which Plan 6 will have on resolution of the issue concerning the demand for developed recreation opportunity. However, resource outputs, benefit values, and costs of facilities construction on Roosevelt Lake are not included in the economic analysis which follows Table 2 because these variables are independent of actions and budgets proposed in the Forest Plan. Also, since the Bureau's activities apply to all alternatives, there would be no change in the economic ranking of alternatives.

Proposed Action (Preferred Alternative) (10)

The Proposed Action intensively manages the Forest to approach its productive capability. With the exception of capital investments necessary to resolve developed recreation demand, the Proposed Action is highly responsive to concerns identified during the scoping process while remaining consistent with multiple use considerations. This alternative will provide the highest level of response to Forest and Regional objectives in line with budgetary constraints. Time period one is constrained to $7.3 million, per year 1980, 4th quarter dollars. All other time periods are constrained to $9.3 million, per year 1980, 4th quarter dollars.

Major objectives of the Proposed Action are:

- Intensively manage all suitable timber and range lands to approach their productive capability. Intensively integrate wildlife, timber, and recreation management prescriptions in the Ponderosa-pine/Mixed Conifer vegetative type under the Mogollon Rim.
- Continued closure of Sierra Ancha Experimental Forest to timber management activities and grazing. Close Three Bar Watershed/Wildlife Area and Lower Salt River recreation area to grazing.
- Bring permitted grazing use in balance with forage capacity and have each allotment under appropriate level of management in the second period.
- Improve and maintain riparian areas in a healthy ecological condition with an emphasis on meeting the needs of riparian dependent resources.

- Emphasize warm water fishing opportunity at Roosevelt, Apache, Horseshoe, and Bartlett Lakes. Emphasize general water-based recreation at Saguaro, Apache, and Canyon Lakes.

- Feature water-based recreation opportunities at Bartlett Lake to emphasize fishing, swimming, and family-oriented boating.

  Improve and protect the condition of Forest watersheds.

- Provide favorable conditions of water flow and high quality water for National Forest purposes and downstream users.

- Where compatible with other resources and uses, manage the Ponderosa-pine and chaparral vegetative communities to increase water yield.

- Yearlong camping will be allowed along the Chain-of-Lakes except for the Lower Salt River and Saguaro and Canyon Lakes where camping will be allowed only during the winter with day use only in the summer. Boat camping will be allowed yearlong.

- Analysis of recreation use continuance for all established summer home areas will have been completed with no change in status of the permits for the next 10 years.

- Provide for reconstruction and paving of the Bartlett Lake Road along with moderate recreation development, including a Marina and lake zoning for boats at Bartlett Lake.

- Manage Threatened and Endangered (T&E) species and habitat with the goal of increasing population levels that will remove them from lists.

- Rehabilitate existing recreation sites in first and second periods and begin a very conservative program of new site construction in the first period.

- Retain Bush Highway Research Natural Area. Recommend establishment of Buckhorn Mountain RNA (2,810 acres), Picket Post Mountain RNA (1,120 acres), Upper Forks Parker Creek (1,288 acres), Haufer Wash RNA (680 acres); State Natural Areas (Sycamore Creek - 60 acres), (Fossil Springs - 20 acres); Botanical Areas (Blue Point Cottonwoods - 480 acres) (Desert Botanical Garden - 1,200 acres); and 60 acres for the Superstition Mountain Museum in cooperation with the Superstition Mountain Historical Society.

- Two river systems have been named by the National Park Service as qualified for classification under the Wild and Scenic Rivers Program. They are the East Verde River and Tonto Creek. Neither of the rivers are proposed for inclusion into the Wild and Scenic Rivers Program.

Current (4)

Alternative 4 projects current resource management emphasis. This is the No Action alternative required by the NEPA regulations. Alternative 4 provides a high level of resolution of the forage production issue. The budget for the first two time periods is constrained to current, $7.3 million per year 1980, 4th quarter dollars.

Major objectives of this alternative are:

- Bring permitted grazing use in balance with forage capacity and each grazing allotment under appropriate level of management in the fourth period.

Alternatives Including the Proposed Action

- Close Three Bar Watershed/Wildlife Area, Sierra Ancha Experimental Forest and Lower Salt River recreation area to grazing. Close Sierra Ancha Experimental Forest to timber management activities except for research purposes.
- No rehabilitation of existing recreation sites, and no new site construction.
- Retain Bush Highway Research Natural Area.
- Two river systems have been named by the National Park Service as qualified for classification under the Wild and Scenic Rivers Program. They are the East Verde River and Tonto Creek. Neither of the rivers are proposed for inclusion into the Wild and Scenic Rivers Program.

RPA (3)

Alternative 3 attempts to meet RPA objectives assigned to the Forest through the Regional Guide. This alternative favorably addresses concerns about recreation, water yield, timber, fuelwood, wildlife habitat, and riparian habitat. Analysis has shown that the RPA objective for developed recreation greatly exceeds projected demand. There were no budget constraints used with this alternative.

Major objectives of this alternative are:

- Meet or exceed objectives assigned to the Forest in the Regional Guide.
- Bring permitted grazing use in balance with forage capacity and have each grazing allotment under appropriate level of management in the fourth period.
- Open Sierra Ancha Experimental Forest to grazing and timber management activities. Close Three Bar Watershed/Wildlife Area and Lower Salt River recreation area to grazing.
- Rehabilitate existing developed recreation sites in first and second periods, and construct new sites in each period commensurate with other commodity resource output objectives.
- Retain Bush Highway Research Natural Area, and recommend establishment of one botanical area (Blue Point Cottonwood - 480 acres).
- Two river systems have been named by the National Park Service as qualified for classification under the Wild and Scenic Rivers Program. They are the East Verde River and Tonto Creek. Neither of the rivers are proposed for inclusion into the Wild and Scenic Rivers Program.

Alternative 1

Alternative 1 intensively manages the Ponderosa-pine and chaparral vegetative types to emphasize water yield. This alternative is highly responsive to concerns regarding increased water yield from the Forest. The first period budget is constrained to $7.6 million per year 1980, 4th quarter dollars.

Major objectives of this alternative are:

- Maximize water yield through vegetative treatment in chaparral and Ponderosa-pine vegetative communities.
- Three Bar Watershed/Wildlife Area and Sierra Ancha Experimental Forest would be open to vegetative treatment to increase water yield.

- Lower Salt River recreation area closed to grazing. Permitted livestock use balanced with forage capacity and have each grazing allotment under appropriate level of management in the fifth period.
- Retain Bush Highway Research Natural Area.
- Two river systems have been named by the National Park Service as qualified for classification under the Wild and Scenic Rivers Program. They are the East Verde River and Tonto Creek. Neither of the rivers are proposed for inclusion into the Wild and Scenic Rivers Program.

Alternative 2

Alternative 2 features improved watershed condition Forest-wide. This alternative is highly responsive to concerns expressed about water quality and soil productivity and stability. The first period budget is constrained to $7.6 million per year 1980, 4th quarter dollars.

Major objectives of this alternative are:

- Feature improved watershed condition while providing commodity outputs at levels compatible with the emphasis.
- Emphasize watershed restoration through projects that provide for soil stability and improved vegetative cover.
- Close Three Bar Watershed/Wildlife Area and Sierra Ancha Experimental Forest to vegetative treatment practices except for research purposes, and close to grazing. Close Lower Salt River to grazing.
- Bring permitted livestock grazing use in balance with forage capacity and have each grazing allotment under appropriate level of management in the first period.
- Retain Bush Highway Research Natural Area, and recommend establishment of Buckhorn Mountain RNA (2,810 acres), Upper Forks Park Creek RNA (1,288 acres), Picket Post Mountain RNA (1,120 acres), a 1,200 acre Botanical Area, and two State Natural Areas, (Fossil Springs - 20 acres) (Sycamore Creek - 60 acres).
- Two river systems have been named by the National Park Service as qualified for classification under the Wild and Scenic Rivers Program. They are the East Verde River and Tonto Creek. Neither of the rivers are proposed for inclusion into the Wild and Scenic Rivers Program.

Alternative 6

Alternative 6 provides Forest management at a low investment/low intensity level. The first period budget is constrained to $7.6 million per year 1980, 4th quarter dollars. This alternative favorably addresses concerns about deteriorating recreation sites Forest-wide.

Major objectives of this alternative are:

- Low intensity resource management prescriptions applied Forest-wide except rehabilitate existing recreation sites in first and second periods and continue operation and maintenance at current level. No new developed recreation sites.
- Close Sierra Ancha Experimental Forest to timber management activities and grazing. Close Three Bar Watershed/Wildlife Area and Lower Salt River recreation area to grazing.

- Bring permitted grazing use in balance with forage capacity in the fifth period. Range management intensity at low level which maintains use in line with capacity.

- Retain Bush Highway Research Natural Area.

- Two river systems have been named by the National Park Service as qualified for classification under the Wild and Scenic Rivers Program. They are the East Verde River and Tonto Creek. Neither of the rivers are proposed for inclusion into the Wild and Scenic Rivers Program.

Alternative 7

Alternative 7 provides intensive development and management of recreation sites Forest-wide to meet projected demand. Dispersed recreation opportunity is featured throughout the Forest. Alternative 7 addresses concerns regarding recreation opportunity and experience diversity. Because of high investments required to provide a high level of developed recreation outputs the budget for this alternative is not constrained.

Major objectives of this alternative are:

- Feature intensive developed and dispersed recreation management Forest-wide. The Ponderosa-pine/Mixed Conifer vegetation type under the Mogollon Rim features intensive integration of recreation, wildlife habitat and timber management prescriptions.

- Rehabilitate all existing developed recreation sites in first and second periods and in each period add new sites to meet projected increase in demand.

- Close Sierra Ancha Experimental Forest to timber management activities and grazing. Close Three Bar Watershed/Wildlife Area and Lower Salt River recreation area to grazing.

- Bring permitted grazing use in balance with capacity and have each grazing allotment under appropriate levels of management in the fifth period.

- Retain the Bush Highway Research Natural Area. Recommend establishment of two natural areas under State of Arizona Parks Board Program (Sycamore Creek - 60 acres), fossil Springs - 20 acres), one botanical area (Blue Point Cottonwoods - 480 acres), and 60 acres for a Superstition Mountain Museum in cooperation with the Superstition Mountain Historical Society.

- Both the East Verde River and Tonto Creek are recommended for inclusion under the Wild and Scenic Rivers Program. The East Verde River includes 32 miles on National Forest System Lands. A description of the individual segments is provided in the Wild and Scenic River section of Chapter 3. All eligible segments are recommended for classification under this alternative. This would place 22 miles of river in the "Wild" and 10 miles in the "Scenic" category.

  Tonto Creek would have 18 miles recommended to the "Wild" category and 15 miles would be recommended to the "Recreation" category under this alternative.

Alternative 8

Alternative 8 manages the Forest to provide optimum opportunity for hunting, fishing and non-consumptive wildlife use and wildlife habitat management. This alternative specifically addresses concerns regarding wildlife and riparian habitat. The budget for the first time period is constrained to $7.6 million per year 1980, 4th quarter dollars.

Major objectives of this alternative are:

- Harvest commercial timber and fuelwood at a level which integrates maximum wildlife habitat enhancement.
- Close Sierra Ancha Experimental Forest to timber management activities and grazing. Close Three Bar Watershed/Wildlife Area and Lower Salt River recreation area to grazing.
- Emphasize warm water fishing opportunity at Roosevelt, Apache, Horseshoe, and Bartlett Lakes. Emphasize general water-based recreation at Saguaro and Canyon Lakes.
- Feature water-based recreation opportunities at Bartlett Lake to emphasize fishing, swimming, and family-oriented boating. Water skiing and fast boating excluded.
- Bring permitted grazing use in balance with forage capacity and have each grazing allotment under appropriate management levels in the fifth period.
- Manage Threatened and Endangered (T&E) species and habitat with the ultimate goal of increasing population levels that will remove them from lists.
- Provide protection to key riparian areas.
- Retain Bush Highway Research Natural Area and recommend establishment of one botanical area (Blue Point Cottonwood - 480 acres).
- Two river systems have been named by the National Park Service as qualified for classification under the Wild and Scenic Rivers Program. They are the East Verde River and Tonto Creek. Neither of the rivers are proposed for inclusion into the Wild and Scenic Rivers Program.

Alternative 9

Alternative 9 manages the Forest for market value resources in the most cost efficient manner: 1) Forage, 2) wood products, 3) developed recreation. The first period budget is constrained to $7.6 million per year 1980, 4th quarter dollars.

Major objectives of this alternative are:

- Maximize PNV on resources with market values.
- Open Sierra Ancha Experimental Forest to timber management activities and grazing. Open Three Bar Watershed/Wildlife Area and Lower Salt River recreation area to grazing.
- Bring permitted grazing use in balance with forage capacity and have each allotment under appropriate levels of management in the fifth period.
- Declassify Bush Highway Research Natural Area to multiple use lands.
- Two river systems have been named by the National Park Service as qualified for classification under the Wild and Scenic Rivers Program. They are the East Verde River and Tonto Creek. Neither of the rivers are proposed for inclusion into the Wild and Scenic Rivers Program.

Alternatives Including the Proposed Action

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 (Period 1) and/or at the end of 50 years (Period 5) 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. Naturally, 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.

Alternatives Including the Proposed Action

Table 2

Comparison of Issue Resolution by Alternative

Issue: Recreation Diversity and Supply 3/

Alternative	Quantifiable Comparison - Fifth Period: Dev. Rec. PAOT 1/	% Demand Satisfied 2/: Dev Rec	Disp Rec	Non-Quantifiable Comparison
Proposed Action (10)	23,092	89	100	Retain existing sites with rehabilitation beginning in first period. Provide new sites Forest-wide at popular areas of high existing or potential use. Management and administration of sites aimed at full service level with possible reductions to reduced service levels at some sites based on actual funding levels. Reduced service levels could result in seasonal or complete closure of developed sites, reduced services such as garbage pickup, toilet cleaning, litter clean-up, and visits by Forest officers. Light maintenance could be reduced and most heavy maintenance deferred. Law enforcement services would be reduced. The remainder of demand for developed recreation will be met in the private sector and by the public choosing dispersed recreation as an alternative. Fee system at all qualified sites. Pursue user fee on lower Salt River. Moderate to high level management and administration of dispersed recreation. Cooperative and Forest Service law enforcement at high level in areas of heavy public use, moderate level elsewhere. Provides high level of cultural resource protection. High integration of visual resource components in all resource management will result in enhancement of visual quality objectives. Commercial river running permits not to exceed 50 percent of capacity. Optimum level of commercial recreation special uses to meet public need.
Current (4)	19,551	84	100	Retain existing developed sites without rehabilitation. Level of visitor experience will continue to decline under reduced service level of management. Pursue user fee on lower Salt River. Dispersed recreation managed at reduced service level. Cooperative and Forest Service law enforcement at current level resulting in increasing violations and vandalism of cultural resources. Moderate level of commercial recreation special use permits. No commercial river running permits. Visual quality objectives will be integrated into other resource activities at a low to moderate level.

1/ Persons at one time. Refer to glossary for definition. Developed recreation PAOT in the first period under all alternatives is 12,466.

2/ Percent demand satisfied is calculated by dividing projected outputs under an alternative by future demand projected in The Assessment of the Management Situation (2605 M RVD's).

3/ Includes effects of Plan 6 on new site development and percent of demand satisfied for developed recreation.

Table 2 (continued)

Comparison of Issue Resolution by Alternative

Issue: Recreation Diversity and Supply

Alternative	Quantifiable Comparison - Fifth Period: Dev. Rec. PAOT	% Demand Satisfied: Dev Rec	% Demand Satisfied: Disp Rec	Non-Quantifiable Comparison
RPA (3)	23,999	100	100	Retain existing developed sites with rehabilitation beginning in the first period. Provide new site development to meet demand on Salt and Verde Rivers and reservoirs, in the high country, and on Pinal Mountain. Alternative provides for maximum developed recreation opportunity in heavy use areas adjacent to urban population. Full service management at sites on rivers and reservoirs, with slightly less than full service elsewhere on Forest. Fee system at all qualified sites. Pursue user fee on lower Salt River. Dispersed recreation managed at a full service level. Some increase in cooperative and Forest Service law enforcement on rivers and reservoirs. Cultural resource protection at a moderate level. Moderate level of commercial recreation special uses to meet public need. No commercial river running permits. Effects on visual quality same as Alternative 2.
1	19,551	86	100	Retain existing developed sites with rehabilitation beginning in the first period. No new site construction through Forest Service funding. Alternative does not provide maximum developed recreation opportunity in heavy use areas adjacent to urban population. Full service management at sites on rivers and reservoirs, with slightly less than full service elsewhere on Forest. Fee system at all qualified sites. Pursue user fee on Lower Salt River. Dispersed recreation managed at a full service level. Some decrease in cooperative and Forest Service law enforcement on rivers and reservoirs. Cultural resource protection at a low level. Moderate level of commercial recreation special uses to meet public need. No commercial river running permits. Effects on visual quality same as Alternative 2.
2	19,551	84	100	Retain existing developed sites with rehabilitation beginning in the second period. No new site construction through Forest Service funding. Continued overcrowding and sanitation problems adjacent to existing sites particularly on reservoirs. Fee system at all qualified sites. Pursue user fee on Lower Salt River. Dispersed recreation opportunities managed below the current reduced service level. Cooperative and Forest Service law enforcement will not keep pace with increasing use in more popular areas. Cultural resource protection will be at a low level. Commercial recreation special uses at moderate level to meet public need. No commercial river running permits. Purpose and scheduling of vegetative treatment will reduce visual quality in areas of vegetative treatment over the short-term. In areas of solid vegetative cover, visual quality could be enhanced.
6	19,551	84	98	Retain and rehabilitate existing developed sites. No new site construction through Forest Service funding. Full service management at heavy use sites only with some sites open for shorter than normal season of use. Fee system at all qualified sites. Pursue user fee on Lower Salt River. Dispersed recreation opportunities managed at reduced service level. Reduced cooperative law enforcement agreements. Cultural resource protection would be at a very low level same as Alternative 4. Forest Service law enforcement very limited resulting in increasing

Table 2 (continued)

Comparison of Issue Resolution by Alternative

Issue: Recreation Diversity and Supply

Alternative	Quantifiable Comparison - Fifth Period: Dev. Rec. PAOT	% Demand Satisfied: Dev Rec	% Demand Satisfied: Disp Rec	Non-Quantifiable Comparison
				violations and vandalism. Moderate level of commercial recreation special uses. No commercial river running permits. Visual resource will decline under low intensity - low integration.
7	25,813	100	100	Retain existing sites with rehabilitation beginning in first decade. Provide new sites Forest-wide to meet projected demand for each time period. Maximum opportunities for high level visitor experience at full service management level. Fee system at all qualified sites. Pursue user fee on Lower Salt River. Dispersed recreation opportunities provided at full service management level. Cooperative and Forest Service law enforcement at moderate level Forest-wide. Provides moderate level of cultural resource protection including development of interpretive opportunities. Optimum level of commercial recreation special uses to meet public need. Limited number of commercial river running permits not to exceed 50 percent of use capacity. Effects on visual quality same as Alternative 2.
8	21,459	100	100	Retain existing developed sites with rehabilitation beginning in first decade. Provide new site development to meet demand on Salt and Verde Rivers, and reservoirs, in the high country, and on Pinal Mountain. Alternative provides maximum developed recreation opportunity in heavy use areas adjacent to urban population. Full service management at sites on rivers and reservoirs, with slightly less than full service elsewhere on Forest. Fee system at all qualified sites. Pursue user fee on Lower Salt River. Dispersed recreation managed at a full service level. Moderate level of cooperative and Forest Service law enforcement on rivers and reservoirs. Cultural resource protection at a moderate level. Moderate level of commercial recreation special uses to meet public need. No commercial river running permits. Effects on visual quality same as Alternative 2.
9	19,551	84	100	Same as Alternative 2 except rehabilitation of existing developed sites beginning in the first period.

Alternatives Including the Proposed Action

Table 2 (continued)

Proposed Recreation Facilities Construction, by Alternative - Periods 1 - 5 (Forest Service)

Alternative	Facilities: Camping Sites (toilets, tables, grills water, access, etc.) No. of Sites	Picnic Sites (toilets, tables, grills ramadas, water access, etc.) No. of Sites	Trailer Dump Stations No. of Sites	Group Sites (Tables) No. of People	Boat Ramps No. of Ramps	Parking Lots No. of Cars
Proposed Action (10)	400	100	0	400	4	300
Current (4)	0	0	0	0	0	0
RPA (3)	650	150	0	650	4	450
1	0	0	0	0	0	0
2	0	0	0	0	0	0
6	0	0	0	0	0	0
7	1,000	200	0	1,000	6	600
8	200	25	0	125	1	75
9	0	0	0	0	0	0

Proposed Recreation Facilities Construction, Plan 6, Bureau of Reclamation

All Alternatives	1440	0	2	500	6	1700

Table 2 (continued)

Comparison of Issue Resolution by Alternative

Issue: Wilderness Opportunity and Management

Alternative	Quantifiable Comparison in First and Fifth Periods MRVD'S Period 1	Period 5	Non-Quantifiable Comparison
Proposed Action (10)	376	576	Protection of wilderness resource and enhancement of visitor experience provided through a basic management program. Extensive use of volunteers, including Wilderness Information Specialists at major trailheads. Implementation Plans developed and implemented commensurate with funding. Capacity management implemented in Superstition Wilderness. Essential trail maintenance on a systematic basis. Major reconstruction of hazardous and/or eroding trail sections.
Current (4)	1,272	1,976	Management at a reduced service level with many less miles of trail maintained. No reconstruction or hazard-removal. Some trails deteriorate to a point of impassability.
RPA (3)	255	381	Protection of wilderness resource and enhancement of visitor experience provided through basic but active management program. Extensive use of volunteers supplements seasonal employees, including Wilderness Information Specialists at major trailheads. Implementation Plans developed with limited implemention commensurate with funding. Essential trail maintenance carried out, with reconstruction of hazardous and/or eroding sections.
1	255	381	Protection of wilderness resource and enhancement of visitor experience provided through basic but active management program. Extensive use of volunteers supplements seasonal employees, including Wilderness Information Specialists at major trailheads. Implementation Plans developed with limited implemention commensurate with funding. Essential trail maintenance carried out, with reconstruction of hazardous and/or eroding sections.
2	448	693	Management of wilderness resource and trails similar to Alternative 3.
6	553	843	Minimal management, with several new areas simply in a "care-taker" status. Wide-spread deterioration of trail system, with many trails becoming impassable over a period of years.
7	433	672	Wilderness and trail management similar to Alternative 3.
8	382	590	Wilderness and trail management similar to Alternative 3.

Table 2 (continued)

Comparison of Issue Resolution by Alternative

Issue: Wilderness Opportunity and Management (Cont.)

Alternative	Quantifiable Comparison in First and Fifth Periods: MRVD'S Period 1	MRVD'S Period 5	Non-Quantifiable Comparison
9	471	718	Minimal level of management on Superstition and Mazatzal Wildernesses; others in a "care-taker" status. Wide-spread deterioration of trail system, with many trails becoming impassable and hazardous.

Table 2 (continued)

Comparison of Issue Resolution by Alternative

Issue: Fuelwood Availability

Alternative	Quantifiable Comparison - First and Fifth Period: Total Fuelwood Production MMBF [1/] First Period	Fifth Period	Non-Quantifiable Comparison
Proposed Action (10)	9.5	10.1	Through vegetative treatments and intensive fuelwood/recreation management, a moderate level of production is provided. There would be moderate level of opportunity to resolve demand conflicts. Increased law enforcement will curtail current level of fuelwood theft.
Current (4)	7.1	7.3	No increase in fuelwood production above current level. Very little opportunity to resolve demand conflicts. Fuelwood theft would continue to be a problem.
RPA (3)	13.9	14.0	Fuelwood production at maximum level due to intensive fuelwood management integrated as part of water yield and wildlife habitat management program in Ponderosa-pine, pinyon-juniper, and chaparral vegetative types. Would provide best opportunity to resolve conflicts between local and off-Forest demand. Personal use would be favored over commercial harvest. Increased law enforcement would curtail most of the current level of theft.
1	13.3	13.4	Vegetative treatments to increase water yield will provide high opportunities for fuelwood production and additional public access. Low level of law enforcement will result in increased theft as more fuelwood becomes accessible. There would be optimum opportunity to resolve conflicts between local and off-Forest demand as well as commercial and personal use.
2	9.6	9.8	Moderate availability of fuelwood from existing road access. Moderate opportunity to resolve demand conflicts. Fuelwood theft would continue to be a problem.
6	7.0	7.0	Same as Alternative 4.
7	12.7	12.9	Fuelwood production at high level due to intensive fuelwood management integrated as part of the recreation activity potential in the Ponderosa-pine and, to a lesser extent, the pinyon-juniper vegetative types. Would provide high opportunity to resolve conflicts between local and off-Forest demand. Personal use would be highly favored over commercial harvest. Increased law enforcement would curtail most of the current level of theft.
8	12.9	13.6	Fuelwood production at high level due to intensive fuelwood management integrated as part of the wildlife habitat management program in Ponderosa-pine, pinyon-juniper, and chaparral vegetative types. Would provide high opportunity to resolve conflicts between local and off-Forest demand. Personal use would be favored over commercial harvest. Increased law enforcement would curtail most of the current level of theft.
9	8.4	9.2	Same as Alternative 2.

1/ With exception of small variations in topwood, fuelwood production remains constant over the planning horizon for all alternatives.

Alternatives Including the Proposed Action

Table 2 (continued)

Comparison of Issue Resolution by Alternative

Issue: Forage Production and Use

Alternative	Quantifiable Comparison - Fifth Period: Grazing MAUM Use 2/	Capacity 2/	Management Intensity 1/ - M Acres: Closed	Extensive	Intensive	Non-Quantifiable Comparison
Proposed Action (10)	278	278	54.8	903.4	1012.7	Balances permitted use and forage capacity in second period. Forage production for wildlife and livestock use is emphasized through integration of resource management practices.
Current (4)	278	278	54.2	1274.8	641.9	Balances permitted use and forage capacity in fourth period. Forage production for wildlife and livestock use is emphasized through integration of resource management practices.
RPA (3)	226	226	0	1811.5	159.4	Balances permitted use with forage capacity in fourth period. Grazing managed to maintain permitted numbers in balance with capacity on lands under extensive system. Minimal range improvements to maintain capacity only. On land managed intensively, grazing by domestic livestock is maximized with structural and nonstructural improvements to provide for increased forage production and permitted use. Intensive range management takes place in pinyon/juniper, chaparral, and Ponderosa-pine vegetative types.
1	204	204	27.6	1934.5	0	Balances permitted use with forage capacity in fifth period. Grazing managed to maintain permitted numbers in balance with capacity. Minimal range improvements to maintain capacity not to increase forage production or increase permitted use.

1/ Management intensities: (1) Closed - excludes livestock grazing to protect other values or eliminate conflicts with other uses; (2) extensive - permitted use is within grazing capacity with minimal improvements only to extent needed to protect and maintain range resource in presence of grazing (Level B); (3) intensive - optimize production and utilization of forage allocated for livestock use consistent with maintaining the environment and providing for multiple use of the range. Improvements and practices used to improve forage supplies and uniform livestock distribution and forage use (Level C and D).

2/ Permitted use at the beginning of Period 1 is the same for all alternatives - 407,000 AUM's. Levels of permitted use and grazing capacity is based on current estimated land capabilities to produce forage for domestic livestock on a sustained yield basis. Figures cannot be viewed as being absolute or precise as actual levels of permitted use and grazing capacities will depend greatly on more indepth studies and/or estimates, intensity and effectiveness of management, and actual response and improvement in the forage resource resulting from improved management practices.

Table 2 (continued)

Comparison of Issue Resolution by Alternative

Issue: Forage Production and Use

Alternative	Quantifiable Comparison - Fifth Period: Grazing MAUM Use	Grazing MAUM Capacity	Management Intensity - M Acres: Closed	Extensive	Intensive	Non-Quantifiable Comparison
2	197	197	54.8	1916.1	0	Balances permitted use and forage capacity in the first period. Grazing managed to maintain permitted numbers in balance with capacity through extensive management. Minimal range improvements to maintain capacity only. Primary emphasis on balancing capacity with permitted use in shortest time frame for purpose of improvement and maintenance of watershed condition.
6	196	196	54.2	1916.1	0	Same as Alternative 1.
7	200	200	54.2	1916.1	0	Balances permitted use with forage capacity in fifth period. Grazing managed to maintain permitted numbers in balance with capacity. Minimal range improvements to maintain capacity only.
8	201	201	54.8	1916.1	0	Same as Alternative 1.
9	197	197	0	1970.9	0	Same as Alternative 1.

Alternatives Including the Proposed Action

Table 2 (continued)

Comparison of Issue Resolution by Alternative

Issue: Water Quality and Quantity

Alternative	Quantifiable Comparison - Fifth Period: Water Yield (M Acre Feet) Period 5	Quantifiable Comparison - Fifth Period: Percent Change from 1980 Water Yield (349 M Acre Feet)	Non-Quantifiable Comparison
Proposed Action (10)	394	+13	This alternative increases water yields by periodic burning of chaparral vegetation. Water quality in these burned areas will temporarily decline due to increased soil erosion and nitrate losses. However, the water quality Forest-wide will improve as a result of improving range conditions.
Current (4)	332	-5	This alternative will result in a slight reduction in water yields. This can be attributed to increased vegetative ground cover associated with improving watershed conditions. Reductions in soil erosion will improve water quality.
RPA (3)	405	+16	This alternative substantially increases water yields by periodic burning of chaparral (brush) vegetation, and by heavy timber harvesting in Ponderosa-pine forests. In areas treated to increase water yields, there will be a decline in water quality due to increased sedimentation and nitrate losses. However, the water quality Forest-wide will improve as a result of increased vegetative cover.
1	419	+20	This alternative produces the highest level of water yields by periodic burning of chaparral (brush) vegetation, and by heavy timber harvesting in Ponderosa-pine forests. In areas treated to increase water yields, there will be a decline in water quality due to increased sedimentation and nitrate losses. However, the water quality Forest-wide will improve as a result of increased vegetative cover.
2	332	-5	This alternative maximizes opportunities to prevent soil erosion and to provide high quality water. The reduction in total water yield can be attributed to the increased vegetative ground cover. This increased vegetation allows more precipitation to sink into the ground and results in less runoff.
6	332	-5	Same as Alternative 4.
7	398	+14	This alternative increases water yields primarily by periodic burning of chaparral vegetation. Water quality in these burned areas will temporarily decline due to increased soil erosion and nitrate losses. However, the water quality Forest-wide will improve as a result of increased vegetative cover.

Table 2 (continued)

Comparison of Issue Resolution by Alternative

Issue: Water Quality and Quantity

Alternative	Quantifiable Comparison - Fifth Period: Water Yield (M Acre Feet) Period 5	Quantifiable Comparison - Fifth Period: Percent Change from 1980 Water Yield (349 M Acre Feet)	Non-Quantifiable Comparison
8	400	+15	Same as Alternative 7.
9	334	-4	Same as Alternative 4.

Alternatives Including the Proposed Action

Table 2 (continued)

Comparison of Issue Resolution by Alternative

Issue: Soil Productivity and Stability [1/]

Alternative	Quantifiable Comparison in Third and Fifth Periods: MM Acres In Satisfactory Condition, Period 3	Period 5	Non-Quantifiable Comparison
Proposed Action (10)	2.7	2.8	Erosion rates will decrease rapidly in the third and fourth periods.
Current (4)	1.8	2.8	Erosion rates will decrease rapidly, but not as quickly as Alternative 10.
RPA (3)	1.8	2.6	Erosion will decline at a moderate rate.
1	1.8	2.5	Due to emphasis on vegetation management to increase water yields, erosion rates will decline more slowly.
2	2.7	2.8	Maximum opportunity to reduce soil erosion and enhance soil productivity.
6	1.4	2.4	Low investments will result in erosion rates that decline more slowly.
7	1.8	2.5	Less emphasis on range and watershed management will result in erosion rates that decline more slowly.
8	1.8	2.5	Same as Alternative 7.
9	1.4	2.4	Due to emphasis on commodity production, erosion rates will decline more slowly.

1/ All alternatives will result in a substantial reduction in current on site soil losses over the planning period through increased vegetative cover and resulting stabilization of watershed.

Table 2 (continued)

Comparison of Issue Resolution by Alternative

Issue: Transportation System Management (Roads)

Alternative	Miles of Road System by Road Maintenance Levels 1/ 1	2	3	4	5	Total	Non-Quantifiable Comparison
Proposed Action (10)	242	2246	480	140	95	3203	Road maintenance will be at a level which provides for user safety, protection of investments and soil and water resource. Roads causing soil and water degradation or conflicts with other resources will be obliterated.
Current (4)	76	2889	610	190	45	3810	Continuation of soil and water degradation and conflicts with other resources. Few roads closed.
RPA (3)	102	1638	1090	140	95	3065	More miles of roads will be unsuited for low clearance vehicles or wet weather travel. Roads causing soil and water degradation or conflicts with other resources will be obliterated.
1	242	1640	948	190	45	3065	More miles closed to public traffic than the current situation and fewer miles maintained for public comfort. Roads causing soil and water degradation or conflicts with other resources will be obliterated.
2	192	940	860	190	95	2277	Maximum mileage closed to public traffic. Road densities minimized to provide maximum ground cover for watershed protection.
6	42	2923	670	150	25	3810	Minimum mileage closed to public traffic. Maximum mileage suitable for high-clearance vehicles or fair weather travel only. Continuation of soil and water degradation and conflicts with other resources.
7	242	1278	1320	200	95	3135	Similar to Proposed Action with an increase in mileage maintained for passenger car access.
8	242	1305	1288	200	95	3130	More mileage than currently maintained for passenger car access. Roads causing soil and water degradation or conflicts with other resources will be obliterated.
9	242	2223	1310	190	45	3810	Similar to Alternative 6 with an increase in mileage maintained for passenger car travel.

1/ Road maintenance levels are described in Chapter 4. Table 2 includes only existing roads. New roads will be placed in the appropriate maintenance level at the time of construction. Totals reflect miles of road obliterated and removed from the system. Final selection of road maintenance levels and identification of specific roads to be obliterated will be subject to further public involvement and environmental analysis following implementation of the Forest Plan.

Table 2 (continued)

Comparison of Issue Resolution by Alternative

Issue: Transportation System Management (Roads)

Road Density

Alternative	Miles of System Roads 1/ per Square Mile of Land
Proposed Action (10)	0.86
Current (4)	1.02
RPA (3)	0.82
1	0.82
2	0.61
6	1.02
7	0.84
8	0.84
9	1.02

1/ Wilderness Area acreage excluded from land base for road density calculation.

Table 2 (continued)

Comparison of Issue Resolution by Alternative

Issue: Transportation System Management (Trails)

Alternative	Quantifiable Comparison: Avg. Annual Miles of Maintenance/Rehabilitation for Periods 1 - 5		Quantifiable Comparison: Avg. Annual Miles of Construction/Reconstruction for Periods 1 - 5		Non-Quantifiable Comparison
	Wilderness	Non-Wilderness	Wilderness	Non-Wilderness	
Proposed Action (10)	96	37	2.8	4.0	Reconstruction of trail system in first 20 years Forest-wide will eliminate all areas of resource damage problems or potential. Some trails in very poor condition with low use will be closed and/or obliterated. Construction of new trail outside of wilderness will be emphasized. There will be some continuing damage as use increases on trails not scheduled for maintenance on a regular basis.
Current (4)	46	89	0.0	0.4	Continue minimal program of trail maintenance both in and out of wilderness. Effort will be concentrated on most critical areas of resource damage.
RPA (3)	58	46	2.0	5.2	Intensive reconstruction and construction of trails in the first 20 years of the planning period. Some trails in very poor condition with low use will be closed and/or obliterated. There will be some continuing damage as use increases on trails not scheduled for reconstruction.
1	66	49	3.7	9.3	Intensive reconstruction and construction of trails in the first 20 years of the planning period. Some trails in very poor condition with low use will be closed and/or obliterated. There will be some continuing damage as use increases on trails not scheduled for reconstruction.
2	82	26	4.5	0	Concentrate on water bars and erosion control. Trail system closures would be implemented in high hazard areas. Overuse on remaining open trails will result in continued degradation of resources and visitor experience.
6	36	40	0.0	0.0	Significant deterioration of entire trail system, with severe erosion occurring. Only most severe hazards are resolved.

Alternatives Including the Proposed Action

Table 2 (continued)

Comparison of Issue Resolution by Alternative

Issue: Transportation System Management (Trails) - (Cont.)

Quantifiable Comparison					Non-Quantifiable Comparison
	Avg. Annual Miles of Maintenance/Rehabilitation for Periods 1 - 5		Avg. Annual Miles of Construction/Reconstruction for Periods 1 - 5		
Alternative	Wilder-ness	Non-Wilder-ness	Wilder-ness	Non-Wilder-ness	
7	79	41	4.3	5.1	Entire existing trail system will be reconstructed over the planning period, most of it in the first 20 years. Provides maximum enhancement of visitor experience as well as maximum resource protection. Construct and reconstruction of trails in areas to best serve the public.
8	74	43	4.1	6.5	Similar to Alternative 7, with emphasis on trails to wildlife-interest areas.
9	36	39	0.0	0.0	Same as Alternative 6.

Table 2 (continued)

Comparison of Issue Resolution by Alternative

Issue: Wildlife and Habitat

Alternative	Quantifiable Comparison - First and Fifth Periods: Wildlife Recreation MRVD's Period 1	Wildlife Recreation MRVD's Period 5	M Acres of Wildlife Emphasis Prescription	Non-Quantifiable Comparison
Proposed Action (10)	688	1,030	436.0	Habitat improvement and increased wildlife populations resulting from management activities is anticipated as a result from high budget levels. Therefore, species requiring early to mid-successional stages will be favored while providing adequate habitat for those requiring late successional stages. Even though significant acreages emphasize other activities as compared to Alternatives 1, 3 and 8, wildlife habitat diversity will be increased through coordinated management activities and direct habitat improvement projects. Wildlife use will increase in consumptive areas more than nonconsumptive. Competition between livestock and wildlife will be reduced as range forage conditions improve. Threatened and Endangered (T&E) species habitat management and enhancement will be increased over current levels and recovery of listed species will be accomplished at a high rate. Wildlife use demand will exceed supply. Wildlife generated benefits in terms of RVD's and revenue will be at a moderate level in the first decade and are expected to increase 50 percent up to a high level by year 2030. Arizona State Comprehensive Wildlife Plan goals will be met at a high level.
Current	535	535	0	Competition between livestock and wildlife will be reduced as range forage conditions improve. Wildlife habitat diversity will be increased somewhat primarily through resource coordination with other management activities. There will be a low level of improvement through direct habitat improvement projects. Habitat improvement for T&E species will continue at present levels. Consumptive and nonconsumptive demand will far exceed supply. Wildlife generated outputs in terms of RVD's and revenue will be at a low level in the first period and continue through to 2030. Arizona State Comprehensive Wildlife Plan goals will be met at a low level.
RPA (3)	739	1,183	1286.4	Habitat improvement and increased wildlife populations resulting from management activities is anticipated as a result of high budget levels.

Table 2 (continued)

Comparison of Issue Resolution by Alternative

Issue: Wildlife and Habitat (Cont.)

Alternative	Quantifiable Comparison - First and Fifth Periods: Wildlife Recreation MRVD's Period 1	Wildlife Recreation MRVD's Period 5	M Acres of Wildlife Emphasis Prescription	Non-Quantifiable Comparison
				Therefore, species requiring early to mid-successional stages will be favored while providing for species requiring late successional stages. Wildlife habitat diversity will be increased through management activities and improvement projects. Wildlife use will increase in consumptive areas more than non-consumptive. Competition between livestock and wildlife will be reduced as range forage conditions improve. Threatened and endangered species habitat management and enhancement will be increased over current levels. Demand for hunting, fishing and non-consumptive wildlife use will exceed supply. Wildlife generated benefits in terms of RVD's and revenue will be at a moderate level in the first period increasing 43 percent up to a high level by 2030. Arizona State Comprehensive Wildlife Plan goals will be met at a high level.
1	743	1,202	1445.8	Same as Alternative 3.
2	557	599	33.6	Little improvement in habitat and increased wildlife populations resulting from management activities is anticipated as a result of low budget levels. Therefore, species requiring mid to late successional stages will be favored. There will be little opportunity for increased habitat diversity through management. Wildlife use will shift from predominantly consumptive to non-consumptive. Competition between livestock and wildlife will be reduced as range forage conditions improve. The current level of T&E species habitat management will be maintained. There will be a low level of habitat improvement work for Bald Eagles. Demand for hunting and fishing will far exceed supply. Wildlife generated benefits in terms of RVD's and revenue will be at a low level in the first decade and continue at a low level through the planning period. Arizona State Comprehensive Wildlife Plan goals will be met at a low level.
6	427	427	0	Low intensity resource management and low investment will result in an overall decline in

Table 2 (continued)

Comparison of Issue Resolution by Alternative

Issue: Wildlife and Habitat (Cont.)

Alternative	Quantifiable Comparison - First and Fifth Periods: Wildlife Recreation MRVD's Period 1	Wildlife Recreation MRVD's Period 5	M Acres of Wildlife Emphasis Prescription	Non-Quantifiable Comparison
				wildlife habitat quality. Management of T&E species habitat will be at a minimum legal level with a decline in overall quality and recovery will be accomplished at a very slow rate. Wildlife generated output RVD's and revenue will be lowest of all aternatives throughout the planning period. Arizona Comprehensive Wildlife Plan goals will be met at a very low level.
7	638	986	880.4	Habitat improvement and increased wildlife populations resulting from management activities is anticipated as a result of moderate budget levels. Therefore, species requiring early to mid successional stages will be favored while providing for those species requiring late successional stages. Wildlife habitat diversity will be increased through coordinated management activities and habitat improvement projects. Consumption wildlife use will experience relatively larger gains over non-comsumptive. Competition between livestock and wildlife will be reduced as range forage conditions improve. Threatened and Endangered species management and enhancement will be increased significantly over current levels. Recovery of listed species will be accomplished at a moderate rate. Demand for wildlife use will still exceed supply however, the difference will be smaller compared to other alternatives. Wildlife generated outputs in terms of RVD's and revenue will be at a moderate level in the first period and increasing about 35 percent by 2030. Arizona State Comprehensive Plan goals will be met at a moderate level.
8	721	1,153	1451.6	Habitat improvement and increased wildlife populations resulting from management activities will approach optimum levels as a result of high budget levels and more areas of wildlife emphasis prescriptions. Therefore, species requiring early to mid successional stages will be favored while providing for species requiring late successional stages. Wildlife habitat diversity will be increased over present through coordinated management activities and habitat improvement projects.

Table 2 (continued)

Comparison of Issue Resolution by Alternative

Issue: Wildlife and Habitat (Cont.)

Alternative	Quantifiable Comparison - First and Fifth Periods: Wildlife Recreation MRVD's Period 1	Wildlife Recreation MRVD's Period 5	M Acres of Wildlife Emphasis Prescription	Non-Quantifiable Comparison
				Wildlife use will increase more in consumptive areas than non-consumptive. Competition between livestock and wildlife will be reduced as range forage conditions improve. Threatened and endangered species habitat management and enhancement will be increased over current levels and recovery of listed species will be accomplished at its highest rate. Demand for hunting, fishing and non-consumptive wildlife use will continue to exceed supply. This alternative comes closest to meeting demand. Wildlife generated benefits in terms of RVD's and revenue will be at their highest level among alternatives in the first period and are expected to increase 55 percent ($16 mm/year) by 2030. Arizona State Comprehensive Wildlife Plan goals will be met at a high level.
9	431	432	53.9	Competition between livestock and wildlife will be reduced as range forage conditions improve. The wildlife program will consist of a threshold level of legal compliance with existing laws with no habitat improvement activity. Recovery of T&E species will be at a low rate. Wildlife generated outputs in terms of RVD's and revenue will be at a low level through the planning period. Demand for wildlife use will far exceed supply. Arizona Comprehensive Wildlife Plan goals will be met at a low level.

Table 2 (continued)

Comparison of Issue Resolution by Alternative

Issue: Riparian Habitat

Alternative	Quantifiable Comparison: Acres in Acceptable Ecological Condition 1/ Period 1	Period 3	Period 5	Non-Quantifiable Comparison
Proposed Action (10)	12,500	17,100	25,900	Complete riparian recovery and management of this unique and valuable habitat will approximate optimum under this alternative. Budget levels will encourage not only a high level of coordination with other uses such as recreation and range but allow rehabilitation and re-establishment projects to accelerate recovery. Conducive weather patterns that basically control natural re-establishment and recovery cannot be predicted but are assumed to occur at times within the 50 year planning period. As grazing permitted use is balanced with forage production it is expected that most riparian areas should recover by the end of period three or four. Management emphasis in riparian areas will feature wildlife needs over recreation and grazing.
Current (4)	12,000	13,800	19,000	Current efforts in riparian will continue for Bald Eagle habitat. However, the austere wildlife budget does not allow the level of work necessary to accelerate riparian recovery as in Alternatives 1, 8, RPA and Proposed Action. Riparian recovery is expected to continue past Period 5 due to natural processes when livestock use is brought into line with forage capacity in the fourth period. However, the management emphasis on recreation in riparian areas is expected to result in sub-optimum habitat quality for wildlife into the future as recreation demand increases.
RPA (3)	12,500	15,100	20,300	Some riparian acres will continue to be degraded as permitted livestock use is being brought into line with available forage over the first four decades. Wildlife budget levels will allow some direct habitat improvement work. This is expected to accelerate recovery better than Alternative 2 but not to the extent as Alternative 1. This is due to the management emphasis on recreation use. High demand for recreation use in riparian areas coupled with the management emphasis is expected to cause a slower rate of riparian recovery. Heavy recreation use in riparian also results in reduced habitat quality for wildlife.
1	12,500	16,500	24,900	Some riparian acres will continue to be degraded as permitted livestock use is being brought into line with available forage over the first five periods. Other riparian acres will be enhanced on those allotments under improved management. There will be some acres re-established by riparian improvement projects as the priority for the modest wildlife budget levels takes precedent over other habitat needs. However, the emphasis on water yield particularly in the pine and chapparal types will result in less than optimum riparian condition in those types.

1/ Defined as being in fair or better condition by a riparian survey contract in 1981 by Arizona State University.

Table 2 (continued)

Comparison of Issue Resolution by Alternative

Issue: Riparian Habitat (Cont.)

Quantifiable Comparison				Non-Quantifiable Comparison
	Acres In Acceptable Ecological Condition			
Alternative	Period 1	Period 3	Period 5	
2	12,500	17,100	25,900	Complete riparian recovery and management of this unique and valuable habitat will approximate optimum under this alternative. This results primarily from balancing livestock use with capacity in the first decade and low levels of permitted livestock through the planning period. Conducive weather patterns that basically control natural re-establishment and recovery cannot be predicted but are assumed to occur at times within the 50 year planning period. As grazing permitted use is balanced with forage production it is expected that most riparian areas should recover by the end of period three or four. Management emphasis in riparian areas will feature wildlife needs over recreation and grazing.
6	11,850	13,600	18,500	Same as Alternative 2.
7	12,000	14,000	19,500	Riparian recovery is expected under this alternative. However, gains on allotments under proper stocking and improved management will to some extent be offset by others not under improved management. This continues through periods three and into four. Then as improved management takes effect, overall riparian recovery is expected to accelerate. Austere budget levels in wildlife will allow little if any, projects to accelerate re-establishment and recovery in degraded channels. In addition, the management emphasis on recreation is expected to result in sub-optimum riparian habitat quality for wildlife into the future as recreation use increases.
8	12,500	17,100	25,900	Complete riparian recovery and management of this unique and valuable habitat will approximate optimum under this alternative. Budget levels will encourage not only a high level of coordination with other uses such as recreation and range but allow rehabilitation and re-establishment projects to accelerate recovery. Conducive weather patterns that basically control natural re-establishment and recovery cannot be predicted but are assumed to occur at times within the 50 year planning period. As grazing permitted use is balanced with forage production it is expected that most riparian areas should recover by the end of period three or four. Management emphasis in riparian areas will feature wildlife needs over recreation and grazing.
9	11,850	13,600	18,500	Same as Alternative 2.

Alternatives Including the Proposed Action

Table 2 (continued)

Comparison of Issue Resolution by Alternative

Issue: Off-Road Vehicle (ORV) Use

Quantifiable Comparison				Non-Quantifiable Comparison
Alternative	Acres - Open 1/	Thousands Closed 2/	Miles of Roads Forest-wide Open to Vehicle Travel	
Proposed Action (10)	914.7	1,958.6	2961	Alternatives 1, 3, 7, 8, 9, and the Proposed Action implement ORV management within direction of the Southwestern Regional Guide and objectives of each alternative. Desert areas are closed unless posted open. Designated routes in closed areas are posted open to ORV use. In the conifer and woodland vegetative types, lands 0-40 percent slope are open unless posted closed. These alternatives provide for ORV use where it is compatible with other resources and uses as well as provide the best means of implementation and enforcement of ORV restrictions. Alternatives 2 and 6 close the entire Forest to cross-country motorized travel, but do allow for travel on designated routes. Alternative 4 continues current management which provides for closure of critical areas of resource damage or user conflict. Implementation and enforcement problems and continuing resource damage would continue under this alternative.
Current (4)	2,325.9	547.4	3734	
RPA (3)	975.7	1,897.6	2963	
1	933.2	1,940.1	2823	
2	0	2,873.3	2085	
6	0	2,873.3	3768	
7	901.1	1,972.2	2893	
8	919.9	1,953.4	2888	
9	975.7	1,897.6	3768	

1/ Open areas in Alternatives 1, 3, 7, 8, 9, and Proposed Action are primarily located in the pinyon-juniper and Ponderosa-pine types of the Payson and Pleasant Valley Ranger Districts.

2/ The ORV policy in the desert will be implemented gradually over the first ten years after the Forest Plan is approved. Priorities for implementation will be in areas of highest use near the Phoenix metropolitan area.

Excluding wilderness trails, there are approximately 400 miles of trails Forest-wide which are open to motorized travel. However, vehicle width is limited to 40 inches in accordance with 36 CFR 261.12. Potential conflicts with other users (i.e. horses and hikers) will be subject to further public involvement and environmental analysis following implementation of the Forest Plan. This will be done in conjunction with further analysis of the total transportation system.

Alternatives Including the Proposed Action

Table 2 (continued)

Comparison of Issue Resolution by Alternative

Issue: Timber Management Intensity

Alternative	Suitable Acres	Quantifiable Comparison - First and Fifth Periods: Total Average Annual Harvest Sawtimber & Roundwood Products MMBF [1/] Period 1	Period 5	Non-Quantifiable Comparison
Proposed Action (10)	109,492	7.9	16.7	Silvicultural practices and harvest schedules apply to suitable acres to achieve high level of integrated wildlife, recreation, and timber management. No regulated harvest in Sierra Ancha Experimental Forest or Pinal Mountains.
Current (4)	102,862	8.2	11.3	Perpetuates current silvicultural practices and harvest schedule on suitable acres less than 40 percent slope. No regulated harvest from Sierra Ancha Experimental Forest or Pinal Mountains.
RPA (3)	122,612	18.0	18.8	Silvicultural practices and harvest schedules apply to suitable acres including Sierra Ancha Experimental Forest and Pinal Mountains to produce sustained yield.
1	122,612	7.7	10.9	Silvicultural practices and harvest schedules apply to suitable acres including Sierra Ancha Experimental Forest and Pinal Mountains. Emphasize increased water yield opportunities, with resulting increases in forage production.
2	109,492	8.7	13.1	Silvicultural practices and harvest schedules apply to suitable acres with no regulated harvest from Sierra Ancha Experimental Forest or Pinal Mountains.
6	102,862	4.7	5.7	Silvicultural practices and harvest schedules apply to suitable acres less than 40 percent slope. No regulated harvest from Sierra Ancha Experimental Forest or Pinal Mountains. Harvest levels during the first five time periods reduced to low levels due to budget limitations.
7	109,492	8.7	13.1	Same as Alternative 2.
8	120,797	7.8	18.2	Silvicultural practices and harvest schedules apply to suitable acres to emphasize maximum wildlife habitat improvement and maintenance. No regulated harvest in Sierra Ancha Experimental Forest.
9	122,612	8.0	20.3	Silvicultural practices and harvest schedules apply to suitable acres including Sierra Ancha Experimental Forest and Pinal Mountains to facilitate forage production and recreation opportunity.

1/ Refer to Table 6 for a detailed breakdown of sawtimber and roundwood products.

Table 2 (continued)

Comparison of Issue Resolution by Alternative	
Alternative	Issue: Unauthorized Use
Proposed Action (10)	High level of emphasis to control unauthorized use in areas of high recreation use and fuelwood production. Action will be initiated to resolve backlog of occupancy trespass cases by year 2000 and keep up annually to prevent or solve problems.
Current (4)	Unauthorized use of the Forest would remain at current level. Violations of State and Federal laws will continue to increase in popular areas as use increases. Occupancy trespass, vandalism, and ORV problems will continue with limited opportunities to resolve.
RPA (3)	Emphasis on solving problems of unauthorized use in areas on or adjacent to Salt and Verde Rivers and reservoirs and fuelwood area. Other areas would be at current or lower level of action.
1	Same as Alternative 4 except there will be a greater increase in violations of State and Federal laws.
2	Same as Alternative 1.
6	Very limited opportunity to deal with unauthorized use because of low budget level. Therefore, increases in vandalism, wood theft and trespass can be expected.
7	Moderate level of emphasis to control unauthorized use in areas of high recreation use and fuelwood production. Action will be initiated to resolve backlog of occupancy trespass cases by year 2000 and keep up annually to prevent or solve problems.
8	Same as Alternative 7.
9	Same as Alternative 6.

Table 2 (continued)

Comparison of Issue Resolution by Alternative

Issue: Mineral Development

Quantifiable Comparison - Period 1

M Acres Open for Exploration

Alternative	Locatable Minerals	Leasable Minerals	Total M Acres Withdrawn
Proposed Action (10)	2,073.0	2,287.3	800.3
Current (4)	2,082.5	2,287.3	790.8
RPA (3)	2,080.2	2,287.3	791.1
1	2,082.5	2,287.3	790.8
2	2,076.0	2,287.3	797.3
6	2,082.5	2,287.3	790.8
7	2,079.2	2,287.3	794.1
8	2,081.1	2,287.3	792.2
9	2,082.5	2,287.3	790.8

The variation between locatable and leasable acres open is due to leasing with limited or no surface occupancy in special areas such as roadside zones which are withdrawn from locatable mineral entry.

Alternatives Including the Proposed Action

Issue Resolution Summary

All of the alternatives presented 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 individual alternatives.

The Proposed Action and Alternative 3 provide the best overall resolution of the issues. Both alternatives are highly responsive to dispersed recreation demand, fuelwood, water yield, transportation system management, wildlife and riparian habitat, off-road vehicle use, integration of timber harvest practices with wildlife habitat and diversity, law enforcement needs, soil productivity and stability, permitted grazing use, and mineral exploration and development. These alternatives also respond to developed recreation demand; however, the Proposed Action falls 11 percent short of meeting long-term projected demand. Although this will have adverse effects, the Proposed Action represents anticipated funding levels while Alternative 3 exceeds this level by an average of 2.8 million dollars annually (Table 7) during the first five periods. The Proposed Action provides a twenty percent higher output in permitted grazing use than Alternative 3 at the end of Period 5.

Alternatives 2, 4, 6 and 9, provide the least overall resolution of the issues. Alternative 6 and 9 provide for rehabilitation of developed recreation sites during the first time period. Alternative 4 provides a high level of permitted grazing use, and provides for watershed restoration projects in addition to meeting basic soil and water protection needs. Alternative 2 provides for a high level of watershed restoration projects.

Alternative 7 provides an optimum level of developed recreation site construction-reconstruction. However, average annual budgets during the first five time periods would exceed anticipated funding levels by 11 million dollars annually. Alternatives 1, 2, 6, 7, 8, and 9, provide a low level of permitted grazing use.

Alternative Acreage Distribution

Table 3 displays the acreage assigned to each prescription category by alternative. Additional detail on prescriptions can be found in Appendix B.

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. One way to evaluate the affects 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 Management Emphasis Category for Each Alternative (M Acres)

Management Emphasis	Proposed Action (10)	Current (4)	RPA (3)	1	2	6	7	8	9
Low Intensity. Minimum Outputs and Costs to Meet Legal Requirements	120.1		116.1	116.1		2,183.8	122.0	123.9	2,095.8
Current. Continuation of Present Outputs Within Existing Budgets	197.5	2,770.4 2/	141.7 3/						
Recreation 1/ Emphasis	90.6		437.1	315.6	4.7	.6	1,006.8	428.1	.8
Wilderness Low Intensity Management Emphasis			53.0	112.8	112.8	586.0	112.8	112.8	586.0
Wilderness High Intensity Management Emphasis	586.0		391.3	473.2	473.2		473.2	473.2	
Range Emphasis	1,012.7		159.4						
Wildlife Emphasis	436.0		1,286.4	1,445.8	33.6		880.4	1,451.6	53.9

1/ Includes non-wildlife and non-wilderness dispersed, and developed recreation.

2/ Includes 585,990 acres of existing wilderness.

3/ Current management prescriptions applied to 141.7 acres of wilderness.

Table 3 (continued)

Acreage Assignments by Management Emphasis Category for Each Alternative (M Acres)

Management Emphasis	Proposed Action (10)	Current (4)	RPA (3)	1	2	6	7	8	9
Water Yield Emphasis	100.9		165.7	287.2			168.6	162.9	14.2
Watershed Condition Emphasis	220.0				2,139.5				
Low Timber Emphasis						102.9			
Current Timber Emphasis		102.9	1.7						7.1
Maximum Timber Emphasis Intergrated with Recreation and Watershed Condition	90.5		45.7		109.5		109.5	102.3	67.4
Maximum Timber Emphasis Intergrated with Wildlife Habitat	19.0		36.0					18.5	11.5
Maximum Timber Emphasis Intergrated with Increased Water Yield			39.2	122.6					36.6

Alternatives Including the Proposed Action

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 (M Acres)

Alternative	Timber Harvest	Livestock Management Intensive	Livestock Management Extensive	Developed 1/ Recreation	Minerals Exploration and Development Locatable	Minerals Exploration and Development Leasable
Proposed Action (10)	109.5	1,012.7	903.4	3.1	2,073.0	2,287.3
Current (4)	102.9	641.9	1,274.8	1.5	2,082.5	2,287.3
RPA (3)	122.6	159.4	1,811.5	3.2	2,080.2	2,287.3
1	122.6	0	1,943.3	1.5	2,082.5	2,287.3
2	109.5	0	1,916.1	1.5	2,076.0	2,287.3
6	102.9	0	1,916.7	1.5	2,082.5	2,287.3
7	109.5	0	1,916.7	4.0	2,079.2	2,287.3
8	120.8	0	1,916.1	2.3	2,081.1	2.287.3
9	122.6	0	1,970.9	1.5	2,082.5	2,287.3

1/ Includes recreation facilities constructed on Roosevelt Lake through Plan 6.

Alternatives 3, 4, and the Proposed Action are the only alternatives which exceed low levels of permitted livestock use, consequently only these alternatives feature intensive livestock management. In the Proposed Action, permitted use and grazing capacity balance in Period 2. Alternatives 3 and 4 balance in Period 4, Alternative 2 balances in Period 1, and all other alternatives balance in Period 5. The difference in acres managed intensively for livestock production results from a mix of management prescriptions in the Proposed Action and Alternative 3, while Alternative 4 generated only current management prescriptions.

Variables which affect acres available for timber harvest are slopes greater than 40 percent, and the inclusion of suitable timber lands in the Sierra Ancha Experimental Forest and the Pinal Mountains. The Proposed Action includes Forest lands in excess of 40 percent slopes. Alternatives 2, 3, 7, and 8 include Forest lands in excess of 40 percent slope, and components of the Sierra Ancha Experimental Forest and the Pinal Mountains. Refer to Table 2 for a detailed discussion by alternative.

Acres available for developed recreation sites are primarily a function of capital investments for new sites. This occurs only in Alternatives 3, 7, 8, and the Proposed Action.

Alternatives Including the Proposed Action

Harvest Method Acreage

While Table 4 shows the total acreage available 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 acreage in each alternative devoted to various timber harvesting methods.

Table 5

Acres of Timber Harvest Methods

Alternative	Shelterwood Tractor	Cable
Proposed Action (10)	102,814	6,678
Current (4)	102,862	0
RPA (3)	115,131	7,481
1	115,131	7,481
2	102,814	6,678
6	102,862	0
7	102,814	6,678
8	113,430	7,367
9	115,131	7,481

Variation in the total acres harvested by tractor and cable is a function of slope gradient and alternative emphasis. Cable logging occurs on slope gradients in excess of 40 percent and represents 6 percent of the suitable timber lands.

Timber harvest in Alternatives 4 and 6 is restricted to suitable timber lands less than 40 percent slope.

Alternatives emphasize higher levels of timber output by including additional acres of suitable timber lands. The Proposed Action includes Forest lands in excess of 40 percent slope. Alternatives 2, 3, 7, and 8, include Forest lands in excess of 40 percent slope, and components of the Sierra Ancha Experimental Forest and the Pinal Mountains.

Resource Outputs

Table 6 displays the alternative and benchmark outputs for the first five time periods. Selected benchmarks are included so the alternatives can be viewed in perspective with the minimum level and maximum single resource outputs. The benchmarks do not contain all the constraints that were applied to the alternatives to make them financially and legally feasible. The units of measure are indicated by each output. Appendix B contains additional detail on estimation of outputs.

Table 6

Resource Outputs by Alternatives and Selected Benchmarks

Output/Activity		Proposed Action (10)	Current (4)	RPA (3)	Alternatives 1	2	6	7	8	9	Low Budget	Benchmarks Max PNV Asig.	Max Timber PNV	Max Range PNV
Recreation Developed					Thousand Recreation Visitor Days Per Year (MRVD)									
Period	1	1,539	1,537	1,580	1,541	1,537	1,537	1,648	1,581	1,537	1,048	1,580	1,580	1,537
	2	1,544	1,537	1,668	1,549	1,537	1,537	1,862	1,670	1,537	1,048	1,674	1,674	1,543
	3	1,558	1,537	1,763	1,558	1,537	1,537	2,088	1,766	1,537	1,048	1,770	1,770	1,543
	4	1,599	1,537	1,878	1,569	1,537	1,537	2,375	1,883	1,537	1,048	1,897	1,897	1,555
	5	1,643	1,537	1,962	1,577	1,537	1,537	2,580	1,968	1,537	1,048	1,981	1,981	1,555
Dispersed					Thousand Recreation Visitor Days Per Year (MRVD)									
Period	1	3,619	2,579	4,509	4,509	3,533	3,310	3,635	3,755	3,337	4,840	4,860	4,860	4,817
	2	4,036	2,860	5,018	5,018	3,936	3,693	4,048	4,181	3,723	5,393	5,415	5,415	5,367
	3	4,446	3,140	5,527	5,527	4,339	4,074	4,460	4,604	4,104	5,940	5,965	5,965	5,913
	4	4,899	3,457	6,095	6,095	4,780	4,486	4,914	5,076	4,521	6,545	6,573	6,573	6,516
	5	5,446	3,853	6,775	6,776	5,315	4,984	5,462	5,645	5,022	7,276	7,306	7,306	7,508
Highway Use					Thousand Recreation Visitor Days Per Year (MRVD)									
Period	1	3,065	3,065	3,065	3,065	3,065	3,065	3,065	3,065	3,065	3,065	3,065	3,065	3,065
	2	3,416	3,416	3,416	3,416	3,416	3,416	3,416	3,416	3,416	3,416	3,416	3,416	3,416
	3	3.763	3,763	3,763	3,763	3,763	3,763	3,763	3,763	3,763	3,763	3,763	3,763	3,763
	4	4,145	4,145	4,145	4,145	4,145	4,145	4,145	4,145	4,145	4,145	4,145	4,145	4,145
	5	4,610	4,610	4,610	4,610	4,610	4,610	4,610	4,610	4,610	4,610	4,610	4,610	4,610
Wilderness					Thousand Recreation Visitor Days Per Year (MRVD)									
Period	1	376	1,272	255	255	448	553	433	382	471	413	353	353	353
	2	427	1,453	296	296	514	629	498	439	535	470	410	410	410
	3	480	1,631	330	330	577	703	559	495	599	525	467	467	467
	4	528	1,800	353	353	634	774	614	541	657	569	510	510	510
	5	576	1,976	381	381	683	843	672	590	718	612	554	554	554
Wildlife & Fish Mgmt.					Thousand Wildlife Fish User Days Per Year (MRVD)									
Period	1	688	535	739	743	557	427	638	721	431	465	735	735	700
	2	774	535	850	858	558	427	725	829	431	465	832	832	776
	3	859	535	962	973	558	427	812	937	431	465	929	929	852
	4	945	535	1,073	1,088	558	427	899	1,046	431	465	1,025	1,025	929
	5	1,030	535	1,183	1,202	559	427	986	1,153	432	465	1,121	1,121	1,005

Table 6 (continued)

Resource Outputs by Alternatives and Selected Benchmarks

Output/Activity		Alternatives: Proposed Action (10)	Current (4)	RPA (3)	1	2	6	7	8	9	Benchmarks: Low Budget	Max PNV Alg.	Max Timber PNV	Max Range PNV
Range Mgmt. Permitted Use						Thousand Animal/Unit Months Per Year (MAUM)								
Period	1	397	404	405	405	249	404	405	405	403	414	412	412	403
	2	251	347	318	316	226	341	317	316	340	349	325	325	324
	3	272	338	284	287	202	285	285	285	284	290	288	288	267
	4	275	268	226	228	193	226	226	226	226	230	230	230	284
	5	278	278	226	204	197	196	200	201	197	198	200	200	301
Grazing Capacity														
Period	1	247	245	253	252	249	248	250	251	248	252	252	252	259
	2	251	252	236	230	226	225	228	228	225	228	229	229	260
	3	272	261	219	207	202	201	204	204	202	204	205	205	267
	4	275	268	226	199	193	191	195	196	192	193	195	195	284
	5	278	278	226	204	197	196	200	201	197	198	200	200	301
Soil & Water Mgmt.-Watershed Condition						Million Acres Satisfactory Condition or Better (MM Acres)								
Period	1	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9
	2	1.0	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.8	0.8	1.0
	3	2.7	1.8	1.8	1.8	2.7	1.4	1.8	1.8	1.4	1.3	1.7	1.7	2.1
	4	2.8	2.3	2.1	1.9	2.8	1.8	1.9	1.9	1.8	1.8	1.8	1.8	2.8
	5	2.8	2.8	2.6	2.5	2.8	2.4	2.5	2.5	2.4	2.4	2.4	2.4	2.8
Timber Mgmt. Net Sawtimber						Million Board Feet Per Year (MMBF)								
Period	1	7.5	7.5	16.4	7.5	7.5	4.7	7.5	7.5	7.5	4.7	16.4	6.9	26.5
	2	13.4	7.5	17.2	9.7	12.1	4.7	12.1	13.4	13.4	4.7	17.2	18.1	14.2
	3	16.4	11.7	17.1	8.6	14.8	4.7	14.8	18.2	19.1	4.7	17.1	10.9	15.3
	4	16.4	11.9	18.8	12.1	15.2	4.7	15.2	18.7	20.3	4.7	18.8	13.4	13.2
	5	16.0	9.1	17.6	10.1	9.7	4.7	9.7	17.4	19.7	4.7	17.6	12.5	17.1

Table 6 (continued)

Resource Outputs by Alternatives and Selected Benchmarks

Output/Activity		Proposed Action (10)	Current (4)	RPA (3)	Alternatives 1	2	6	7	8	9	Benchmarks Low Budget	Max PNV Alg.	Max Timber PNV	Max Range PNV
Net Products					Million Board Feet Per Year (MMBF)									
Period	1	.4	.7	1.6	.2	1.2	.03	1.2	.3	.5	.03	1.6	-	3.3
	2	.4	-	.2	1.2	.2	-	.2	.2	.4	-	.2	.6	.9
	3	.1	.4	.6	1.9	.2	.05	.2	.2	.6	.05	.6	.6	1.6
	4	.4	.5	.6	.5	-	.06	-	.4	.4	.06	.6	.9	.3
	5	.7	2.2	1.2	.8	3.4	.10	3.4	.9	.6	.10	1.2	1.2	4.3
Fuelwood PJ					Million Board Feet Per Year (MMBF)									
Period	1	5.1	3.5	7.5	7.5	5.1	3.5	7.3	7.4	4.5	3.5	7.5	7.4	6.6
	2	5.1	3.5	7.5	7.5	5.1	3.5	7.3	7.4	4.5	3.5	7.5	7.4	6.6
	3	5.1	3.5	7.5	7.5	5.1	3.5	7.3	7.5	4.5	3.5	7.5	7.4	6.6
	4	5.1	3.5	7.5	7.5	5.1	3.5	7.3	7.5	4.5	3.5	7.5	7.4	6.6
	5	5.1	3.5	7.5	7.5	5.1	3.5	7.3	7.5	4.5	3.5	7.5	7.4	6.6
Fuelwood Other					Million Board Fee Per Year (MMBF)									
Period	1	4.4	3.6	6.4	5.7	4.5	3.4	5.4	5.5	4.8	3.4	6.4	5.5	6.6
	2	4.8	3.6	6.5	5.9	4.9	3.4	5.7	5.9	5.3	3.4	6.5	6.3	5.8
	3	5.1	4.0	6.5	5.9	5.0	3.4	5.9	6.3	5.7	3.4	6.5	5.7	5.9
	4	5.1	4.0	6.6	6.1	5.1	3.4	6.0	6.3	5.8	3.4	6.6	5.9	5.7
	5	5.0	3.8	6.5	5.9	4.7	3.4	5.6	6.2	5.7	3.4	6.5	5.9	6.0
Net Merch. Timber Vol.					Million Cubic Feet Per Year (MMCF)									
Period	1	2.2	2.1	4.8	2.1	2.2	1.3	2.3	2.2	2.1	1.3	4.8	1.8	8.1
	2	3.9	2.1	4.8	2.9	3.5	1.3	3.5	3.8	3.9	1.3	4.8	5.0	4.1
	3	4.2	3.0	4.8	3.0	3.7	1.3	3.7	4.7	5.0	1.3	4.8	2.9	4.5
	4	4.2	3.0	4.8	2.9	3.7	1.3	3.7	4.7	5.0	1.3	4.8	3.7	3.1
	5	4.2	3.0	4.8	2.9	3.7	1.5	3.7	4.7	5.0	1.5	4.8	3.6	6.0
LTSYC					Million Cubic Feet Per Year (MMCF)									
Period 1 - 8		5.1	3.8	5.8	2.9	4.2	2.2	4.3	5.5	5.1	2.2	5.8	6.3	4.1

Table 6 (continued)

Resource Outputs by Alternatives and Selected Benchmarks

Output/Activity		Alternatives: Proposed Action (10)	Current (4)	RPA (3)	1	2	6	7	8	9	Low Budget	Benchmarks: Max PNV Alg.	Max Timber PNV	Max Range PNV
Water Yield					Thousand Acre Feet Per Year (M Acre Feet)									
Period	1	356	332	364	378	332	332	361	362	334	332	362	362	371
	2	375	332	384	399	332	332	380	381	334	332	386	386	394
	3	394	332	405	419	332	332	398	400	334	332	407	407	416
	4	394	332	405	419	332	332	398	400	334	332	407	407	416
	5	394	332	405	419	332	332	398	400	334	332	407	407	416

Alternatives Including the Proposed Action

The Low Budget benchmark defines the lower end of the feasible legal decision space. This benchmark meets only minimum management standards required by regulation, and establishes the base level for all other resource outputs. This does not appear to be true when analyzing wilderness recreation visitor days. However, the reader must remember, wilderness use as displayed is a function of limiting and distributing visitor use in accordance with estimates of maximum level of use that allow natural processes to operate freely, and that do not impair the values for which wilderness areas were created.

The maximum PNV assigned value benchmark represents the most cost efficient manner of managing the Forest based on resources having an established market or assigned value, and the associated costs of producing those resource outputs. In other words the outputs are solely the result of a mathematical solution to a planning problem.

Alternative 4 displays the consequences of continuing with the current management direction. This alternative is important because it establishes a base line from which to compare the effect of analyzing other combinations of management prescriptions to attain specific resource outputs, or to implement specific management decisions.

In Alternative 8, the objective of maximizing opportunity for hunting, fishing, and non-consumptive wildlife use and wildlife habitat management is compatible with Alternative 3 which attempts to meet the Forests' share of the Regions' RPA targets. Consequently, the output differences between Alternatives 3 and 8 are insignificant.

Alternatives 3, 7, and 8 meet 100 percent of demand in developed recreation. Alternative 7 produces the highest outputs because there were no budget constraints, and the objective was to maximize non-wildlife recreation Forest-wide. Comparable levels of developed recreation do not occur in the Proposed Action because budget constraints preclude optimum levels of recreation site development. High levels of developed recreation outputs do not occur in the remaining alternatives because it is not compatible with objectives of those alternatives.

Unless the planning solution was constrained to achieve a high level of grazing capacity the lower end of the decision space was not exceeded in any alternative. This is because the monetary costs associated with structural and nonstructural range improvements do not result in large monetary benefits. It does not include the net benefits comprised of the positive social and economic benefits to communities within and immediately adjacent to the Forest. The Proposed Action reflects a management decision to provide an output level compatible with dependent livestock enterprises.

The rate of improvement in watershed conditions is related to the rate of improvement in range forage condition, and the level of investments made in watershed improvement projects.

Sawtimber and product outputs are highest in Alternatives 2, 3, 7, 8, 9, and the Proposed Action, because these alternatives feature the most intensive silvicultural systems.

Higher fuelwood outputs are directly related to vegetative modification for water yield and wildlife habitat improvement in Alternatives 1, 3, 7, 8, and the Proposed Action.

Costs

Table 7 displays the costs of implementing the alternatives and benchmarks for the first five time periods. They are expressed as average annual figures in thousands of dollars. Selected 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 7

Cost by Alternatives and Selected Benchmarks - M Dollars Per Year

Cost		Proposed Action (10)	Current (4)	RPA (3)	1	2	6	7	8	9	Low Budget	Max PNV Alg.	Max Timber PNV	Max Range PNV
Total Budget to Implement														
Period	1	8,667	8,920	12,410	7,815	7,913	7,467	23,515	8,474	7,701	4,552	12,421	12,157	11,513
	2	10,786	8,913	11,162	10,094	9,733	6,408	16,442	11,995	6,801	4,551	11,305	11,321	9,671
	3	10,806	10,899	12,159	9,098	8,379	6,436	21,509	11,815	6,966	4,580	12,259	12,095	9,752
	4	10,777	10,898	13,516	9,101	8,362	6,436	19,867	12,925	6,926	4,579	14,120	14,010	10,123
	5	10,777	10,898	14,826	8,882	8,363	6,435	25,184	13,496	6,924	4,579	15,031	14,929	9,980
Constrainted 1/ Portion of Total Budget														
Period	1	7,329	7,117	10,876	6,438	6,763	6,450	22,177	7,115	6,609	3,534	10,929	10,809	9,905
	2	9,341	7,111	9,628	8,674	8,513	5,392	15,034	10,550	5,714	3,534	9,813	9,818	8,285
	3	9,342	9,049	10,618	7,678	7,170	5,417	20,086	10,313	5,714	3,560	10,761	10,698	8,330
	4	9,342	9,049	11,973	7,679	7,153	5,418	18,444	11,427	5,676	3,560	12,620	12,577	8,773
	5	9,342	9,049	13,290	7,463	7,154	5,417	23,761	11,849	5,675	3,560	13,538	13,499	11,991
Developed Recreation O&M														
Period	1	876	524	1,214	925	929	841	4,088	1,220	925	239	1,220	1,220	928
	2	876	525	1,769	926	929	841	5,438	1,782	926	239	1,832	1,832	985
	3	876	524	2,313	925	929	839	6,676	2,337	925	238	2,376	2,372	985
	4	876	524	3,139	925	929	840	7,868	3,174	925	238	3,305	3,301	1,088
	5	876	524	3,139	925	929	839	8,481	3,175	925	238	3,306	3,301	1,088

1/ The constraint portion of the budget includes all funds expended by the Forest except timber purchaser road construction, emergency forest fire funds, and range betterment funds held in the Regional Office. The total budget to implement an alternative includes the above items plus range permittee costs and costs associated with on site soil loss. Refer to Appendix B for further details on costs.

If recreation facilities are constructed on Roosevelt Lake in conjunction with Plan 6 of the Central Arizona Project, developed recreation O&M will be funded an additional $300,000/year for Period 1, $600,000/year for Period 2, and $1,200,000/year for all subsequent periods.

Table 7 (continued)

Cost by Alternatives and Selected Benchmarks - M Dollars Per Year

Cost		Proposed Action (10)	Current (4)	RPA (3)	1	2	6	7	8	9	Low Budget	Max PNV Alg.	Max Timber PNV	Max Range PNV
Developed Recreation Capital Investments														
Period	1	359	0	3,059	0	0	2,354	11,634	0	2,354	0	3,063	3,062	2,362
	2	2,487	0	2,173	2,354	2,354	1,296	3,910	3,070	1,295	0	2,193	2,192	1,319
	3	2,245	0	2,593	1,295	1,295	1,296	7,746	2,186	1,295	0	2,589	2,593	1,296
	4	2,247	0	3,282	1,295	1,295	1,296	5,075	2,612	1,295	0	3,593	3,597	1,610
	5	2,248	0	4,538	1,295	1,295	1,296	9,711	3,311	1,295	0	4,534	4,538	1,295
Dispersed 2/ Recreation														
Period	1	208	304	598	275	155	169	658	608	160	114	683	683	375
	2	208	304	509	275	155	169	568	517	160	114	610	610	391
	3	208	304	514	275	155	169	574	523	160	114	641	641	417
	4	208	304	449	275	155	169	508	456	160	114	660	660	501
	5	208	304	514	275	155	169	574	523	160	114	641	641	417

2/ Includes only non-wildlife and non-wilderness costs.

Table 7 (continued)

Cost by Alternatives and Selected Benchmarks - M Dollars Per Year

Cost		Proposed Action (10)	Current (4)	RPA (3)	1	2	6	7	8	9	Low Budget	Max PNV Alg.	Max Timber PNV	Max Range PNV
Wilderness Management														
Period	1	154	125	141	143	134	42	139	143	45	97	156	156	143
	2	154	125	141	143	134	42	139	143	45	97	156	156	143
	3	154	125	141	143	134	42	139	143	45	97	156	156	143
	4	154	125	141	143	134	42	139	143	45	97	156	156	143
	5	154	125	141	143	134	42	139	143	45	97	156	156	143
Trails O&M														
Period	1	110	112	86	89	90	63	100	97	63	55	104	104	83
	2	110	112	86	89	90	63	100	97	63	55	104	104	83
	3	110	112	86	89	90	63	100	97	63	55	104	104	83
	4	110	112	86	89	90	63	100	97	63	55	104	104	83
	5	110	112	86	89	90	63	100	97	63	55	104	104	83
Trails Capital Investment														
Period	1	126	5	225	86	85	0	267	264	0	0	307	307	74
	2	126	5	68	86	85	0	109	105	0	0	150	150	74
	3	64	5	114	44	42	0	135	133	0	0	155	155	37
	4	64	5	35	44	42	0	55	53	0	0	76	76	37
	5	64	5	35	44	42	0	55	53	0	0	76	76	37
Wildlife O&M														
Period	1	173	100	186	195	37	6	151	176	28	14	175	175	174
	2	173	100	186	195	37	6	151	176	28	14	175	175	174
	3	173	100	186	195	37	6	151	176	28	14	175	175	174
	4	173	100	186	195	37	6	151	176	28	14	175	175	174
	5	173	100	186	195	37	6	151	176	28	14	175	175	174

Table 7 (continued)

Cost by Alternatives and Selected Benchmarks - M Dollars Per Year

Cost		Proposed Action (10)	Current (4)	RPA (3)	1	2	6	7	8	9	Low Budget	Max PNV Alg.	Max Timber PNV	Max Range PNV
Wildlife Habitat Improvement														
Period	1	51	9	53	59	6	0	44	56	0	0	53	53	44
	2	51	9	53	59	6	0	44	56	0	0	53	53	44
	3	51	9	53	59	6	0	44	56	0	0	53	53	44
	4	51	9	53	59	6	0	44	56	0	0	53	53	44
	5	51	9	53	59	6	0	44	56	0	0	53	53	44
T&E Operation & Maintenance														
Period	1	17	0	22	23	17	17	22	23	17	17	22	22	16
	2	17	0	22	23	17	17	22	23	17	17	22	22	16
	3	17	0	22	23	17	17	22	23	17	17	22	22	16
	4	17	0	22	23	17	17	22	23	17	17	22	22	16
	5	17	0	22	23	17	17	22	23	17	17	22	22	16
T&E Habitat Improvement														
Period	1	42	21	28	30	0	0	27	28	0	0	27	27	30
	2	42	21	28	30	0	0	27	28	0	0	27	27	30
	3	42	21	28	30	0	0	27	28	0	0	27	27	30
	4	42	21	28	30	0	0	27	28	0	0	27	27	30
	5	42	21	28	30	0	0	27	28	0	0	27	27	30
Range O&M														
Period	1	439	311	169	165	605	141	139	139	137	141	139	139	532
	2	439	311	169	165	605	141	139	139	137	141	139	139	532
	3	439	311	169	165	532	141	139	139	137	141	139	139	532
	4	439	311	169	165	300	141	139	139	137	141	139	139	532
	5	439	311	169	165	300	141	139	139	137	141	139	139	532

Table 7 (continued)

Cost by Alternatives and Selected Benchmarks - M Dollars Per Year

Cost		Proposed Action (10)	Current (4)	RPA (3)	1	2	6	7	8	9	Low Budget	Max PNV Asig.	Max Timber PNV	Max Range PNV
Range Improvements														
Period	1	326	234	93	85	200	58	58	59	56	58	58	58	277
	2	401	234	93	85	200	58	58	59	56	58	58	58	277
	3	343	234	133	129	88	88	87	88	84	88	87	87	413
	4	159	234	133	129	88	88	87	88	84	88	87	87	413
	5	159	234	133	129	88	88	87	88	84	88	87	87	413
Reforestation and Timber Stand Improvement														
Period	1	125	125	125	125	125	89	125	125	125	89	125	125	125
	2	125	125	125	125	125	89	125	125	125	89	125	125	125
	3	125	125	125	125	125	89	125	125	125	89	125	125	125
	4	125	125	125	125	125	89	125	125	125	89	125	125	125
	5	125	125	125	125	125	89	125	125	125	89	125	125	125
Timber Sale Preparation & Admin.														
Period	1	401	398	486	398	405	313	405	403	395	313	486	368	596
	2	456	398	487	426	443	313	443	453	458	313	487	494	464
	3	470	425	490	425	451	313	450	485	533	313	491	429	478
	4	468	425	491	426	450	313	450	483	495	313	492	450	435
	5	467	425	487	425	452	313	452	336	494	313	487	450	532
Timber Purchaser Road Construction														
Period	1	265	265	409	265	265	163	265	265	265	163	409	265	593
	2	358	265	410	309	336	163	336	352	361	163	410	421	372
	3	379	313	414	306	349	163	349	407	424	163	414	313	396
	4	377	313	416	308	349	163	349	403	423	163	416	349	324
	5	377	313	410	306	350	163	350	553	422	163	410	347	483

Table 7 (continued)

Cost by Alternatives and Selected Benchmarks - M Dollars Per Year

Cost		Proposed Action (10)	Current (4)	RPA (3)	1	2	6	7	8	9	Low Budget	Max PNV Asig.	Max Timber PNV	Max Range PNV
Law Enforcement														
Period	1	208	107	113	83	67	31	141	124	31	31	143	142	114
	2	208	107	113	83	67	31	141	124	31	31	143	142	114
	3	208	107	113	83	67	31	141	124	31	31	143	142	114
	4	208	107	113	83	67	31	141	124	31	31	143	142	114
	5	208	107	113	83	67	31	141	124	31	31	143	142	114
Fire Management														
Period	1	1,042	1,547	1,159	1,148	894	888	1,118	1,139	859	888	1,127	1,127	981
	2	1,042	1,547	1,159	1,148	894	888	1,118	1,139	859	888	1,127	1,127	981
	3	1,042	1,547	1,159	1,148	894	888	1,118	1,139	859	888	1,127	1,127	981
	4	1,042	1,547	1,159	1,148	894	888	1,118	1,139	859	888	1,127	1,127	981
	5	1,042	1,547	1,159	1,148	894	888	1,118	1,139	859	888	1,127	1,127	981
Fuel Treatment														
Period	1	44	29	24	24	24	0	24	24	0	0	24	24	24
	2	44	29	24	24	24	0	24	24	0	0	24	24	24
	3	44	29	24	24	24	0	24	24	0	0	24	24	24
	4	44	29	24	24	24	0	24	24	0	0	24	24	24
	5	44	29	24	24	24	0	24	24	0	0	24	24	24
Emergency Forest Fire Funds														
Period	1	977	1,461	1,087	1,075	836	831	1,047	1,067	804	831	1,056	1,056	920
	2	977	1,461	1,087	1,075	836	831	1,047	1,067	804	831	1,056	1,056	920
	3	977	1,461	1,087	1,075	836	831	1,047	1,067	804	831	1,056	1,056	920
	4	977	1,461	1,087	1,075	836	831	1,047	1,067	804	831	1,056	1,056	920
	5	977	1,461	1,087	1,075	836	831	1,047	1,067	804	831	1,056	1,056	920

Table 7 (continued)

Cost by Alternatives and Selected Benchmarks - M Dollars Per Year

Cost		Proposed Action (10)	Current (4)	RPA (3)	1	2	6	7	8	9	Low Budget	Max PNV Alg.	Max Timber PNV	Max Range PNV
Road O&M														
Period	1	309	387	225	223	203	193	208	214	197	215	213	213	234
	2	309	387	225	223	203	193	208	214	197	215	213	213	234
	3	309	387	225	223	203	193	208	214	197	215	213	213	234
	4	309	387	225	223	203	193	208	214	197	215	213	213	234
	5	309	387	225	223	203	193	208	214	197	215	213	213	234
Road Capital Investments														
Period	1	252	483	159	157	142	135	146	150	138	151	150	150	193
	2	252	483	159	157	142	135	146	150	138	151	150	150	193
	3	252	491	159	157	142	135	146	150	138	151	150	150	193
	4	252	491	159	157	142	135	146	150	138	151	150	150	193
	5	252	491	159	157	142	135	146	150	138	151	150	150	193
Existing Road Closures														
Period	1	10	7	12	7	9	0	10	10	0	0	7	7	7
	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	0	0	0	0	0	0	0	0
Facilities Maintenance														
Period	1	104	88	56	56	54	47	54	54	49	25	27	27	26
	2	104	88	56	56	54	47	54	54	49	25	27	27	26
	3	104	88	56	56	54	47	54	54	49	25	27	27	26
	4	104	88	56	56	54	47	54	54	49	25	27	27	26
	5	104	88	56	56	54	47	54	54	49	25	27	27	26

Table 7 (continued)

Cost by Alternatives and Selected Benchmarks - M Dollars Per Year

Cost		Proposed Action (10)	Current (4)	RPA (3)	1	2	6	7	8	9	Low Budget	Max PNV Alg.	Max Timber PNV	Max Range PNV
Facility Capital Investments														
Period	1	59	0	541	88	513	0	515	0	0	24	512	512	512
	2	59	0	81	148	77	0	104	198	0	24	98	98	98
	3	59	1,904	17	215	16	0	16	198	0	24	40	40	40
	4	59	1,904	0	215	0	0	0	198	0	24	25	25	25
	5	59	1,904	0	0	0	0	0	0	0	24	25	25	25
General Administration														
Period	1	1,251	1,604	1,509	1,479	1,172	716	1,495	1,493	693	716	1,513	1,513	1,543
	2	1,176	1,604	1,509	1,479	1,172	716	1,495	1,493	693	716	1,513	1,513	1,543
	3	1,535	1,604	1,509	1,479	1,172	716	1,495	1,493	693	716	1,513	1,513	1,543
	4	1,719	1,604	1,509	1,479	1,404	716	1,495	1,493	693	716	1,513	1,513	1,543
	5	1,719	1,604	1,509	1,479	1,404	716	1,495	1,493	693	716	1,513	1,513	1,543
Lands Mgmt.														
Period	1	80	84	57	55	57	57	56	56	55	57	56	56	60
	2	80	84	57	55	57	57	56	56	55	57	56	56	60
	3	80	84	57	55	57	57	56	56	55	57	56	56	60
	4	80	84	57	55	57	57	56	56	55	57	56	56	60
	5	80	84	57	55	57	57	56	56	55	57	56	56	60
Land Line Location														
Period	1	36	29	27	27	29	29	27	27	28	29	27	27	27
	2	28	29	27	27	29	29	27	27	28	29	27	27	27
	3	28	29	27	27	29	29	27	27	28	29	27	27	27
	4	28	29	27	27	29	29	27	27	28	29	27	27	27
	5	28	29	27	27	29	29	27	27	28	29	27	27	27

Table 7 (continued)

Cost by Alternatives and Selected Benchmarks - M Dollars Per Year

Cost		Proposed Action (10)	Current (4)	RPA (3)	1	2	6	7	8	9	Low Budget	Max PNV Asig.	Max Timber PNV	Max Range PNV
Cultural Resource Mgmt.														
Period	1	45	57	45	41	39	29	50	47	28	29	50	50	45
	2	45	57	45	41	39	29	50	47	28	29	50	50	45
	3	45	57	45	41	39	29	50	47	28	29	50	50	45
	4	45	57	45	41	39	29	50	47	28	29	50	50	45
	5	45	57	45	41	39	29	50	47	28	29	50	50	45
Soil & Water Mgmt. & Improvement														
Period	1	157	268	93	83	398	57	77	77	55	57	80	80	129
	2	157	268	93	83	398	57	77	77	55	57	80	80	129
	3	157	268	93	83	398	57	77	77	55	57	80	80	129
	4	157	268	93	83	398	57	77	77	55	57	80	80	129
	5	157	268	93	83	398	57	77	77	55	57	80	80	129
Road Obliteration Projects														
Period	1	139	0	200	200	176	0	181	185	0	0	197	197	97
	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	0	0	0	0	0	0	0	0
Energy Minerals Mgmt.														
Period	1	57	57	56	55	57	57	56	56	55	57	56	56	57
	2	57	57	56	55	57	57	56	56	55	57	56	56	57
	3	57	57	56	55	57	57	56	56	55	57	56	56	57
	4	57	57	56	55	57	57	56	56	55	57	56	56	57
	5	57	57	56	55	57	57	56	56	55	57	56	56	57

Table 7 (continued)

Cost by Alternatives and Selected Benchmarks - M Dollars Per Year

Cost		Proposed Action (10)	Current (4)	RPA (3)	1	2	6	7	8	9	Low Budget	Max PNV Alg.	Max Timber PNV	Max Range PNV
Non-Energy Minerals Mgmt.														
Period	1	97	86	84	83	86	86	84	84	83	86	84	84	86
	2	97	86	84	83	86	86	84	84	83	86	84	84	86
	3	97	86	84	83	86	86	84	84	83	86	84	84	86
	4	97	86	84	83	86	86	84	84	83	86	84	84	86
	5	97	86	84	83	86	86	84	84	83	86	84	84	86
Non-Energy Mine Rehab.														
Period	1	14	0	0	0	21	0	0	0	0	0	11	11	0
	2	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	0
	4	0	0	0	0	0	0	0	0	0	0	0	0	0
	5	0	0	0	0	0	0	0	0	0	0	0	0	0
Other														
Period	1	91	93	69	68	57	55	104	61	56	56	61	61	106
	2	90	92	68	67	56	54	146	60	55	55	60	60	105
	3	90	92	67	66	55	54	145	59	55	55	59	59	104
	4	89	91	67	66	55	53	145	59	54	54	59	59	104
	5	89	91	66	65	54	53	144	58	54	54	58	58	103

The costs to implement Alternative 7 are the highest because substantial capital investments are necessary to construct developed recreation sites Forest-wide.

Alternatives 3 and 8 have a moderate amount of capital investment for developed recreation facilities and administrative site construction.

The Proposed Action reflects anticipated funding levels. As a result, major capital investments for rehabilitation of developed recreation sites are delayed until the second period. Major capital investments in new developed recreation sites are delayed until the third period. A low level of capital investments for administrative facilities is maintained throughout all time periods.

Alternatives 6 and 9 represent a management level which incorporates a high number of prescriptions which meet only minimum management standards.

Benefits

Table 8 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 time periods. This data is useful to evaluate trends over time in resource production and value. Table 8 also contains data on potential receipts to the U.S. Government, the distribution of revenues to the States, and employment and income generated by each alternative.

Selected 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 8

Resource Benefits by Alternatives and Benchmarks (M M Dollars) Per Period

Benefits		Alternatives: Proposed Action (10)	Current (4)	RPA (3)	1	2	6	7	8	9	Benchmarks: Low Budget	Max PNV Asig.	Max Timber PNV	Max Range PNV
Total Benefits														
Period	1	1,090.4	942.5	1,247.7	1,207.6	983.6	759.9	1,165.5	1,176.7	776.4	751.0	1,283.7	1,269.3	1,187.8
	2	1,167.0	1,001.8	1,360.5	1,311.5	1,054.0	796.6	1,285.3	1,290.5	821.3	793.8	1,400.9	1,377.8	1,263.5
	3	1,281.3	1,072.2	1,477.3	1,416.1	1,128.9	834.8	1,409.0	1,408.5	867.5	838.1	1,520.9	1,511.5	1,361.3
	4	1,377.7	1,142.0	1,596.9	1,523.7	1,195.4	875.9	1,531.6	1,519.2	909.9	886.1	1,643.4	1,636.1	1,456.7
	5	1,489.7	1,214.5	1,729.8	1,644.7	1,269.8	928.1	1,658.1	1,644.7	960.9	947.5	1,781.3	1,773.9	1,599.0
Timber Benefits														
Period	1	14.8	11.7	25.5	12.1	11.9	7.5	12.1	12.0	11.8	7.6	25.5	11.1	40.1
	2	20.6	11.7	26.3	15.3	18.7	7.5	18.9	20.8	20.4	7.5	26.3	3.2	21.6
	3	24.7	17.9	26.0	13.9	22.7	7.4	22.9	27.5	28.8	7.5	25.9	16.5	23.6
	4	25.0	18.3	28.2	18.9	23.3	7.5	23.6	28.6	30.5	7.5	28.1	20.8	19.9
	5	24.4	14.2	24.5	16.0	15.2	7.6	15.4	26.7	29.7	7.6	27.0	19.5	26.0
Recreation Benefits														
Period	1	766.4	652.8	901.5	868.4	703.7	491.0	848.7	847.6	501.4	474.7	938.2	938.2	830.3
	2	843.5	717.3	997.0	952.5	769.7	533.6	949.6	937.3	543.4	523.6	1,038.9	1,038.9	911.0
	3	917.7	781.4	1,091.8	1,035.0	835.0	575.7	1,051.0	1,026.9	585.0	571.9	1,138.9	1,138.9	990.2
	4	1,000.8	856.0	1,196.2	1,125.1	905.2	620.9	1,164.5	1,125.1	629.8	624.3	1,249.4	1,249.4	1,076.0
	5	1,100.0	931.1	1,317.1	1,133.5	989.3	674.8	1,288.0	1,238.2	683.3	687.3	1,376.1	1,376.1	1,200.1
Wildlife Benefits														
Period	1	100.2	77.9	107.7	108.2	81.2	62.2	92.9	105.0	62.7	67.7	107.0	107.1	101.9
	2	112.7	77.9	123.9	125.0	81.3	62.2	105.6	120.8	62.8	67.7	121.2	121.2	113.1
	3	125.2	77.9	140.1	141.8	81.3	62.2	118.3	136.6	62.8	67.7	135.3	135.3	124.1
	4	137.7	77.9	156.3	158.6	81.4	62.2	131.0	152.4	62.9	67.7	149.4	149.4	135.3
	5	150.1	77.9	172.4	175.3	81.4	62.2	143.6	168.1	62.9	67.7	163.4	163.4	146.4

Table 8 (continued)

Resource Benefits by Alternatives and Benchmarks (M M Dollars) Per Period

Benefits		Alternatives									Benchmarks			
		Proposed Action (10)	Current (4)	RPA (3)	1	2	6	7	8	9	Low Budget	Max PNV Alg.	Max Timber PNV	Max Range PNV
Minerals														
Period	1	35.7	35.7	35.7	35.7	35.7	35.7	35.7	35.7	35.7	35.7	35.7	35.7	35.7
	2	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0
	3	35.8	35.8	35.8	35.8	35.8	35.8	35.8	35.8	35.8	35.8	35.8	35.8	35.8
	4	36.3	36.3	36.3	36.3	36.3	36.3	36.3	36.3	36.3	36.3	36.3	36.3	36.3
	5	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0	37.0
Range Benefits														
Period	1	32.4	33.0	33.0	33.1	20.3	33.0	33.0	33.0	32.9	33.8	33.7	33.7	32.9
	2	19.1	28.3	26.0	25.7	18.5	27.8	25.9	25.8	27.8	28.5	26.5	26.5	26.4
	3	22.2	27.6	23.2	23.4	16.4	23.2	23.3	23.3	23.2	23.7	23.5	23.5	21.8
	4	22.4	21.9	18.4	18.6	15.7	18.5	18.5	18.4	18.5	18.8	18.7	18.7	23.2
	5	22.5	22.7	18.4	16.7	16.1	16.0	16.4	16.4	16.1	16.2	16.4	16.4	24.6
Water Yield Benefits														
Period	1	141.1	131.4	144.1	149.9	131.3	131.4	143.1	143.4	132.4	131.3	143.3	143.3	146.7
	2	148.4	131.4	152.1	157.8	131.3	131.4	150.3	150.8	132.4	131.3	152.8	152.8	156.2
	3	155.9	131.4	160.2	166.0	131.3	131.4	147.7	158.4	132.4	131.3	161.3	161.3	164.7
	4	155.9	131.4	160.2	166.0	131.3	131.4	157.7	158.4	132.4	131.3	161.3	161.3	164.7
	5	155.9	131.4	160.2	166.0	131.3	131.4	157.7	158.4	132.4	131.3	161.3	161.3	164.7

Table 8 (continued)

Resource Benefits by Alternatives and Benchmarks (M M Dollars) Per Period

Benefits		Alternatives: Proposed Action (10)	Current (4)	RPA (3)	1	2	6	7	8	9	Benchmarks: Low Budget	Max PNV Asig.	Max Timber PNV	Max Range PNV
Returns to 1/ U.S. Govt.														
Period	1	21.5	18.5	32.4	18.9	17.1	14.3	19.1	18.9	18.6	13.8	32.5	18.1	46.9
	2	25.6	17.9	32.4	21.1	23.7	13.6	25.3	26.9	26.5	13.0	32.4	9.3	27.5
	3	30.0	24.0	31.8	19.4	20.6	12.9	29.2	33.3	34.3	12.3	31.7	22.3	28.1
	4	30.8	23.6	32.6	23.9	25.1	12.3	29.7	33.9	35.3	11.7	33.5	26.2	25.3
	5	30.0	19.6	29.9	20.6	19.7	12.1	21.5	31.9	34.2	11.4	32.2	24.7	31.7
Returns to 2/ States														
Period	1	5.4	4.6	8.1	4.7	4.7	3.6	4.8	4.7	4.7	3.5	8.1	4.5	11.7
	2	6.6	4.5	8.1	5.3	6.2	3.4	6.3	6.8	6.6	3.3	8.1	2.3	6.9
	3	7.5	6.0	8.0	4.9	5.3	3.2	7.3	8.3	8.6	3.1	7.9	5.6	7.0
	4	7.7	5.9	8.1	6.0	6.3	3.1	7.4	8.5	8.8	2.9	8.4	6.6	6.3
	5	7.5	4.9	7.5	5.2	4.9	3.0	5.4	8.0	8.6	2.9	8.1	6.2	7.9

1/ Includes sawtimber and products, fuelwood, grazing, and developed recreation revenues.

2/ Represents twenty-five percent of returns to U.S. Government.

Alternatives 6 and 9 provide the lowest return in resource benefit values, because for the most part, low intensity prescriptions meeting only minimum management standards entered into solution of the planning problem. This limits costs, but also limits the amount of investment work required to optimize benefits.

Alternative 3 provides the highest return in resource benefit values. This alternative is essentially the same as the maximum assigned value benchmark except slightly lower timber yields are attained, and the planning solution was constrained to achieve the Forest share of the Regions' RPA grazing target.

The Proposed Action ranks fifth in resource benefit values when compared to the Maximum PNV Benchmark. The primary reason reason for this is the budget constraint throughout all time periods. The biggest impact occurs on dollars available for construction and reconstruction of developed recreation sites. For comparative purposes, Alternative 3 generates an average annual return of 16.4 million dollars in developed recreation over the first five time periods, while the Proposed Action generates an average annual return of 13.9 million dollars over the same period of time.

Alternatives 2 and 4 do not emphasize management practices which enhance all forms of recreation on the Forest. Thus, these alternatives maintain a return in benefit values higher than Alternatives 6 and 9, but lower than the Proposed Action.

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 use), permitted livestock use, timber products and fuelwood, minerals, 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 nonpriced 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 substracted from the value of the expected flow of priced outputs.

Table 9 presents a display of the alternatives arranged in order of increasing present value of costs (PVC). 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.

Table 9

Value Analysis Over the Planning Horizon - Millions of 1980, 4th Quarter Dollars Discounted at 4 Percent

	6	9	2	1	Current (4)	Proposed Action (10)	8	RPA (3)	Max. PNV Assign.	7
PVB	2058.2	2118.7	2735.5	3387.4	2613.8	3099.8	3392.8	3576.6	3681.0	3392.3
Change Between Alt.		+ 60.5	+616.8	+651.9	-773.6	+486.0	+293.0	+183.8	+104.4	-288.7
PVC	168.7	177.9	215.8	219.9	237.3	250.0	281.2	309.5	314.3	538.9
Change Beteen Alt.		+ 9.2	+ 37.9	+ 4.1	+ 17.4	+ 12.7	+ 31.2	+ 28.3	+ 4.8	+224.6
PNV	1889.5	1940.8	2519.7	3167.5	2376.5	2849.8	3111.6	3267.1	3366.7	2853.4
Change Between Alt.		+ 51.3	+578.9	+647.8	-791.0	+473.3	+261.8	+155.5	+ 99.6	-513.3
PVB by Resource Category										
Timber	19.7	52.3	42.9	36.4	34.7	47.1	50.7	63.9	64.3	43.5
Recreation	1395.4	1419.2	2020.9	2457.3	1889.4	2221.5	2478.8	2636.1	2749.0	2529.2
Wildlife	154.8	155.9	201.9	335.3	193.1	298.5	323.5	331.8	322.0	281.1
Range	63.5	63.5	44.7	63.0	69.4	61.9	62.7	63.7	63.7	62.7
Water Yield	326.3	328.7	326.1	394.4	326.2	370.8	376.8	380.1	381.0	375.5
Minerals	98.5	99.1	99.0	101.0	101.0	100.0	100.3	101.0	101.0	100.3

Table 9 (continued)

Value Analysis Over the Planning Horizon - Millions of 1980, 4th Quarter Dollars Discounted at 4 Percent

	6	9	2	1	Current (4)	Proposed Action (10)	8	RPA (3)	Max. PNV Assign.	7
PVC by Major Budget Cost Category										
Timber 1/	14.6	23.4	21.9	20.9	20.5	22.6	23.0	25.6	25.3	21.9
Recreation 2/	67.0	68.9	56.7	60.8	21.7	69.8	120.0	136.0	147.1	375.6
Range 3/	5.3	5.1	13.6	6.7	13.5	17.4	5.2	6.9	5.2	5.2
Wildlife 4/	.6	1.1	1.5	7.6	3.2	7.0	7.0	7.2	6.9	5.7
Fire Protection	22.1	21.3	22.2	28.5	38.4	25.9	28.3	28.8	28.0	27.8
Road & Trail 5/	9.7	9.9	12.4	13.3	24.4	18.9	15.1	14.6	16.1	15.0
Const & Maint of Fac. 6/	1.2	1.2	6.0	4.3	17.4	4.0	3.7	6.4	5.8	6.2
General Admin.	17.8	17.2	38.8	36.7	39.8	38.7	37.1	37.5	37.6	37.1
Other	30.4	29.8	42.7	41.1	58.4	45.7	41.8	46.5	42.3	44.4

1/ Includes fuelwood survey, reforestation, timber stand improvement, timber sale preparation and administration, and timber purchaser road construction.

2/ Includes developed operation and maintenance, developed construction reconstruction, wilderenss management, and dispersed management.

3/ Includes range operation and maintenance, and FS range improvements.

4/ Includes wildlife operation and maintenance, habitat improvement, and threatened and endangered operation and maintenance and habitat improvement.

5/ Includes operation and maintenance and construction - reconstruction.

6/ Includes maintenance, construction, and reconstruction of facilities.

Alternatives Including the Proposed Action

Table 9 presents and compares discounted priced benefits, discounted costs, and the present net value of the alternatives, arranged in order of total investment and operating costs. With exception of Alternative 4 (Current Direction), 7, 8, and the Proposed Action, both total discounted priced benefits and PNV increase as total cost increases. The four exceptions to this trend occur because; 1) In Alternative 4 investments are not made which emphasize enhancement of wildlife habitat, development of recreational facilities in high use areas, and increased water yield. As a result, a larger portion of the budget is being spent in operation and maintenance areas which protect basic resource values, but maintain the status quo in relation to output levels. This alternative also emphasizes a level of permitted livestock use which is biased toward increased costs, but lower priced benefits and PNV; 2) Alternative 7 emphasizes large capital investments in new site development. This alternative would meet projected demand and provide recreation visitors with an optimum level of convenience. However, the large investments do not produce enough additional priced recreation visitor days to compensate for expenditure levels; 3) the factors affecting Alternative 8 lie primarily in slightly higher levels of operation and maintenance and capital investment in management of developed, dispersed, and wilderness recreation which do not increase priced outputs. This includes expenditures for facilities such as garbage cans, toilets, bulletin boards, etc. in dispersed recreation areas; 4) the Proposed Action emphasizes a level of permitted livestock use which is biased toward increased costs and lower priced benefits. Also, the budget constraints in all time periods severely limit capital investments in developed recreation facilities. This results in the Proposed Action falling 11 percent short of meeting long-term developed recreation demand. In other words, the budget constraint results in a larger proportion of the budget being spent on operation and maintenance and not invested in programs producing additional facilities and priced outputs.

The total cost increases from a low of $169 million (Alternative 6) to a high of $539 million (Alternative 7), a difference of $370 million.

Total priced benefits vary from a low of $2,058 million in Alternative 6 to a high of $3,577 million in Alternative 3. Present net value ranges from a low of $1,890 million in Alternative 6 to a high of $3,267 million in Alternative 3. This range represents the difference between the increase in total costs and the increase in total priced benefits between Alternatives 3 and 6.

Alternatives 6 and 9 are essentially low cost, low priced benefit alternatives with the following exceptions. In both alternatives developed recreation sites are rehabilitated in the first and second periods. In addition, Alternative 9 produces a high level sawtimber and products which accounts for most of the higher expenditures and PNV in Alternative 9.

With the exception of the Proposed Action and Alternatives 2, 3, and 4, range forage production costs remain consistent between alternatives. Costs increase in Alternative 3 because one objective of this alternative was to meet the Forest share of the Region's RPA target. Costs increase in the Proposed Action because the solution was constrained to achieve a level of grazing capacity in the third time period which is compatible with current management direction (278,000 animal unit months). Prescriptions which produce high levels of grazing capacity are not as cost effective as other prescriptions. Thus, constraints which produce higher levels of grazing capacity result in higher costs and reductions in PNV.

Range operation and maintenance costs increase in Alternative 2 because accelerated balancing of capacity and use result in higher administrative costs. These higher administrative costs result in reductions in PNV.

In general total recreation costs remain consistent when considering operation and maintenance, rehabilitation, and new construction in aggregate. Costs for Alternative 4 decline because developed receation sites are allowed to deteriorate without rehabilitation. Lower benefits in Alternatives 6 and 9 are a reflection of fewer dispersed RVD priced outputs in these alternatives. Costs in the Proposed Action remain relatively low in relation to Alternatives 3, 7, and 8 because major reconstruction of existing developed sites is delayed until the second period and major construction of new sites is delayed until the third time period. Even then, investments remain at a low level. Developed recreation costs are highest in Alternatives 3, 7, and 8. This is a reflection of capital investments in developed site construction. The fact that costs rise more rapidly than benefits in Alternative 7 is a reflection of developing marginal sites from the standpoint of increasing priced outputs.

Timber costs and benefits generally increase in proportion to harvest levels. Range, wildlife, and water yield benefits and costs are affected only slightly by variation in harvest levels. The activities associated with management of the Chapparal and Pinyon Juniper vegetative types in Alternatives 1, 3, 7, 8, and the Proposed Action result in improved wildlife habitat, increased water yield, and a substantial increase in benefits.

Monetary benefits to taxpayers, as reflected by receipts of the Treasury and payments to counties in lieu of taxes are substantially lower in alternatives which harvest less timber, and produce low levels of developed recreational opportunity.

Non-Priced Benefits

Minor trade-offs in PNV occur in a number of activities which have assigned costs, but do not have assigned benefit values. The trade-offs are so minor that they do not lend themselves to a meaningful analysis.

The major trade-offs in PNV occur in priced outputs because of constraints applied to achieve objectives of individual alternatives, and to meet budget constraints which insure financial feasibility.

Present Net Value

Table 10 displays the ranking of the alternatives against the Max PNV assigned value benchmark. The alternatives rank in the order of decreasing PNV from left to right. The comparisons are in millions of 1980, 4th quarter dollars discounted at 4 percent.

The difference in PNV from one alternative to the next is called the opportunity cost of that alternative. The opportunity cost is a measure of the economic efficiency foregone (change in PNV) to achieve the objectives of that alternative instead of the objectives of the next higher ranked alternative.

The alternatives differ in the amount of priced and nonpriced costs and benefits produced to meet the objectives of each alternative.

Table 10

Comparison of Alternatives with MAX PNV Assigned Benchmark

	Max PNV Assigned	RPA (3)	1	8	7	Proposed Action (10)	2	Current (4)	9	6
Millions Dollars	3366.7	3267.1	3167.5	3111.6	2853.4	2849.8	2519.7	2376.5	1940.8	1889.5
Percent of Max PNV Assigned		97.0%	94.1%	92.4%	84.8%	84.6%	74.8%	70.5%	57.6%	56.1%

Alternatives Including the Proposed Action

The following discussion highlights the major opportunity costs of each alternative compared to the alternative with the next highest PNV.

Max PNV Benchmark

The PNV of this benchmark is used as a reference point for evaluating the opportunity costs of achieving the objectives of the alternatives. This benchmark produced the highest PNV because the objective of the benchmark was to maximize economic efficiency with the least number of resource constraints. The only constraints on the benchmark were those needed to meet minimum policy, such as non-declining yield, and legal requirements which were common to all benchmarks and alternatives. See Appendix B for a complete discussion of constraints.

Alternative 3 (RPA)

This alternative was designed to produce the Forest's share of the national RPA targets assigned in the Regional Guide. Except for grazing use and developed recreation outputs, the max PNV benchmark achieved the Forest's assigned targets. The analysis model was constrained to produce the assigned amount of grazing use. As shown in Table 75 there is a trade-off between grazing use and recreation opportunities. The opportunity cost of Alternative 3 is $99.6 million and is due primarily to a reduction in recreation benefits and an increase in grazing costs to achieve the grazing use target.

Table 65 compares RPA targets with all alternatives.

Alternative 1

The objective of this alternative was to be highly responsive to the water yield issue. Increased water yields were obtained by constraining the analysis model to produce water at or near the maximum potential level. This is accomplished through management by burning in the chaparral type and keeping timber stands severely thinned. In addition, the alternative had a budget limit of $7.6 million per year during the first time period to reflect potential funding. The opportunity cost is $99.6 million, and is primarily due to reduction in recreation benefits caused by reduced recreation investment to stay under the budget limitation. Timber benefits are also reduced because the severe thinning reduces timber production.

Alternative 8

The objective of Alternative 8 was to respond to wildlife and riparian habitat issues. The alternative also had the same budget limit as Alternative 1. To meet the objectives of the alternative a set of wildlife habitat constraints were used to provide optimum quality wildlife habitat. Because the analysis model did not directly track habitat quality factors, constraints on management emphases of the various prescriptions were used as proxies. This limited the number of available prescriptions and caused the opportunity cost of $55.9 million with the primary benefit being quality of wildlife habitat which was unpriced and did not increase the priced wildlife RVD's.

Alternative 7

Alternative 7 is highly responsive to the issue of providing a high level of high quality developed and dispersed recreation opportunities. The analysis model was constrained to meet recreation demand and rehabilitate and maintain all recreation improvements to an as-built condition for the optimum comfort, convenience, and safety of Forest visitors. The budget was unlimited to show the opportunity cost of making maximum response to the recreation issue. The opportunity cost is $258.2 million and is primarily due to the rehabilitation and maintenance of facilities which does not increase benefits but improves the quality of recreation experience, reduces crowding, and increases safety.

Alternatives Including the Proposed Action

Proposed Action

This alternative is designed to be highly responsive to as many of the issues as possible. It achieves many of the nonpriced wildlife habitat objectives of Alternative 8 but maintains a higher level of grazing capacity and use. Larger investments to improve watershed condition and maintain the transportation system are made which result in nonpriced benefits of improved water quality and comfort for Forest visitors. The budget was limited to the most probable budget expectation of $7.3 million per year the first time period and $9.3 million per year for all succeeding periods. The opportunity cost of $3.6 million is primarily due to the budget constraint which limits recreation developments and reduces recreation benefits. The increased grazing capacity and corresponding stability of the grazing industry is a nonpriced benefit which is achieved through investments in range improvements.

Alternative 2

Response to the issue of water quality, soil productivity, and soil stability was the objective of this alternative. These are all nonpriced benefits. The alternative was limited to an optimistic potential budget level of $7.6 million per year the first time period. The analysis model was constrained to use management prescriptions emphasizing watershed restoration. The opportunity cost is $330.1 million and is caused by the limited prescriptions available to provide the highest level of watershed condition. This caused reductions in grazing, timber, water yield, and developed recreation benefits. The major impact was created by the budget limit which caused a reduction in recreation investment and corresponding reduction in recreation benefits.

Alternative 4 (No Action)

This alternative is designed to continue the present management into the future. Response to issues is maintained at the status quo. The budget limit is $7.3 million per year. The analysis model was limited to use only current management prescriptions. The opportunity cost is $143.2 million and is primarily due to the limited options available. Timber, recreation, water yield, and wildlife benefits are all reduced under this alternative because investments are deferred which would increase outputs and, hence, benefits.

Alternative 9

This alternative maximizes the outputs having market values. A budget limit of $7.6 million per year was imposed the first time period. The opportunity cost is $435.7 million and is because of the emphasis on market value output. The trade-off between the market value and assigned value outputs is described in Table 75.

Alternative 6

The objective of this alternative is to manage the Forest at a very low budget level so funding is available for other national priorities. It is the least cost alternative but also produces low levels of timber and recreation benefits and results in an opportunity cost of $51.3 million. The opportunity cost is primarily due to the lack of investment to increase the level of priced benefits.

Alternatives Including the Proposed Action

Summary-Significant Environmental Effects

A summary of significant environmental effects presented in Chapter 4 is displayed in Table 11.

Table 11

Summary of Significant Environmental Effects - All Alternatives

Resource/Activity	Significant Effects
Dispersed Recreation	All alternatives meet predicted demand. Only the Proposed Action and Alternatives 1, 3, 7, and 8 provide an adequate level of funding for trail construction adjacent to the metropolitan area. The Proposed Action and Alternative 7 provide for a high level of recreation special use permits, i.e., commercial river-running, and dispersed recreation facilities such as trailheads and parking areas. Alternatives 3, 7, and 8 partially satisfy these demands while Alternatives 1, 2, 4, 6, and 9 either meet these demands at a very low level or not at all. There are no significant irretrievable or irreversible effects. Adverse impacts due to user conflicts can be anticipated in all alternatives other than the Proposed Action due to lower levels of management.
Developed Recreation	The Proposed Action partially satisfies total demand, new facility construction, and overall level of management. Alternatives 3, 7, and 8 achieve 100 percent of demand while Alternatives 1, 2, 4, 6, 8, and 9 achieve the lowest levels. There are no significant irreversible or irretrievable effects. Some adverse impacts due to overcrowding in developed sites can be expected in all alternatives except 3, 7, and 8 due to a combination of fewer developed sites, and varying levels of management.
Visual Resource	Impacts of all alternatives on visual quality are temporary. Revegetation of disturbed areas and other techniques minimize changes in inventoried visual quality levels. There are no significant adverse impacts or significant irreversible or irretrievable effects.
Wilderness	The Proposed Action and Alternatives 1, 2, 3, 7, and 8 provide for high levels of wilderness management including trail construction and trail maintenance. Alternatives 4, 6, and 9 result in reduced service level management and no new trail construction. All alternatives allow for the use of prescribed natural fire to maintain natural ecological processes. There are no significant irreversible or irretrievable effects. Some adverse impacts due to overcrowding and deteriorating trail conditions can be expected in Alternatives 4, 6, and 9 due to low funding levels.
Cultural Resources	All alternatives provide for cultural resource surveys prior to ground disturbing activities, and consultation with the State Historic Preservation Officer and the Advisory Council on Historic Preservation to identify, protect and/or mitigate impacts on cultural sites. The potential for vandalism and theft is highest in Alternatives 1, 2, 4, 6, and 9 because of low levels of law enforcement.

	Alternatives 3, 7, and 8 provide a moderate level of law enforcement protection. The Proposed Action provides a high level of law enforcement protection. Loss of cultural material through ground disturbing activities, theft, or vandalism would be irreversible.
Wildlife and Fish Habitat	The Proposed Action and Alternatives 1, 3, and 8 emphasize wildlife habitat improvement on high levels of suitable land base. These alternatives are also rated highest in achievement of the Arizona State Game and Fish Comprehensive Plan objectives. Alternatives 2, 4, 6, and 9 provide low levels of wildlife habitat improvement and achievement of the State Comprehensive Plan objectives. Alternative 7 provides a moderate level of achievement of State objectives, and emphasis on wildlife habitat improvement. The Proposed Action and Alternative 8 are the most beneficial in terms of management indicator species. Alternative 3 is slightly less beneficial to management indicator species while Alternatives 1, 2, 4, 6, 7, and 9 benefit management indicator species the least. All alternatives protect cold water fish habitat, and habitat of listed species. There are no significant adverse impacts or significant irreversible or irretrievable effects.
Range	The Proposed Action and Alternative 4 project the highest level of permitted use and grazing capacity. Alternative 3 meets RPA goals in permitted use and grazing capacity which is significantly less than levels achieved in the Proposed Action. Alternatives 1, 2, 6, 7, 8, and 9 project very low levels of permitted use and grazing capacity, and result in adverse socioeconomic impacts on grazing permittees due to reductions in livestock numbers. There are no significant irretrievable effects or irreversible effects.
Timber	The Proposed Action ranks fourth in total average annual timber harvest in the fifth time period. Alternatives 3, 8, and 9 produce higher harvest levels, but also incorporate maximum or near maximum tentatively suitable acres assigned to timber production. Alternatives 1, 2, 4, 6, and 7 produce lower harvest levels than the Proposed Action with tentatively suitable acres varying from 102,862 acres (minimum) in Alternative 6 to 122,612 acres (maximum) in Alternative 2. The Proposed Action and Alternatives 3, 8, and 9 emphasize wildlife habitat improvement and maintenance. There are no significant differences among alternatives in long-term sustained yield. There are no significant adverse impacts or significant irretrievable or irreversible effects.
Fuelwood	The Proposed Action's harvest level is above Alternatives 2, 4, 6, and 9 but below Alternatives 1, 3, 7, and 8. Fire hazard is reduced on timber sale areas in all alternatives. Harvest levels in the Proposed Action and Alternatives 1, 3, 7, and 8 have a positive effect on increased water yield, and wildlife habitat improvement. There are no significant adverse impacts or significant irretrievable or irreversible effects.

Water Yield	Water yield in the Proposed Action by the fifth period is higher than Alternatives 2, 4, 6, and 9 but below Alternatives 1, 3, 7, and 8. Higher water yields in the Proposed Action and Alternatives 1, 3, 7, and 8 have a positive effect on fuelwood availability through vegetative modification. There are no significant adverse impacts or significant irretrievable or irreversible effects.
Watershed and Soils Condition	The Proposed Action, Alternative 8, and Alternative 2 project recovery of all riparian areas by the fifth Other alternatives project recovery beyond the fifth period. The Proposed Action and Alternative 2 and 4 return all watersheds to satisfactory condition by the fifth period. All other alternatives extend into the sixth period. There are no significant irreversible or irretrievable effects but some adverse impacts due to off-road vehicle travel can be expected in Alternatives 1, 2, 3, 4, 6, 7, 8, and 9 due to lower levels of management.

Affected Environment

3

OVERVIEW

When Zane Grey wrote "Under the Tonto Rim" in 1926 he described a land of wide, open spaces, rich in material and esthetic resources, and unique in character. He was writing about the Tonto National Forest, the country below the Mogollon Rim. The establishment of this area as National Forest began in the 19th century with the creation of the Black Mesa Forest Reserve in 1898, Rio Verde Forest Reserve in 1901, Pinal Mountains Forest Reserve in 1905, Tonto Forest Reserve in 1905, and Verde National Forest (later to become part of the Prescott National Forest) in 1907. On January 13, 1908, parts of the Rio Verde Forest Reserve and Pinal Mountains Forest Reserve were combined with the Tonto Forest Reserve to create the Tonto National Forest. Later in 1908 the southeastern portion of the Tonto was transferred to the newly created Crook National Forest. The final boundaries of the Tonto took shape over the next 40 years with a transfer of a portion of the Tonto to the Coconino National Forest in 1923, and additions to the Tonto from the Black Mesa National Forest (now the Coconino and Apache-Sitgreaves National Forests) in 1908, from the Prescott National Forest in 1923 and 1934, and from the Crook National Forest in 1910 and again in 1953 when that Forest was abolished as an administrative unit.

The Forest Homestead Entry Act of 1906 created a number of private inholdings, as have Federal-private land exchanges. Other lands have been transferred to the National Park Service for the creation of Tonto National Monument, and to local governments for townsite expansion.

Today the Tonto National Forest covers 2,873,292 acres of National Forest System land within the Salt, Verde, and Gila River watersheds and includes a wide variety of landforms and habitats.

This chapter describes the environment that will be affected by implementation of the proposed plan or alternatives. It is presented in three sections. Section A describes the physical and biological setting; Section B, the socio-economic setting; and Section C, the current resource situation and management for specific resource elements.

SECTION A PHYSICAL and BIOLOGICAL SETTING

Physiography

The landscape is generally mountainous with numerous streams and washes, mesas, and plateaus. Elevations range from about 1,500 feet in the lowland desert to several peaks in excess of 7,000 feet. Four Peaks, a central geographical landmark on the Forest, rises to 7,657 feet. The desert region of the Forest is typically rolling country broken by sand washes and occasional mountainous outcroppings. The Superstition and Goldfield Mountains, as well as the Salt and Verde River valleys, are within the desert.

As the Forest rises above the desert, it takes on the appearance of an extensive plateau disected by canyons of moderate depth, creating buttes and mesas. The dominant physiographic features are the Mogollon Rim, and Sierra Ancha and Mazatzal Mountain ranges.

Climate

The area can be divided into three major climatic zones: arid, semi-arid, and sub-humid. Arid climate regions are found in desert and semi-desert areas. Semi-arid areas are generally between the desert and the conifer vegetative zones, e.g., the chaparral and pinyon-juniper areas. Sub-humid climate regimes are found in mountainous forested areas under and on the Mogollon Rim and in the Pinal Mountains. Depending on elevation, the amount of precipitation may

Affected Environment

range from eight to 34 inches annually with the greater part falling in the winter months. The growing season ranges from 100 to nearly 325 days per year, depending on elevation. Air temperatures rise to desert summer highs of 115 degrees, and may fall as low as minus 20 degrees in areas under or along the Mogollon Rim.

Geology and Soils

Geologic materials in the area date from the Precambrian to the Quaternary period. Major rock types are granites, limestones, sandstones, schists, basalts, quartzites, rhyolite, and tuff. Surface soils within this region are mostly loams with some rock outcrops, and also some loamy sand and clay. Montmorillonite (churning, cracking) clay deposits are common throughout the Forest.

Soil is the foundation for sustained resource management. Soils of the Tonto National Forest vary widely in their fertility and erosion potential. They also occur in complex patterns. Inherent soil fertility varies from low to high and erosion potential varies from low to extreme. Erosion hazards increase on steep slopes and loss or destruction of protective vegetation increases the speed and severity of erosion.

Soil loss occurs under natural conditions. This is called natural or geologic soil loss; however, losses may be increased by resource extraction or management activities which disturb the ground surface. Current soil loss resulting from management is calculated by subtracting natural or geologic soil loss from the gross current soil loss. This net soil loss estimate averages about 1.3 million tons annually.

The objective of soil management on the Forest is to match management activities to the capability and suitability of the soil to assure long-term productivity. This can be done quite precisely where the soil has been inventoried and soil characteristics are known. As part of the National Cooperative Soil Survey, there are 1,072,000 acres on the Tonto National Forest that have been inventoried with a soil survey. On uninventoried areas, land productivity will have to be estimated and the maintenance of soil productivity assumed.

Continuing concern by the public to maintain the productivity of soil will require increased management emphasis to maintain soil productivity.

Vegetation

Vegetation is highly diverse due to wide variations in soils, elevation, and climate. Plant communities range from the desert scrub and semi-desert grasslands at the drier lower elevations, through the interior chaparral/pinyon-juniper, to Ponderosa pine and some mixed conifer below and along the Mogollon Rim.

Historical grazing use and other factors has resulted in a reduction of native perennial grasses and an increase in annual grasses and brush species.

Timber stands are dominated by pole size trees with very little old growth remaining in the overstory. This condition will make it difficult to maintain the current scheduled annual harvest rate until a better distribution of size and age classes is achieved.

Riparian

Riparian vegetation is an important element of the land base, especially on the Tonto, where it is limited to less than one percent of total Forest area (25,900 acres). Riparian areas are wetland ecosystems which have a high water table because of their proximity to an aquatic ecosystem or subsurface water. They usually occur as a transition between aquatic and upland ecosystems, but have distinct vegetation and soil characteristics. Riparian is associated with intermittent streams, perennial streams, rivers, ponds, and lakes.

Riparian areas are probably the most critical ecosystems on the Tonto for multiple use management because of the following:

Scenic values are very high.

The majority of the developed recreation sites are in, or directly adjacent to, the riparian area because people concentrate here to be near the water and lush vegetation.

They are generally more productive per acre of biomass (plant and animal) than other areas.

The three basic requirements of wildlife habitat (food, cover, and water) are often met in this area. The fisheries resource (aquatic ecosystem) is associated with this area.

Roads are frequently found along major stream courses, creating direct conflicts with other resources.

Domestic livestock prefer these riparian areas and concentrate in them.

The most significant adverse impacts to riparian areas have occurred along the larger primary drainages, such as the Verde River, where heavy grazing activity predated Forest management.

Deteriorated areas are characterized by the absence of shrub and tree species along streambanks. Streambanks are unstable, stream temperatures are elevated, aquatic community diversity is reduced, fish habitat is depleted, and terrestrial wildlife habitat is extremely limited. Conditions have not improved naturally due to continued improper livestock grazing, uncontrolled recreation use, and periodic flooding.

Disturbance of riparian areas by logging activities in the past has been relatively minor because few timber sales have been located near riparian areas. Developed recreation sites have locally affected riparian wildlife habitat due simply to human presence. In localized areas, fishing activity has caused the deterioration of ground cover and the compaction of soil along streambanks and lake shores.

SECTION B SOCIAL and ECONOMIC SETTING

Area of Influence

The social and economic influence of the Forest is limited primarily to Gila, Maricopa, and Pinal Counties. The Forest covers 2.6 million acres in this three-county area, and activities and outputs are estimated to be directly or indirectly responsible for approximately one percent of the total employment in the area of influence. However, the influence of the Forest on employment and the economy of Gila County is substantially higher.

A portion of the Forest is within Yavapai County. Residents there relate more strongly to the town of Prescott and surrounding communities and to the Prescott National Forest. A very small portion of the Forest is located in Navajo County but is not affected by the Plan.

Population

The area of influence incorporates both rural and metropolitan settings. The predominantly rural population of Gila and Pinal counties in 1980 was about 128,600. The population of the Phoenix-metropolitan area (Maricopa County) was about 1,647,600.

Affected Environment

The population is ethnically mixed, but predominantly Caucasian. The 1980 estimates for the area of influence are 2.2 percent Native American, 3.1 percent Black, 0.8 percent Asian, and 84.4 percent Caucasian, including 16.9 percent Hispanic. (Source: U.S. Department of Commerce, Bureau of the Census).

Future Trends

As displayed on Table 12 population for the 3 County area of influence is expected to more than double between 1980 and the year 2000. Population growth will be highest in Maricopa County. Populations trends in Table 12 show evidence of National population shifts toward the Sun Belt. People have been, and probably will continue to be, attracted to central Arizona by its climate, scenery, variety of outdoor recreation activities, and natural resources.

Table 12

Population Trends - 1960-2030

County	1960	1970	1980	1990	2000	2010	2020	2030
Gila	25,745	29,255	37,400	41,800	47,300	55,300	63,300	71,300
Pinal	62,673	68,579	91,200	111,100	138,300	180,300	222,300	264,300
Maricopa	663,510	971,228	1,519,000	2,053,000	2,820,600	3,257,000	3,879,000	4,502,000
TOTAL:	751,928	1,069,062	1,647,600	2,205,900	2,820,600	3,492,600	4,164,600	4,837,600

(Source: Arizona Department of Economic Security, Population Statistics Unit.)

Table 13

Income in the Three-County Area

County	1976 Per Capita	1979 Per Capita	1976 Total Personal (1000$)	1979 Total Personal (1000$)	Recent Change in Personal 1976-79
Gila	$ 5,021	$ 7,387	$ 167,400	$ 262,000	+56
Pinal	5,524	6,792	476,200	607,300	+28
Maricopa	6,381	9,322	7,808,900	12,492,000	+60
	$5,642 (Avg.)	$ 7,833 (Avg.)	$8,452,500 (Total)	$13,361,300 (Total)	+48 (Avg.)

(Source: U.S. Department of Commerce, Bureau of Economic Analysis.)

Affected Environment

Employment and Income

Average per capita income for the three county area in 1976 was about $5,642; by 1979 it had risen to $7,833. When this increase is corrected for inflation, however, it represents little change in per capita real income. Table 13 portrays income in the three-county area.

The June 1980, unemployment rates for the three Counties were: Gila County 8.8 percent, Pinal County 6.9 percent, and Maricopa County 5.9 percent. The total labor force in the three-County area in June 1980 was estimated to be 708,875 of which 663,825 were employed, for an overall unemployment rate of 6.3 percent compared to the Arizona average of 9.0 percent.

The economic impact computer modeling for the area utilizes 1977 data. The model does not measure full-time employment. Instead, the model reports number of jobs, which includes part-time and seasonal work. That model estimated direct and indirect jobs due to Forest activities at 9,071. Based on an employment to population ratio of 1 to 2.3 for the area, these jobs support about 20,700 residents. Table 14 displays the employment influence of the Forest by selected sectors. The model did not provide meaningful results for Pinal County.

Table 14

Employment Influence of the Forest - 1980
(Gila and Maricopa Counties Only)

	Employment Due to Forest Activities 1/ (Persons Employed)
Logging/Sawmills/Wood Products	92
Livestock	107
Tourism	5,568
Other	3,304
TOTAL:	9,071

1/ Number of Jobs. Includes part-time and seasonal.

Lifestyles, Social, and Economic Situations

Lifestyles of communities within and surrounding the Forest may be characterized as structured on "frontier values." The pioneer ethic of individual landownership is strong and the political philosophy conservative, with rights of individuals strongly voiced. A fundamental philosophy is that progress relates directly to growth, both in population and development of resources.

The communities most directly affected by resource decisions are Payson, Young, Tonto Basin/Roosevelt, Globe/Miami, Superior, and the Phoenix metropolitan area.

Primary impacts of resource management are felt by people living close enough to visit the Forest weekly or more frequently. There are two distinct groups within this population with different sets of interest. The first group consists of people who use the Forest for recreation on a fairly regular basis. They may have a cabin in the Payson area, backpack in the wilderness, enjoy tubing on the Lower Salt River, or they may fish, hunt, hike, camp, or picnic.

If they cut firewood, the fresh air and exercise will probably be as important to them as the economic value of the wood. These people are concentrated in the Phoenix metropolitan area. The Forest substantially enhances the quality of life of residents in the urban communities. The frequency of visits by this group results in a proprietary interest in Forest management decisions and resource uses.

The second group has what might be described as a socioeconomic interest. Members of this group reside in communities and rural areas within or surrounded by the Forest and depend on the Forest for direct economic values. They may work in the timber industry, mining industry graze cattle, operate a service business, pick jojoba beans, or cut poles, posts, or fuelwood for their own economic benefits. These people also derive a sense of social well-being as they picnic, hunt, camp, or fish on the Forest.

The Forest is used by some people from the minority communities of Phoenix, Globe, Miami, and Superior for recreation. They are especially attracted to the lower Salt and Verde Rivers for tubing, fishing, picnicking, and swimming.

Each year, during the mild late fall, winter, and early spring months, several thousand visitors to Arizona temporarily reside in the Phoenix metropolitan area and enjoy the recreation opportunities of the Tonto. These visitors to the Sonoran desert come from all over the United States and Canada. They spend up to six months in temporary residences, many in mobile home parks on the fringes of metropolitan Phoenix, often adjacent to the Forest.

SECTION C RESOURCE ELEMENTS

As an ecological system and an asset to the public, the Forest may be described in terms of its resource potential. The capacity of the land to provide outputs (goods and services) is directly related to the management of the Forest collectively. Management affects a variety of resources, and decisions are made only after considering the entire set of ramifications involved. Similarly, single management activities are actually designed to serve a variety of resource objectives. Resources discussed below are part of a complex system with numerous interactions. These resources are described individually only to emphasize important aspects of the current situation in some type of organized framework. These elements must be conceptually combined in order to understand the overall current situation of the Forest.

Recreation

Since Arizona is one of the fastest-growing states in the nation, and offers abundant year-round recreation opportunities, there is an increasing demand for outdoor recreation on the Forest. This demand often exceeds existing developed site capacities, and dispersed use in some areas is beginning to have an adverse impact on the environment. The variety of ecosystems in close proximity to metropolitan Phoenix, make recreation opportunities on the Forest attractive year-round.

Availability and use of private land for recreation development is limited.

Dispersed Recreation (Non-wilderness)

There are approximately 2,270,670 acres available for dispersed recreation activities. This area can be broken down by use of the Recreation Opportunity Spectrum (ROS) classes. ROS classes provide a framework for defining the types of outdoor recreation opportunities the public desires, and identifying what portions of the spectrum a National Forest might be able to provide.

Affected Environment

Currently, the Forest has approximately 18,900 acres in the Rural ROS class; 553,100 acres in the Roaded Natural ROS class; 911,446 acres in the Semi-primitive Motorized ROS class; 797,088 acres in the Semi-primitive Non-motorized ROS class; and 4,727 acres in the Primitive ROS class.

Dispersed recreation use outside of wilderness, including hunting, fishing, and non-consumptive wildlife use such as birdwatching, is estimated at 4,503,000 Recreation Visitor Days (RVD's) per year. It accounts for the largest amount of recreation use and is projected to be the fastest growing segment of recreation on the Forest.

Under the statewide Off-Road Vehicle (ORV) Management Plan (1976) certain sensitive and erodible areas and trails on the Forest are closed to motorized ORV's, or use is restricted.

Since implementation of the 1976 Plan, there have been policy changes which necessitate a change in the Forest management of ORV use. These changes are reflected in the Forest Plan and alternatives presented in this Environmental Impact Statement. Presently, 771,000 acres are closed to motorized off-road use.

Future Trends

Based on current assumptions and trends, dispersed recreation use is projected to increase to 5,098,000 RVD's by the year 2000 and reach 7,857,000 RVD's by the year 2030. The estimated ORV use portion would be 76,500 RVD's by the year 2000 and 117,800 RVD's by the year 2030. The total dispersed recreation use capacity with full development and access is approximately 8,100,000 RVD's. The ORV portion would amount to approximately 121,500 RVD's. In both cases, capacity for dispersed recreation and ORV use exceeds projected demand.

Developed Recreation

Use at developed recreation sites in 1980 was 1,237,000 RVD's. These sites have a combined total capacity of 4,444 persons at one time (PAOT) which could provide for a use of 1,539,000 RVD's. The season of use in the Mogollon Rim area generally runs from May 1 to October 31, and in the desert September 15, to May 15, except yearlong at sites on the Salt and Verde Rivers and reservoirs. Fees are charged at five campgrounds which meet Land and Water Conservation Fund Act criteria.

Nearly all sites are currently operated and maintained at a reduced service level which results in a reduced season of use and/or limited cleanup and maintenance. Some sites are literally worn out or deteriorating to a point where visitor health, safety, and experience is at a low level and major rehabilitation is needed. Water quality, visitor control, and general resource protection continue to decline.

The Forest offers an abundance of water based recreation opportunity on the Salt and Verde Rivers and reservoirs and adjacent National Forest land. Demand for this opportunity is high while facilities are lacking. Existing problems with sanitation, boating/non-boating user conflicts, law enforcement, overcrowding, and site degradation will continue under current budgets and commensurate management levels.

The estimated potential for developed recreation on the Forest is 3,200,000 RVD's. This potential could be realized through providing additional developed sites by the Forest Service, and by the Bureau of Reclamation through Plan 6.

Other forms of developed recreation include use at private recreation residences on National Forest land, and use occurring at resort/marinas on the reservoirs. The other forms of developed recreation (private sector) in 1980 accounted for 383,000 RVD's.

Future Trends

Projected demand by the year 2025 is 2,500,000 RVD's per year. Developed recreation assumptions include:

- Demand for developed recreation will increase as metropolitan and local population increases.
- As travel expenses increase, visitors will lengthen the duration of their visits to the Forest.
- As travel expenses increase, use of developed sites by metropolitan and local residents will increase.

Demand by the year 2025 will exceed current capacity. However, if the Forest potential was realized through additional sites, capacity could exceed demand.

Wilderness

The Tonto has 585,990 acres of designated wilderness, distributed among the Mazatzal, a portion of the Pine Mountain, the Superstition, the Sierra Ancha Wildernesses, and four new wilderness areas designated in the Arizona Wilderness Act of August, 1984 (PL 98-406).

The Mazatzal Wilderness was established as a Primitive Area in 1938 and redesignated as Wilderness in 1940. It was expanded in 1984. It contains 205,233 acres of National Forest land.

The topography is exceedingly precipitous and broken by narrow vertically walled canyons. Elevations range from 2,400 feet in Canyon Creek near Bartlett Reservoir to 7,888 feet at Mazatzal Peak. Vegetation is representive of southwestern mountain ranges which rise from the desert floor. Semi-desert vegetation at the lower elevations succumbs to perennial grassland, chaparral, pinyon-juniper woodland, and finally the Ponderosa pine-Douglas fir association at the highest elevations. Stream courses are characterized by riparian vegetation. Water is not abundant, however, and fishing is limited to the East Verde River where several species of native and introduced fish are found. The diverse vegetation of the Wilderness provides habitat for many species of wildlife. Estimated recreation use in 1980 was 19,500 RVD's.

The Superstition Wilderness was designated a Primitive Area in 1939 and a Wilderness in 1940. It was increased in size in 1984. It contains 124,117 acres of National Forest land. The Superstition Mountains rise abruptly from the desert floor. The western portion consists of knife-like ridges divided by deep, sheer-walled canyons. The southern and eastern portions have broader mesas and the canyons are not as steep. Elevations range from 6,266 feet at Mound Mountain to 1,800 feet in Boulder Canyon. Occasionally large blocks of chaparral and small areas of woodland and timber occur as the elevation increases above the desert floor.

Stories of gold mines in the Superstition Mountains abound; the lost Dutchman, La Maina de los Sobreros, and the Seven Peralta Mines are but a few. Over the years the legends have drawn many people, and fortunes have been spent searching, but no gold has been taken from the rugged, unforgiving Superstitions.

Many species of wildlife inhabit the Superstition Wilderness. The desert bighorn sheep, which once inhabited the area, has been reintroduced. Estimated recreation use in 1980 was 35,400 RVD's.

The Sierra Ancha Wilderness was established as a Primitive Area in 1933 and redesignated as a Wild Area in 1951. It remained as such until the passage of the Wilderness Act in 1964. It contains 20,850 acres of National Forest land and lies entirely within the Pleasant Valley Ranger District. The Wilderness is 11 miles in length and ranges from one-half to five miles in width.

Affected Environment

The Sierra Ancha Wilderness embraces the top and main ridge of the Sierra Ancha Mountains, then plunges eastward into Cherry Creek. Precipitous box canyons, high cliffs, and abrupt changes in elevation make the area exceptionally rugged. In many cases there is a difference of 2,500 feet in elevation within a mile.

Elevations vary from 7,600 feet on Center Mountain to 3,200 feet in the northeastern corner near Cherry Creek. This elevational variation is accompanied by a variety of vegetative types. The semi-desert type is found in the lower reaches, while, progressing upward, the chaparral, pinyon-juniper, and Ponderosa-pine types are encountered. Patches of mixed conifer are scattered throughout the higher and wetter reaches while riparian vegetation is found along the stream courses.

The diversity of vegetation has resulted in the occurrence of six Arizona "big ten" game animals within a few miles. These are mule deer, white-tailed deer, black bear, mountain lion, turkey, and Javelina.

Asbestos and uranium, the two major minerals which have been mined in and adjacent to the Sierra Ancha Wilderness, occur in the Apache geological group. This group is found throughout the Wilderness and as a result, mining claims blanket much of the area. Estimated recreation use in 1980 was 16,100 RVD's.

The Pine Mountain Wilderness was set aside as a Primitive Area in 1933 and designated as Wilderness in 1973. Of the total 20,061 acres of National Forest land, 11,450 are on the Tonto National Forest and the remainder on the Prescott. Estimated recreation use on the Tonto portion of the wilderness was 2,100 RVD's in 1980.

Four new wilderness areas were designated in the 1984 Wilderness Act. Table 15 lists the new areas and their acreages. The acreages added to previously existing wilderness are also shown.

Table 15

1984 Arizona Wilderness Act

Name	Acres
Salome	18,950
Mazatzal Contiguous	46,670
Salt	32,800
Superstition Contiguous	35,640
Four Peaks	53,500
Hell's Gate	36,780
TOTAL:	224,340

Future Trends

Based on current assumptions and trends, wilderness use is projected to increase to 143,800 RVD's by the year 2005 and reach 160,400 RVD's by the year 2025. Half of the projected demand is associated with short duration use on the Superstition Wilderness because of its proximity to metropolitan Phoenix.

Cultural Resources

The cultural resource on the Forest represents a potential data source for both the history and prehistory of Arizona that is almost without equal. The Forest is known to contain a large number of historic sites related to the early Anglo military, agricultural, mining, and ranching occupations of Arizona. Little interpretive information about this period is contained in documentary sources.

Within this context, the Forest was critical to the development of Phoenix and the establishment of Arizona statehood. It contains a portion of the military establishment that stimulated the founding of Phoenix and several of the most important mining districts in the State. Within its boundaries are a number of ranches associated with such historic events and persons as the Pleasant Valley War and Zane Grey. The Forest also represents a large part of the watershed for the Salt River Project, the first major reclamation project in the United States.

The prehistory of Arizona is especially well represented on the Forest. Being centrally located between two of the major population centers of prehistoric times, the Salt-Gila River Basin and the Colorado Plateau, and containing one of the richest major river valleys in Arizona (Tonto Basin), the Forest was a natural contact zone between various prehistoric peoples. Present evidence indicates that it may have been one of the earliest occupied areas in Arizona, supporting a variety of settlements and groups almost continually for over 11,000 years.

A total of 2,460 prehistoric and historic sites have been inventoried to date.

Three cultural properties out of the Forest inventory are listed on the National Register of Historic Places: the prehistoric Brazeletes Ruin, historic Verde River Sheep Bridge on Cave Creek District, and Theodore Roosevelt Dam on Tonto Basin District. Recent nominations to the National Register include the Zane Grey-Babe Haught and Lower Salt River Multiple Resource Areas on the Payson and Mesa Districts, respectively. Many eligible properties remain to be nominated.

The current cultural resources program of the Forest consists of four components: Protection, Inventory, evaluation, and enhancement. Protection of cultural resources involves: (1) Review of all Finding of No Significant Impact determinations, Environmental Assessments, and Environmental Impact Statements; (2) monitoring, inspection, and liaison with all outservice archeological contracting permittees working on the Forest; and, (3) providing necessary law enforcement support. Inventory requires: (1) 100 percent cultural resource surveys for project impact areas, except in cases where sample surveys are acceptable, and (2) preparation of survey reports including appropriate avoidance/mitigation strategies for cultural properties located. Evaluation entails: (1) determination of National Register of Historic Places eligibility of cultural resource properties present in project areas, and (2) nomination of significant properties to the Register. Finally, enhancement involves providing environmental and human land use data from investigative and evaluative activities.

Future Trends

Ground-disturbing activities will increase, creating a greater demand for the archeological surveys required for these projects. Evaluation of sites by consultants or academic institutions, is likely to increase and contribute to completing the classification of all sites on the Forest. The thrust of future cultural resource management will be to protect against vandalism and looting and to complete the inventory of the Forest.

Affected Environment

Visual Resources

The Forest is characterized by outstanding scenery. Interest in management of the visual resource is increasing.

Less than one percent of the Forest has been altered due to activities such as road building, timber harvesting, and vegetation manipulation projects to the degree that it is visually evident to the Forest visitor. Visual quality objectives have been maintained through use of the visual management system in resource management activities on a project-by-project basis.

Future Trends

Visual quality of lands viewed from recreation sites and major travelways will become increasingly important. Visual resource management techniques will continue to be applied to all projects in the future, with specific emphasis on those areas identified by the Forest Plan as high in scenic quality or recreation visitor use.

Wild and Scenic Rivers

Inventoried Wild and Scenic Rivers Eligibility and Classification

River Name	Terminal Description	Total Study Miles	National Forest Miles	Eligibility and Classification 1/ Wild	Scenic	Recreation
Tonto Creek	Theodore Roosevelt Lake to source	60	47	22	--	10
East Verde River	Verde River Confluence to source	56	49	18	--	15

1/ Based on Final Revised Guidelines for Eligibility, Classification and Management of Rivers Areas published in the Federal Register Vol. 47, No. 173, Tuesday, September 7, 1982.

In Alternative 7 all eligible segments are recommended for classification. This would place 40 miles of river in "Wild" and 25 miles in "Recreation" categories. Only those segments falling within National Forest lands would be classified.

In all other alternatives neither of the rivers are proposed for inclusion in the Wild and Scenic Rivers Program. The recreation portions of the rivers would not be classified because of the irregular pattern of mixed ownership and development which would make designation and implementation of the Wild and Scenic Rivers Act very difficult. In addition, developments along these segments would be precluded if they invaded the area or unreasonably diminished the recreational, fish, and wildlife values of the designated segment. Also, during the study phase of the Salt and Verde Rivers, local units of government and local citizens were strongly opposed to any action which may foreclose the options for constructing water resource projects. Local units of government were also concerned over the possibility that designation of a river would impose additional costs on their limited finances for such things as search and rescue and other public services.

The Wild portions are not recommended because they are adequately protected by designation of the Mazatzal Wilderness and the Hells Gate Wilderness.

Future Trends

It is anticipated the need to protect and maintain free flowing rivers will continue. The Congressional designation of the Verde System and the protection provided the Upper Salt and East Verde Rivers and Tonto Creek by designated wilderness areas should meet this demand.

Wildlife and Fish

The Forest provides habitat for approximately 410 vertebrate wildlife and fish species. The species are grouped as follows:

Table 16

Vertebrate Wildlife and Fish Species

Species Group	Number of Species
Federal or State Threatened or Endangered (T&E)	20
Harvest Emphasis	51
Pests	12
Maintenance Emphasis	327

Species on the Federal and State lists are of concern to management on the Forest. Seven species are listed by both the State and Federal governments, and 13 additional species are listed by only the State (see Appendix C). In addition, there are two plant species on the Forest which are endangered. Recent proposals for listings have established 11 animal and 7 plant species as candidates. These will be treated as listed species until their status has been determined. The policy and management direction for these species is to improve and maintain their habitats to the point that they can be removed from listed status. Criteria for determining their habitat and distribution follows direction contained in FSM 2671.42. Habitat for several of the eight Federally listed wildlife species has been determined. Maps and recovery information are on file in the Forest Supervisor's Office. Final USDI Fish and Wildlife Service Recovery Plans are available for all species. Distribution and density information is not complete for the thirteen State-listed species.

Population objectives in Tables 17 and 18 are based on Fish and Wildlife Service Recovery Plan and estimates on the capability of habitat on the Forest to support the species. Fish species are tabulated in numbers of populations. The long-range goal is to work with the Arizona Game and Fish Department and USDI Fish and Wildlife Service to identify streams suitable and desirable for stocking of native listed species such as Gila Topminnow. Management of other streams will be guided by goals and objectives established by the State such as in the Coldwater Fisheries Plan.

Affected Environment

Table 17

Threatened and Endangered Population Estimates

Federally Listed T&E Species	Existing	Period 1 Objective	Acres of Habitat
Bald Eagle Nesting 2/	32	64	56,100
Bald Eagle Wintering	10	17	14,600
Peregrine Falcon 3/	6	12	650,200
Yuma Clapper Rail	0	6	17
Gila Topminnow (pop.) 1/	40	50	Acres of fish
Colorado River Squawfish (pop.) 1/	0	2	habitat are not
Woundfin (pop.) 1/	0	2	available at
Bonytail Chub	0	2	this time.

There are 51 Harvest Emphasis Species occurring on the Tonto. These species are important to management because they are harvested by the public. The policy and management direction for these species is to maintain or enhance their habitats in order to meet the goals and objectives established in the State Strategic Plans and the 1981 Arizona Wildlife and Fisheries Comprehensive Plan. All game species are not included. Species included are only those that could be affected by active wildlife and/or habitat management.

For big game species, the existing population estimates are from the 1983 Tonto Annual Wildlife Report based on Arizona Game and Fish Department Data. The Period 1 objective is based on 1985 population goals identified in State Strategic Plans and the 1981 Arizona Wildlife and Fisheries Comprehensive Plan. The Period 1 objective is the population numbers thought to be attainable with resource coordination and habitat improvement in the next few years. For elk, the Period 1 objective is to improve habitats to increase elk numbers 19% up to 475. For mule deer and pronghorn the Period 1 objective is to improve habitats to achieve a 20 percent increase in animal numbers. For small game, population estimates are not given.

Data on existing acres of habitat are from species distribution maps in State Strategic Plans. The distribution information is on file at the Tonto Supervisor's Office.

1/ Fish species are tabulated in numbers of populations. Corresponding habitat are in terms of waters. For Gila topminnow, a water source (spring, stream, or tank) contains one population. With Colorado River squawfish, and Woundfin, an individual water course constitutes a population.

2/ Includes 12 breeding pairs and at least 8 non-breeding individuals.

3/ Includes 2 breeding pairs and at least 2 non-breeding individuals.

Table 18

Big and Small Game Species Population Estimates and Habitat Acres

Big Game Species	Existing 1/	Period 1 Objective	Habitat Acres (Thousands)
Bighorn Sheep	175	110	183
Elk	400	475	149
Mule Deer	16,000	19,200	2,741
Whitetail Deer	8,000	9,600	1,323
Pronghorn	100	120	15
Bear	1,400	1,400	1,631
Mountain Lion	500	500	2,390
Turkey	1,250	1,350	502
Javelina	8,500	9,000	2,343

1/ Existing Bighorn population estimate as of 1985. All others are 1983 estimates.

Small Game Species	Period 1 Objective	
Dove (2 species)	Increase numbers	35
Waterfowl (19 species)	Increase harvest 10%	42
Quail (2 species)	Improve habitat	2,403
Desert Cottontail	Maintain numbers	2,322
Eastern Cottontail	Maintain numbers	927
Abert's Squirrel	Improve status	281
Band-tailed Pigeon	Maintain numbers	1,865

There are 12 pest species such as House Sparrow, Carp, and Red Shiner on the Tonto. Pest species are introduced species that have the ability to outcompete other species if not controlled. The policy and management direction is to support control or utilization programs.

The maintenance group contains a wide array of species. Plans and programs designed to enhance harvest emphasis species may result in the reduction of some of these 327 species. However, the density of any one species will not be allowed to decrease to the point where the species would be considered for Federal or State listing. Policy and management direction is to maintain diverse habitats for viable populations of these species.

Through an interagency process involving the Arizona Game and Fish Department and others, "management indicator species" were selected for planning purposes to predict the effects of alternative management strategies on important habitat components, and to determine if the plan is producing predicted results when implemented. These indicator species are listed in Appendix D.

Both consumptive and nonconsumptive use of the wildlife resource is measured in RVD's, and account for 18 percent of the total Forest recreation use. The 1980 level of wildlife RVD's is shown in Table 19.

Affected Environment

Table 19

Wildlife Recreation Visitor Days

	1980
Big Game	32,100
Small Game	93,600
Warm Water Fishing	193,800
Cold Water Fishing	21,300
Subtotal	340,800
Non-consumptive	228,300
TOTAL:	569,100

Future Trends

It is assumed that fishing pressure will expand beyond supply and that competition between fishing and other water based recreation will become more intense. In addition, it is expected that wildlife habitat diversity will continue to be an important aspect affecting wildlife species diversity and population levels.

Identified management indicator species will continue to require established levels of wildlife habitat diversity in order to maintain minimum viable populations.

Other demand trends are based on the assumption that consumptive and non-consumptive use of wildlife in the future will increase to meet supply and that nonconsumptive uses of wildlife such as viewing, bird watching, and photography, will increase as consumptive uses become more restricted. Small game hunting will become more popular requiring the maintenance and improvement of small game habitats, and the Forest Service will be called upon to improve the quality of big game habitat.

Range

Table 20

Acreage by Vegetative Type, and Grazing Capacity Class

	Acreage			
Vegetation Type	Full Capacity	Potential Capacity	No Capacity	Not Rated
Grassland	235,340	10,466	70,326	764
Chaparral	144,147	14,589	106,749	
Conifer	174,717	11,943	96,546	
Riparian	20,431	3,520	10,601	470
Pinyon/Juniper	707,047	65,657	377,403	5,603
Mesquite	94,662	6,719	68,478	
Desert	441,080	29,101	132,861	2,322
Barren			41,233	517
TOTAL:	1,817,424	141,995	904,197	9,676

1980 carrying capacity is 259,425 animal unit months while the 1980 permitted use was 428,189 animal unit months. 1984 permitted use is 407,163 animal unit months. Maximum potential grazing capacity is 301,000 animal unit months.

Levels of estimated permitted use and grazing capacities are based on current estimated land capabilities to produce forage for domestic livestock on a sustained yield basis. Figures cannot be viewed as being absolute or precise as actual levels of permitted use and grazing capacities will depend greatly on more indepth studies and/or estimates, intensity and effectiveness of management, and actual response and improvement in the forage resource resulting from improved management practices.

The direction in range administration on the Forest is to bring the permitted number of livestock in line with the grazing capacity of each allotment. This is being done on an allotment-by-allotment basis as range analyses are completed, and/or as permittees on overstocked allotments and District Rangers reach negotiated agreements on permitted numbers adjustments. The goal is to have a current management plan for each allotment with permitted stocking levels commensurate with range capacity, basic land capabilities, and management objectives. This process takes considerable time, but significant progress has been made. Currently, 45 allotments are considered to be under satisfactory management within the capacity of the range. Adjustments in permitted numbers and/or improved management are needed on 58 allotments. Under current management, all allotments should be under proper stocking and management during the fourth period.

Following passage of the Wild Horse and Burro Act of 1971, one wild burro territory was identified based on informal data available at the time. Current management is directed toward maintaining a herd size not to exceed 25 wild burros, or 300 animal unit months.

Future Trends

A number of assumptions can be made about the future of grazing on the Forest.

- Demand for grazing will remain high and is expected to exceed the available supply since grazing permittees are heavily dependent on National Forest land.
- Demand for forage for recreation horses will continue to increase as recreation use increases. Overall, supply will exceed demand except in high use recreation areas.
- Conflicts will decrease between grazing and other resource uses as permitted use comes into line with capacity and improved management is implemented.

Affected Environment

Timber, Fuelwood, and Jojoba

Lands suitable for timber production were determined by use of completed silvicultural examinations, aerial photo interpretation, and knowledge of timber staff personnel working in the field. Lands were classed as unsuitable for timber management if:

a. Slopes were greater than 40 percent with slope distance greater than 1,100 feet or estimated timber volume less than 3,000 board feet per acre.

b. Estimated cost of road construction to access isolated small tracts of low volume per acre were judged as uneconomical for harvest.

c. Withdrawn from timber harvest due to wilderness designation.

d. Reforestation could not be assured within five years after the final removal cut. These areas were estimated to have a Site Index of less than 50, low productivity, while any harvest would tend to convert the site to brush or pinyon/juniper. These areas are generally sparsely stocked with Ponderosa-pine and have a heavy brush or pinyon/juniper understory.

Table 21

Summary of Capable and Suitable Timber Analyzed in the Land Management Plan

Total Capable Acres:		272,436
Non-Forest Acres	26,180	
Unsuitable Acres	136,764	
Total Suitable Acres:		109,492
Sparse Poles	13,331	
Dense Poles	55,716	
Immature Sawtimber	17,000	
Mature Sawtimber	7,640	
Seeds/Saps	15,805	

Most of the suitable areas have been harvested with nearly all of the old growth timber now removed. Timber stands are dominated by pole and small sawtimber size trees. The present annual harvest schedule is 4.3 million board feet of sawtimber and 3.6 million board feet of round wood material. Table 22 displays the change in classification of commercial forest land between the 1973 Timber Plan and the Forest Plan. Maximum potential harvest with non-declining yield is 19 million board feet.

Table 22

Comparison of Commercial Forest Land Suitability Between 1973 Timber Plan and the Proposed Forest Plan

Old Classification		New Classification	
Description	Acres	Unsuitable Acres	Suitable Acres
Standard	82,653	-	82,653
Special	21,900	13,770 1/	8,130
Marginal			
Reforestation backlog	1,000	-	1,000 2/
Inoperable	22,000	15,371	5,565
Fringe Sawtimber	38,600	28,720 3/	10,944
Unregulated			
Recreation Sites	5,400	5,400	-
Experimental Forest	2,200	2,200	-
TOTAL:	174,953	65,461	109,492

1/ These acres were deducted from old "Special" classification primarily because of additional multiple use considerations (e.g., riparian area protection) and lack of sufficient volume per acre to economically justify major road investments.

2/ These acres were added from the old "Inoperable" class as being suitable for cable logging based on slope distance and available volume.

3/ These acres were deducted from the old "Fringe" class primarily because reforestation could not be assured within five years after a regeneration cut and the available volume was insufficient to economically justify major road investments.

Affected Environment

Timber harvests are designed to achieve multiple use objectives including wildlife habitat improvement, fuel reduction, and insect and disease control. Shelterwood regeneration systems are being used in the Ponderosa pine and mixed conifer types.

Reforestation efforts in backlog areas that are either understocked or burned over has produced little success.

The present estimated annual harvest of fuelwood is 1.5 million board feet or 3,000 cords. This does not include free use fuelwood (dead and down material). A field inventory of the available fuelwood has not been done. However, potential production is estimated to be 12.7 MMBF. Overall, the present harvest level is not meeting the demand because access to fuelwood sources is a limiting factor.

Present demand for fuelwood on the Payson District exceeds supply. Local residents rely on fuelwood from the Forest for winter heating. Reasonable commuting distance on good roads brings many people from the Phoenix metropolitan area to the Payson District for fuelwood.

The reverse situation exists on the Pleasant Valley District, where supply presently exceeds demand and accessibility is limited. The accessible fuelwood resource on the Globe District has been depleted to the point that only a very limited supply of dead and down material is available. Residents of the Globe/Miami area who rely on fuelwood from the Forest for heating obtain most of it from areas on the Pleasant Valley District. This pressure from surrounding communities will rapidly deplete the dead and down fuelwood supply adjacent to existing roads. Other districts on the Forest experience little demand for a limited supply of dead and down material.

The estimated acreage of productive jojoba is 541,000. Estimated current production is an average of two pounds per acre per year. The interest in harvesting jojoba beans has decreased to the point that demand can be met annually with a significant surplus of unharvested beans. Besides furnishing the jojoba bean from which fine oil is produced, the plant is critical for wildlife food and cover, watershed stability, and food for cattle grazing in the desert.

Future Trends

Some assumptions regarding future production of timber, fuelwood and jojoba on the Forest are as follows:

- It is anticipated that market and non-market demands from the Forest will increase and that in some cases the demands will be in conflict.
- The future demand for fuelwood is expected to continue to exceed the supply as the local Forest and metropolitan area populations increase. The trend toward using fuelwood as a substitute for high-cost heating alternatives will keep the demand up. It is conceivable that as gasoline prices escalate, there may be a point when the cost of obtaining fuelwood, for people residing away from the Forest, may be so high that their share of the demand could decrease.
- Roundwood harvest will decrease. Existing stands have been pulped and are becoming sawtimber size. Sapling stands exist which can replace these pole stands and produce a pulp harvest, but the acreage is too small for a 7,000 cord cut per year.
- Demand for commercial picking of the jojoba bean will be a direct reflection of market value.

Water

The Forest currently yields an average of 349,000 acre feet of water annually. Most of this water flows into the Salt and Verde Rivers and ends up in the Salt River Project (SRP) storage reservoir system. Water from SRP is used in the Phoenix area primarily for domestic, industrial, and agricultural purposes. In addition to these downstream uses, water from the Forest is used in communities and subdivisions throughout the Forest as well as for on-Forest purposes such as recreation, livestock, and wildlife. Maximum supply potential is 420,000 acre feet.

The demands for water use, on and off Forest, exceed the supply. There are opportunities on the Forest for increasing water yields through vegetation management. Such opportunities are greatest in the ponderosa pine and chaparral vegetative communities.

Current consumptive water uses on Forest watersheds are estimated below. This listing also indicates if the legal basis (water right) for these uses stems from State law or from Federal law.

The uses made under authority of State law are primarily for livestock, wildlife and recreation purposes. The uses made under authority of Federal law are primarily for firefighting and the maintenance of administrative facilities such as Ranger Stations.

Watershed	Current Consumptive Use *(Acre-Feet Per Year) State Claims	Federal Reserved Claims
Salt	1,374	23
Verde	509	3
Cave Creek	45	1
Aqua Fria	76	1
Gila	166	1
TOTAL:	2,170	29

* Includes evaporation losses from ponds.

Water dependent resources such as riparian areas will be ranked by priority and risk. Strategies for assuring the presence of water to protect the high priority water-dependent resources will be evaluated. If acquiring a State water right is the best strategy, applications to appropriate will be filed.

Until recently, the Arizona Department of Water Resources had not officially recognized instream flow claims. Since they have recognized such uses, the Forest has filed one claim for 2.5 cubic feet per second. The purpose of this claim is to protect fish, wildlife, and recreation values on Pinto Creek.

It should be noted that the U.S. Bureau of Reclamation in cooperation with the U.S. Fish and Wildlife Service and the Arizona Game and Fish Department, is studying the impact that proposed upstream water exchanges (involving Central Arizona Project water) will have on several rivers. The findings of this study will be published in an Environmental Impact Statement.

The Forest will also have continuing need to develop new waters. This will necessitate additional water rights. In the case of Federal reserved rights, the Forest currently estimates future needs to be approximately 50 acre-feet per year. The water will be required primarily for future administrative sites, fire suppression activities, and roadwatering. In addition, approximately 500 acre feet of water will be needed for future campgrounds, range improvements, and wildlife habitat projects. This will require a State water right for each new surface water development.

Affected Environment

Forest Service demands for water rights are very small relative to downstream users, yet they are vitally important to proper management. The demand for more water developments in the Forest will continue to increase as the public demands more commodities and amenities.

Generally, the quality of water produced on the Forest is good and complies with established water quality standards. Problem areas do exist, however. Occasionally, sewage treatment plants cause some water quality problems, as do various mining activities. Suspended sediment (turbidity) also causes problems. This can be attributed both to natural erosion processes and to man-caused activities such as overgrazing and excessive off-road vehicle useage.

Of the 24 major watersheds on the Forest, 18 are rated in unsatisfactory condition (Table 23). That is, the vegetation protecting the soil surface has been removed to the point that accelerated erosion is occurring and some peak flood flows are being affected. Soil productivity is being adversely affected in these areas.

Table 23

Watershed Condition Ranking

Condition Class	Watershed Name
Satisfactory	Pinal Creek
Satisfactory	Salome Creek
Satisfactory	Cottonwood Creek
Satisfactory	Upper Tonto Creek
Satisfactory	Queen Creek
Satisfactory	Lower Verde River
Unsatisfactory	Pinto-Campaign Creek
Unsatisfactory	Lower Tonto Creek
Unsatisfactory	West Roosevelt Lake
Unsatisfactory	Cave Creek
Unsatisfactory	Spring Creek
Unsatisfactory	San Carlos River
Unsatisfactory	Upper Salt River
Unsatisfactory	Fossil Creek
Unsatisfactory	Agua Fria River
Unsatisfactory	Canyon Creek
Unsatisfactory	Lower Salt River
Unsatisfactory	Middle Tonto Creek
Unsatisfactory	Sycamore Creek
Unsatisfactory	Mineral Creek
Unsatisfactory	East Verde River
Unsatisfactory	Horseshoe Reservoir
Unsatisfactory	East Roosevelt Lake
Unsatisfactory	Cherry Creek

Future Trends

The demand for more water developments in the Forest will continue to increase as the public demands more commodities and amenities. This will necessitate additional water rights. It is assumed the overall demand for water will continue to exceed supply, and that watershed conditions and water quality will improve.

Minerals

Much of the mineral interest on the Forest is associated with the base metal and precious metal deposits of the Globe-Miami and Superior mining districts. Historical production from these districts has totaled several billions of dollars in mineral value, mostly from the large copper porphyry-type deposits on patented lands that are no longer within Forest administration. There are many small deposits of base and precious metals scattered on the Forest surrounding the patented lands, and there has historically been considerable interest in the mineral potential of these areas. Low grade gold occurrences are found southwest of Payson and associated with the mercury deposits of the Rattlesnake mining district between Payson and Mesa. Low-grade vein-type uranium deposits of the Sierra Ancha area were mined in the 1950's and have attracted considerable exploration interest in the recent past. The chrysotile asbestos resources of the Sierra Ancha and Chrysotile areas are among the largest in the United States, but mining has been idle for the past few years. The stratabound, replacement-type iron formations of the Sierra Ancha Mountains represent a huge, low grade resource that is currently of little economic interest. Substantial quantities of sand and gravel for highways and general construction are removed each year from drainages and alluvial valleys on the Forest.

Table 24 lists the mineral occurrences on the Forest and Table 25 lists the acreage of potential mineral occurrence.

The mineral potential ratings of Table 25 are based upon information from State and Federal technical publications relating to geology and mineral occurrences on the Forest, as well as unpublished file data from the Arizona Department of Mines and Mineral Resources, personal communications, and Forest records of past and present mineral operations. A mineral potential report and overlays displaying the rated lands were prepared for the Forest Plan, and are on file at the Supervisor's Office.

The Forest processed and adminstered approximately 180 operating plans for mineral exploration and development in 1981.

Future Trends

Demand trends assume that exploration, development, and production of all mineral categories will continue to increase, and interest in old mines and tailings will increase as prices increase. The copper and uranium industries are currently depressed, but will make a slow recovery. Exploration for oil and gas will increase in frequency, and demand for sand, gravel, and stone will increase with continued rapid population growth and construction.

Affected Environment

Table 24

Mineral Occurrences [1/]

Mineral Type Locatable Minerals	Occurrences Forest Total Sites	Mineral Type Energy Minerals	Occurrences Forest Total Sites
Asbestos	43	Geothermal	3
Barium	12	Oil or Gas	4
Base Metals [2/]	43	Uranium	50
Beryllium	6		
Clay	1	Common Minerals	
Fluorspar	7		
Gem Minerals	2	Building Stone	2
Gypsum	2	Sand and Gravel	127
Iron	25		
Manganese	14		
Mercury	10	TOTAL KNOWN MINERAL	
Perlite	2	OCCURRENCES	418
Precious Metals [3/]	47		
Tungsten	8		
Zeolites	10		

1/= A mineral "occurrence" indicates that the mineral has been found to exist on Forest Service land. There is no suggestion or implication of any economic value.

2/= Copper, lead, or zinc.

3/= Gold or silver.

Critical and strategic minerals include:

1. Asbestos
2. Beryllium
3. Copper
4. Fluorspar
5. Lead
6. Manganese
7. Mercury
8. Silver
9. Tungsten
10. Vanadium
11. Zinc
12. Uranium

Table 25

Acreage of Mineral Potential [1/]

Mineral Type and Rating [2/]	Forest Total (Acres)
Locatable Minerals	
Asbestos	
A2	100
A3	4,180
B4	110,000
Barium	
A0	160
A1	210
Base Metals	
A1	26,000
A3	8,020
B3	120
B4	171,350
Beryllium	
B3	1,900
Clay	
No Rating	
Fluorspar	
A1	210
A3	120
Gem Minerals	
A1	30
A3	90
Gypsum	930
B4	
Iron	
A3	870
B3	7,500
B4	45,700
Limestone	
A1	130
Manganese	
No Rating	
Mercury	
A3	14,100
Molybdenum	
A1	6,200
Perlite	
A1	1,500
Precious Metals	
A1	26,980
A3	6,120
B3	120
B4	168,350
Tungsten	
A3	1,150
Vanadium	
No Rating	
Zeolites	
B4	31,930
Energy Minerals	
Geothermal	
B4	14,600
Oil or Gas	
B0	70,700
Uranium	
A3	1,230
A4	44,000
B3	230
B4	25,000
Common Minerals	
Building Stone	
A1	1,230
A4	50,400

1/ "Potential" indicates that there is a possibility the mineral might occur on the estimated acreage. Acreages are not unique between minerals, i.e., two or more minerals may possibly be found on the same acreage.

2/ Ratings are defined in Table 26.

Affected Environment

Table 26

Mineral Potential Ratings - Criteria

Rating	Expected Mining Activity To Year 2030	Geologic Model Favorability
A0	None	Demonstrated Favorable
A1	Production	Demonstrated Favorable
A2	Development	Demonstrated Favorable
A3	Exploration	Demonstrated Favorable
A4	Prospecting	Demonstrated Favorable
B0	None	Theoretically Favorable
B1	Production	Theoretically Favorable
B2	Development	Theoretically Favorable
B3	Exploration	Theoretically Favorable
B4	Prospecting	Theoretically Favorable

LANDS

Land Adjustment

The Tonto National Forest was designated in 1908. Included within the National Forest boundary are private lands, mineral patents, and lands administered by other government agencies. The Forest Service acquires land through land exchanges, purchases, and donations. There are 44,527 acres designated as base-in-exchange, 19,796 acres of private lands classified as desirable for acquisition by exchange, and 741.98 acres designated as eligible for acquisition in approved Recreation Acquisition Composites.

Land exchange and purchases have been moderate because of uncertain funding for these activities. Land and Water Conservation Funds (L&WCF) have been used to purchase private lands that were primarily valuable for outdoor recreation purposes. This program has been the only source of funding for land purchase.

Occupancy trespass involves the identification, investigation, and resolution of unauthorized occupancy and use. There are many suspected non-mineral related occupancy trespasses resulting from isolated tracts of private land where owners have constructed improvements on adjacent National Forest land. Where property lines are not well identified, the Forest Service has increased efforts to establish property lines through accurate boundary surveys. It is anticipated that ongoing surveys of township and property boundaries will identify more unauthorized occupancy.

There is also an increasing amount of development, especially subdivisions, adjacent to National Forest System lands. The associated impacts in Forest management are increasing; for example, conflicts over responsibility for range fences along property boundaries, access to the Forest, and loss of key habitat for wildlife.

The only general authority to convey National Forest Lands to private individuals is through land exchange. The Forest Service also has authority to convey lands to Government institutions through the Exchange for Public Schools Act and the Townsite Act.

Owners of adjacent property generally favor land exchange with the Forest Service to reduce subdivision costs, resolve access difficulties, and realize investment benefits. The volume of exchange activity has been low in the past due to uncertain funding and few proposed exchanges which would benefit the public.

Land ownership adjustments are coordinated with the plans and programs of other Federal agencies, and State and local governments.

Passage of the "Small Tracts Act" in 1983 will provide the opportunity for an equitable and timely solution to many of the Tonto's occupancy trespass problems.

This legislation will be but another tool in the land adjustment program. It is expected 3-5 cases per year will be processed under this authority. At this rate, the Forest should resolve all qualifying cases in 10-15 years.

Future Trends

Land ownership adjustment proposals from private and government agencies are expected to increase in the immediate future.

Special Land Uses

Except where special uses are specifically prohibited through legislation, local zoning, or administrative decisions, the Forest may be available for a variety of special land uses if it is in the public interest and compatible with Forest goals and objectives. Special uses are authorized through the issuance of special use permits. Factors that limit issuance of permits are suitability of land for the proposed use and compatibility with other management objectives.

There are 441 non-recreational permits on the Forest and 352 recreational permits. Non-recreational use includes electronic sites, roads, apiaries, water transmission facilities, wells, springs, fences, powerlines, telephone lines, school facilities, and sanitary landfills. Recreational uses include recreation residences (summer homes), organized camps, commercial public service sites (roads and marinas), and outfitter/guides.

The Superstition Mountain Historical Society has proposed development of a Superstition Mountain Museum (60 acres).

Future Trends

Demands for various special uses will increase in future years. Issuance of special use permits will become more difficult due to increasing conflicts with Forest management activities.

Utility and Communication Facilities

Utility and communication facilities on the Forest are authorized by special use permit or easement. They include oil and gas pipelines, powerlines, telephone and telegraph lines, and electronic sites. The locations of the major existing utility uses as well as corridors within which future major uses will be considered are shown on the Forest Plan Utility Corridor Map.

Affected Environment

Salt River Project (SRP) manages four dams on the Salt River and two on the Verde River for the benefit of downstream water users. SRP also generates hydroelectric power at the four dams on the Salt River. These facilities are located on National Forest lands withdrawn for reclamation purposes and operated under authority granted by the Bureau of Reclamation. Coordination of all activities that take place within the National Forest for lands withdrawn for the Salt River Project reclamation purposes are covered by a management memorandum (Triparty agreement) dated April 27, 1979 between the Salt River Project Agricultural Improvement and Power District, the USDA Forest Service, and the U.S. Bureau of Reclamation.

The increasing population and size of the Phoenix metropolitan area requires an increasing supply of utilities. Many transmission corridors for electricity, gas, and oil cross the Forest (see Table 27).

Table 27

Utility Corridors - Miles; Electronic Sites - Numbers

Corridor Type	Forest Total
Electric Power Lines	1,019.0
Gas Pipelines	147.0
Railroad	7.6
Telephone Lines	214.1
Water Pipeline	23.4
Television Line	12.0
TOTAL:	1,423.1
----------SITES----------	
Electronic Sites	10
Microwave Sites	3
TOTAL:	13

Future Trends

It is expected that the present trend of increasing numbers of utility uses will continue through the first five decades.

Rights-of-Way (ROW)

The intermingled public and private lands within the boundary of the Forest have resulted in many access problems. These problems are becoming more critical as demands for the use of public land increase. The current emphasis is to acquire ROW's where access problems are the greatest. Private landowners are reluctant to grant ROW's to the Forest Service unless there is a significant benefit to the landowner. When a ROW is in the public interest and the property owner is unwilling to grant an easement, the right of eminent domain can be used.

The status of existing ROW's on roads and trails is often uncertain. The public often confuses unfenced private lands for public land which results in trespass onto private lands. This action often prompts the private landowner to challenge the validity of the easement.

Future Trends

Public demand for public ROW access will increase as Forest uses increase. Resistance to grant public ROW's is likely to increase.

Withdrawals

In 1866 and 1872, Congress granted to all American citizens the right to prospect, explore, develop, mine, and dispose of locatable minerals on all public domain lands not withdrawn or otherwise segregated from appropriation under the mining laws. Certain lands have been withdrawn under various authorities to provide necessary protection from surface-disturbing activities associated with mining. Table 28 shows the acreage currently withdrawn from mineral entry.

Table 28

Existing Withdrawals

Type of Withdrawal	Acres Withdrawn 1/
Reclamation	176,711
Orme Dam Reservoir	1,151
Watershed Research	2,055
Wilderness Water Sources	710
Wildlife Exclosure	40
Experimental Forest	12,600
Historical Site	460
Organization Site	1,323
Roadside Zone	6,122
Recreation Site	810
Administrative Site	1,793
Research Plots	400
Research Natural Area	480
Wild and Scenic River Study:	
Scenic	1,731
Wild	17,721
Superstition Wilderness	124,117 2/
Sierra Ancha Wilderness	20,850 2/
Pine Mountain Wilderness (Tonto NF)	11,450 2/
Mazatzal Wilderness	205,233 2/
Arizona Wilderness Act	224,340 2/

A review and assessment of existing withdrawals is required by Section 204 of the Federal Land Management and Policy Act. Present direction to all agencies is to review withdrawals by 1991, and revoke those which create an unnecessary encumbrance on the land.

1/ Acres are not additive as there is duplication of acreage in Reclamation, Orme Dam Reservoir, and Wild and Scenic River Study withdrawals.

2/ Acreage withdrawn by the Wilderness Act as of December 31, 1983. Includes all forms of appropriation under the mining laws and from disposition under all laws pertaining to mineral leasing and all amendments thereto with the exception of valid claims existing on or before December 31, 1983.

Future Trends

The only new withdrawals contemplated are withdrawals for administrative sites, and those involving other major investment areas which require protection.

Affected Environment

Special Area Designations	
Research Natural Areas, Botanical Areas, Natural Areas	The Tonto National Forest has one designated Research Natural Area: Bush Highway; and four potential areas: Buckhorn Mountain, Upper Forks Parker Creek, Picket Post Mountain, and Haufer Wash. The Bush Highway Research Natural Area, occupies 488 acres in the creosote bush, Palo Verde ecosystem. Buckhorn Mountain is located within the Three Bar Wildlife Area and contains 2,810 acres, primarily interior chaparral. Upper Forks Parker Creek is located within the Sierra Ancha Experimental Forest and contains 1,288 acres, primarily woodland and Ponderosa-pine. Picket Post Mountain occupies 1,120 acres, primarily desert and chaparral ecosystems. Haufer Wash is located approximately three miles north of Punkin Center and occupies 680 acres of mixed semi-desert grassland and desert scrub. Two proposed botanical areas include 1,200 acres of Sonoran desert and Blue Point Cottonwood (480 acres of desert riparian). Proposed State natural areas include Sycamore Creek (60 acres of desert riparian), and Fossil Springs (20 acres of riparian).
Future Trends	Future demands for research natural areas will remain at current levels, or slightly decrease. The existing site and proposed sites should be adequate for the next 10 years.
Protection	Protection is divided into four separate elements, fire, insects and disease, air, and law enforcement.
Fire	Fire management in the area of the Tonto National Forest is a coordinated interagency effort involving Federal, State, and local agencies. Its overall objective is to provide a cost-efficient program responding to land and resource management goals including fire protection, fire use, and protection of life and property. The Tonto does not have risks and/or hazards that are unusual or special. There are three major fuel types on the Forest (See Table 29).

Table 29

Acres of Fuel Type

Fuel Type	Acres
Grass and light shrubs	1,383,354
Chaparral	848,648
Timber/Woodland	641,293

The average number of fires and the acreage burned has been about 357 fires and 19,500 acres per year for the past five years.

Future Trends

Increases in population and recreation use will cause increased risk of man-caused fires. Public understanding and acknowledgement of the use of fire as a management tool will increase as the role of fire in the ecosystem is better understood.

Insects and Disease

Current levels of insect and disease activity are at relatively low levels of occurrence and intensity except for dwarf mistletoe in Ponderosa-pine. Ips engraver beetles (Ips spp.) and Dendroctonus beetles (D. brevicomis = western pine beetles) are causing widely scattered but limited tree mortality. Trees killed occur both singly and in small groups of from one to 10 trees scattered throughout the pine type. Dwarf mistletoe is found throughout the Forest and is currently causing substantial volume loss. Overall it is estimated that tree mortality and growth loss may exceed one million board feet annually.

Some isolated infestations of grasshoppers may be found on small areas of rangeland. These infestations are not considered a serious threat to the range resource. Field checks by the Animal and Plant Health Inspection Service (APHIS) indicate limited areas of infestation which are considered uneconomical to spray for control.

Current policy is to protect and preserve the Forest resource against destructive forest pests by preventing and/or suppressing potentially damaging infestations. Forest protection involves providing District Rangers with appropriate information for planning and decision-making processes and compatible techniques for managing forest pests. Some integrated pest management techniques are being incorporated into Forest prescriptions and Forest operations to minimize potential Ips beetle outbreaks.

Insect-susceptible trees are cut and insect-killed trees are salvaged during timber management activities. Dwarf mistletoe is controlled by management activities specifically designed to optimize growth of stands.

Future Trends

As management practices are applied to Ponderosa-pine stands, the potential for Ips beetle outbreaks will increase. Preventative silvicultural treatments can reduce this risk. Salvage of trees highly susceptible or killed by insects and disease will continue. Dwarf mistletoe will continue to present a risk to Ponderosa pine-stands.

Affected Environment

Air

The air quality on the Tonto National Forest can generally be characterized as good. The two air pollutants of primary concern are particulates (dust, smoke, and other small particles), and sulfur dioxide.

In the lower elevation desert country, fugitive dust emissions from unpaved roads, construction work, and other land disturbing activities occasionally cause particulate concentrations to exceed air quality standards. Thse violations are not frequent, however. For instance, at Miami, Arizona data collected by the Department of Health Services indicates that only 2 of 55 samples collected in 1983 were in violation. At Roosevelt, Arizona none of the 58 samples collected were in violation.

In the higher elevations of the Forest, the only air quality problem of significance relates to wood burning. In the Town of Payson, for instance, the burning of fuel wood to heat homes and businesses occasionally causes violations of particulate standards.

Sulfur dioxide standards are violated in the vicinity of the Forest near Miami, Arizona as a result of copper smelting activities. The Arizona Department of Health Services is currently working with the mining company to alleviate the problem.

Other pollutants such as carbon monoxide that are a problem in the Phoenix metropolitan area do not appear to be causing problems on the Forest. Special monitoring studies at Apache Junction and Globe indicate that carbon monoxide is not causing violations of air quality standards.

The Clean Air Act and its 1977 amendments give the States most of the responsibility for managing air quality within their boundaries. The framework for air quality management is the Arizona State Implementation Plan.

The Forest Service role in air quality management is coordination of National Forest activities with State and Federal air quality control efforts. Coordination is accomplished by properly managing the air pollution created by Forest Service activities such a prescribed fire, construction and use of roads, and the operation of various facilities. The Forest Service has a primary responsibility for protecting the Forest from adverse impacts created by external sources of air pollution by coordinating with the State.

The Forest Service manages air quality in wilderness areas to prevent adverse impacts on wilderness values. Such management includes reviews and recommendations on new source emitting facilities to ensure compliance with Federal and State permit programs.

Table 30 shows the Class I Air Quality Areas on the Forest.

Table 30

Class I Air Quality Areas

Class I Areas	Gross Acres
a. Mazatzal Wilderness	205,346
b. Pine Mountain Wilderness	8,611 (Prescott NF) 11,450 (Tonto NF)
c. Sierra Ancha Wilderness	20,850
d. Superstition Wilderness	124,140

Within Class I areas, there are no non-attainment areas.

Future Trends

Air quality will continue to be a concern of the public and resource managers.

Law Enforcement

The Forest plays host to an increasing number of people for both recreation and a livelihood. Many offenses constantly occur on the Forest including theft of Government property, vandalism, dumping of garbage and thefts from visitors to National Forest facilities. Vandalism in developed recreation sites is a major problem. The proximity of Phoenix to Forest lands contributes to greater incidences of theft and vandalism.

Although not readily visible as some offenses, unauthorized livestock are a problem is some areas. Some unauthorized use occurs due to poor fence maintenance while some is intentional.

The Forest is a major host of archeological sites. Disturbance of archeological sites for removal of Indian artifacts is occurring more frequently.

Future Trends

Arizona's location in the Sun Belt assures continued population growth for the State. That growth will continue to cause law enforcement problems in all areas. Increased funding will be needed to adequately address the law enforcement issue.

TRANSPORTATION SYSTEM

Forest Roads

There are approximately 3,810 miles of existing road on the Forest, not including State and County highways. The roads vary from high standard two lane paved roads to very primitive track roads suited only for high clearance and ORV travel. Many of these roads were constructed without planning or engineering. They evolved from timber harvest, ranching, mining, and recreation activities. There are 1,677 miles currently inventoried as part of the Forest Transportation System. An additional 2,133 miles of existing travelways need to be evaluated for addition to the transportation system, or obliterated and returned to vegetative production. A determination is also needed as to which roads on the transportation system need to be closed to public use and maintained for administrative purposes only.

Since 1970, the Forest has been reacting to five major floods which caused severe damage to the transportation system. Flood projects have helped restore major portions of the transportation system to an adequate serviceable condition.

About five miles of new roads are built each year, primarily for timber sale access.

There are 26 bridges and 23 major culverts on the Forest.

Transportation system maintenance has fallen behind planned levels. The result of which has been deterioration of some roads and some resource damage. Those roads will have to be reconstructed or closed sooner than their designed useful life. Table 31 shows the maintenance level assigned to the 1,677 miles inventoried as part of the transportation system in 1980.

Table 31

Road Maintenance Levels - 1980 1/

	Maintenance Level				
	1	2	3	4	5
Actual Miles	0	1,440	185	51	1

1/ See Chapter 4 for maintenance level definitions.

Forest Highways

Certain Forest, State, or County roads are designated as Forest Highways. The Federal Highway Administration (FHWA) administers the program. These highways serve National Forests in that a significant volume of traffic is generated by traffic not associated with Forest resources. Currently, there are eight Forest Highways on the Tonto. Funding for reconstruction comes from the Highway Trust Fund administered by the FHWA. Coordination is maintained among FHWA, FS, and State and County Highway Departments. Table 32 lists all Forest Highways.

Table 32

Forest Highways - 1983

FH #	Name	Termini	Length (Miles)	Other Road No.
9	SR 188	Roosevelt Dam to Punkin Center	20.0	SR 188
12	Young Highway	SR 88 to SR 288	69.5	SR 288
47	Bartlett	FDR #205 to Riverside Campground	9.5	FDR #19
48	Horseshoe Dam	Cave Creek Road to Horseshoe Dam	17.3	FDR #205
49	Apache Trail	Apache Junction to Roosevelt Dam	47.0	SR 88
50	Bush Highway	Forest boundary north of Apache Junction to SR 87	15.8	FDR #204
51	Control Road	SR 87 to SR 260	22.6	FDR #64
52	Houston Mesa	SR 87 to Control Road	9.8	FDR #199

Federal/State Highway System

There are 10 major State/Federal transporation routes crossing the Forest which total 324 miles. These routes provide access to points and communities located within as well as beyond the Forest. They are used by tourist traffic and as major routes for distribution of goods to areas north and east of the Tonto.

Future Trends	Public use of the Forest road system will continue to increase. Public safety will continue to be a concern of Forest managers. New roads will be constructed to accomplish management objectives.
Trails	The trail system consists of approximately 844 miles of system trail and 244 miles of system travelways. Four hundred thirty-six miles of trail and 71 miles of travelways are in wilderness. Trail use outside wilderness is predominantly recreation-oriented; travelways are used primarily as stock trails, fire access, or for other miscellaneous uses. Two trails on the Forest have been established as National Recreation Trails (NRT) under the National Trails System Act. The Highline NRT on the Payson Ranger District is 51 miles long; the Sixshooter NRT on the Globe Ranger District is 4.7 miles long. Trails are maintained on a periodic basis; the frequency is determined by trail use and need for maintenance. Much of the trail system in and out of wilderness needs major reconstruction or heavy maintenance to provide adequate user safety and protect soil and water resources. Inadequate trailhead facilities are also causing resource damage and hazards to users.
Future Trends	Projected demand for trails is expected to increase along with the demand for dispersed recreation opportunity. The demand for horse and foot trails closer to the metropolitan area is expected to exceed that for more remote areas.
Administrative Facilities	The Forest currently owns nine office buildings, 23 storage buildings, six shop buildings, seven family residences, seven family trailers, 22 crew quarters buildings and trailers, and seven fire lookouts. Thirty-five of these facilities are in poor or fair condition and need replacement or rehabilitation.
Future Trends	Maintenance of facilities, for health and safety will continue to be a concern to assure safety of the public and employees and the protection of investments.

Environmental Consequences

4

OVERVIEW

Environmental consequences are the effects and impacts of implementing an 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 alternatives considered in detail. Direct environmental effects are defined as those occurring at the same time and place as the initial cause or action. Indirect effects are those that occur later in time or are spatially removed from the activity, but are significant in the foreseeable future.

Analysis and evaluation of the consequences provide the analytic basis for comparison of alternatives. Alternatives considered in detail in developing the Tonto National Forest land and Resource Management Plan (Plan) are described in Chapter 2.

Environmental consequences of the alternatives result from application of various combinations of management prescriptions. In each alternative, the mix of prescriptions produces different levels of resource outputs, including recreation, wildlife habitat, timber and fuelwood production, water yield, watershed condition, and grazing capacity. The interaction between the level of outputs and location of their production and timing yields distinct environmental consequences. This mix represents the short-term use of the environment.

Environmental consequences for all alternatives fall within certain limits because of Forest-wide management requirements imposed to ensure long-term productivity of the land. These requirements are contained in standards and guidelines and apply to all management prescriptions. The alternatives considered in detail do not significantly reduce long-term productivity. See Chapter 4 of the Plan for the detailed Forest-wide Management Requirements and Management Area Prescriptions. Chapter 5 of the Forest Plan contains the monitoring requirements that assure long-term productivity is maintained while meeting the goals and objectives.

The alternatives have no significant effect on flood plains, wetlands, air quality, noise levels, or urban quality and these aspects of the environment are not discussed. The effects on visual quality, cultural and historical resources, water quality, Threatened and Endangered species, species diversity, and utility corridors are slightly different in some alternatives and are covered by brief descriptions.

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 Proposed Action alternative from the alternative with the highest output in the first period.

Probable adverse environmental effects which cannot be avoided are also discussed. Unavoidable adverse effects result from managing the land for one resource at the expense of the use or condition of other resources. Management requirements in prescriptions mitigate most adverse effects by limiting the extent or duration of effects. Alternative formulation eliminated alternatives that would have resulted in excessive impacts. Mitigation/coordination/integration measures within standards and guidelines further reduce these conflicts.

Environmental Consequences

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 Period 5 and beyond. Short-term uses are timber and fuelwood harvest, all recreation uses, livestock grazing, mineral extraction, and special land uses.

Soil and water are the primary resources upon which productivity is based. Short-term uses that damage soils and soil-water relationships impair long-term productivity. Management requirements provide for protection of long-term productivity by requiring that impacts on soils and water from short-term uses be mitigated and/or that short-term uses enhance soil productivity and water resources.

Forest-wide, livestock overgrazing has a potential for impacting soil and water resources. Under all management alternatives, permitted livestock numbers will be brought into balance with forage capacity. This will reduce soil erosion, and sedimentation of Forest waters. Other measures will also be taken to reduce soil losses and protect water quality. This includes the use of "Best Management Practices" in timber sale harvesting techniques, the rehabilitation of existing recreation sites and the installation of watershed restoration measures.

Net public benefits (NPB) derive from resources with market and assignable prices as well as resources and conditions for which prices cannot be determined (see Chapter 2 for a more detailed discussion of NPB). Examples of priced components that contribute to the NPB are timber production, acre/feet of water yield, forage produced, and cords of fuelwood cut. Examples of nonpriced components that contribute to the NPB are acres of visual quality, amount of soil lost, acres of threatened or endangered wildlife habitat enhanced or maintained, and the quality of a wilderness experience.

Nonpriced benefits include quantitative and qualitative outputs and effects. Quantitative and qualitative outputs and effects are crucial in understanding the whole picture of environmental consequences and NPB's. For example, watersheds are described both in terms of how much water they yield, and in terms of satisfactory or unsatisfactory condition. Quantitative and qualitative outputs are discussed in this chapter and in Chapter 2. The relationship between resource outputs and environmental qualities and consequences is explained, and where relevant, the ties between the quantitative and qualitative aspects are included.

Predicted outputs for the planning period were developed using FORPLAN. Additional detail on predictions of multi-resource interactions for each alternative is included in planning records on file at the Forest Supervisor's Office and in Appendix B.

Section A of this chapter discusses environmental consequences on resources while Section B covers economic and social considerations. Section C discusses miscellaneous considerations, and Section D summarizes effects.

SECTION A
RESOURCE CONSIDERATIONS

Recreation

Dispersed Recreation

All alternatives meet predicted demand for dispersed recreation and are within the maximum practical capacity. There is little difference in dispersed use trends between alternatives, as the change in opportunity by alternative, represented by the Recreation Opportunity Spectrum (ROS) classes, is insignificant (see Table 33).

Table 33

ROS Class Acres by Alternatives (M Acres)

Alternative	Proposed Action (10)	Current (4)	RPA (3)	1	2	6	7	8	9
Primitive	266	266	266	266	266	266	266	266	266
Semi-Primitive Non-Motorized	978	979	978	978	981	981	978	981	978
Semi-Primitive Motorized	984	987	984	985	991	991	984	991	984
Roaded Natural	609	602	609	608	599	599	609	599	609
Rural	19	25	19	19	19	19	19	19	19
Urban	17	14	17	17	17	17	17	17	17
TOTAL:	2,873	2,873	2,873	2,873	2,873	2,873	2,873	2,873	2,873

Alternatives 1, 2, 3, 4, 6, 8, and 9 provide opportunity for a moderate level slightly above the 1980 level for commercial recreation special use permits to meet public need, and no commercial river running permits.

Alternative 7 and the Proposed Action provides opportunity for an optimum level of commercial recreation special use permits to meet public needs. The number of commercial river running permits is not allowed to exceed 50 percent of river use capacity.

Alternatives 3, 7, 8, and the Proposed Action provide trailhead development Forest-wide which will enhance dispersed recreation opportunities by providing access and parking, as well as, user control through facilities at major trails. The Proposed Action provides for development of approximately 44 miles of trails which will be readily accessible to users in the adjacent metropolitan area. These alternatives also provide a higher level of law enforcement to handle the impacts of increasing dispersed recreation use, particularly in high use areas, i.e., Lower Salt River and Mogollon Rim.

All alternatives, except the Proposed Action, provide funding for management of off-road vehicle (ORV) use at current level. This would mean the Forest would continue to fall behind in signing and enforcement of areas where various closures or restrictions exist. The Proposed Action includes a revision of current ORV restrictions and increases funds for administration. See Chapter 2, Table 2 for areas open to ORV use by alternative.

Adverse effects which cannot be avoided include potential conflicts between off road vehicle use and other uses. An irreversible effect would be soil resource damage by off road vehicles. The difference in RVD's between the Proposed Action and Alternatives 1 and 3, which produce the highest dispersed use is irretrievable. The average annual difference between these alternatives in the first period is 890,000 RVD's.

Developed Recreation

Alternatives 3, 7, and 8 schedule recreation site development to meet the projected demand Forest-wide.

Alternatives 1, 2, 4, 6, and 9 retain the current developed recreation sites. These alternatives would result in some overcrowding, site deterioration, and degradation to the visitor recreation experience.

Conditions of facilities at existing sites are such that if allowed to continue they would deteriorate to a point which could result in threats to public health and safety. All alternatives, except Alternative 4, have scheduled rehabilitation of existing sites to provide a safe and enjoyable recreation experience for the visitor.

Under the Proposed Action, 89 percent of the demand will be met by Forest Service programs and budgets and Plan 6 of the Bureau of Reclamation. Continued reliance would be made on commercial public service sites to provide required services, and the public will choose other alternatives such as dispersed recreation.

Alternatives 3, 7, 8, and the Proposed Action provide a higher level of law enforcement than current level to handle the impacts of increasing use at developed sites, particularly on the Salt and Verde Rivers and reservoirs and Mogollon Rim area.

Table 34 displays how well each alternative meets the projected developed recreation site demand in Forest Service sites - 2,605 MRVD's, in the fifth time period.

Table 34

Alternative Satisfaction of Developed Recreation Demand

Alternative	Fifth Period Percent of Demand Satisfied [1/]
Proposed Action (10)	89
Current (4)	84
RPA (3)	100
1	86
2	84
6	84
7	100
8	100
9	84

1/ Includes recreation facilities constructed on Roosevelt Lake through Plan 6.

Environmental Consequences

Table 35 displays by alternative total developed site acres and estimated persons at one time (PAOT) capacity at the end of the fifth period.

Table 35

Developed Recreation Site Acres and Estimated PAOT by Alternative [1/]

Alternative	Fifth Period	
	Total Acres Developed Sites	Total Estimated PAOT Capacity
Proposed Action (10)	3,054	23,092
Current (4)	1,469	19,551
RPA (3)	3,245	23,999
1	1,469	19,551
2	1,469	19,551
6	1,469	19,551
7	4,035	25,813
8	2,335	21,459
9	1,469	19,551

1/ Includes recreation facilities constructed on Roosevelt Lake through Plan 6.

As can be seen in Table 35 some alternatives develop significantly more acreage than others. During the first, second, and third periods recreation construction in Alternatives 1, 2, 6, and 9 will consist of rehabilitation of existing sites. This will provide for a moderate increase in PAOT with no increase in acreage developed. However, in Alternatives PA, 3, 7, and 8 construction will increase in the first through fifth periods emphasizing trailheads, campgrounds, and picnic grounds.

Adverse environmental effects which cannot be avoided for Alternatives 1, 2, 6, and 9 include: 1) increased user conflicts, deterioration of sites, and overflow areas where use exceeds capacity, and 2) minor reductions in other outputs, such as grazing capacity, from construction of developed sites.

Irreversible effects include soil degradation in Alternatives 1, 2, 8, and the Proposed Action where major rehabilitation of existing sites is delayed until the second time period because of budget limitations. In Alternative 4, soil degradation would be most prevalent because existing sites are not rehabilitated.

In alternatives where new developed sites are provided, these sites represent an irretrievable commitment of resources due to the long-term nature of these developments. In addition, the average annual difference in developed use (109,000 RVD's) between the Proposed Action and Alternative 7 is irretrievable.

Visual Resource

The entire Forest has been inventoried for visual quality. The system used for this inventory assigns visual quality objectives (VQO's) of Preservation, Retention, Partial Retention, Modification, and Maximum Modification (see Glossary). VQO's are quantified on how readily the areas are visible, the number of persons likely to view the areas, and the uniqueness or variety of a particular landscape. Acres by inventoried VQO's are shown in Table 36 and are used for comparison of alternatives.

The objective of visual resource management is to attain the highest possible visual quality commensurate with other appropriate public uses, costs, and benefits. Emphasis is put on areas of retention and partial retention, to ensure that activities meet guidelines and are harmonious with the characteristic landscape.

Overall, the alternatives have little impact on acres on various visual quality objectives. Again, as in the evaluation of the effects on recreation opportunity spectrum, most of the proposed recreation and road development will have a minor impact on changing existing VQO's.

The consequences of some management activities, such as road construction and timber harvesting, will have a net reduction in the visual quality, but, in many instances, of short duration. Some activities, such as road obliteration, will provide rehabilitation; a short-term management goal used to return the existing condition to a natural landscape. Management activities such as timber harvesting and vegetation manipulation to increase landscape diversity, will be used as tools to improve the visual resource through enhancement. Enhancement is a management goal which is aimed at increasing positive visual variety where little variety now exists. Not all management activities will fulfill the assigned VQO. In these situations, all practical mitigating measures will be made to help meet the VQO.

Table 36

Alternative Visual Quality Objectives (Thousand Acres)

VQO	Proposed Action (10)	Current RPA (4)	(3)	Alternatives 1	2	6	7	8	9
Preservation	593	587	587	587	592	587	587	587	587
Retention	319	320	320	320	319	320	320	320	320
Partial Retention	918	920	920	920	920	920	920	920	920
Modification	484	485	485	485	484	485	485	485	485
Max. Modification	559	561	561	561	559	561	561	561	561
TOTAL:	2,873	2,873	2,873	2,873	2,873	2,873	2,873	2,873	2,873

There are no irreversible effects. Irretrievable effects result from placement of structures, and/or modification of vegetative cover, and displacement of soils. These areas are small and highly localized.

Wilderness

The current total designated wilderness on the Forest is 585,990 acres.

The total existing designated wilderness acreage does not change in any alternative. Table 37 displays the existing wilderness situation.

Table 37

Existing Wilderness

Name	Net N.F. Acres
Mazatzal	251,903
Pine Mountain	11,450
Sierra Ancha	20,850
Superstition	159,757
Hell's Gate	36,780
Salome	18,950
Four Peaks	53,500
Salt	32,800
TOTAL:	585,990

Environmental Consequences

All alternatives strive to provide opportunities for solitude with a minimum of direct controls on human use. Wilderness management relies on indirect controls such as education of the user through signing techniques and other information methods. Specific direct control will be introduced where there is a demonstrated need because of wilderness resource degradation. Direct controls of the Superstition Wilderness are used in the Proposed Action to reduce trail deterioration from overuse and improve the quality of the wilderness experience.

Adverse environmental effects which cannot be avoided include lower quality wilderness experience due to reduced service level management (Table 2, Chapter 2) and visual conflicts with range improvements.

Cultural Resource Effects

Protection of cultural resources may be accomplished by avoidance during project work and through site stabilization. Signs with appropriate messages urging preservation of cultural resources have been posted at more popular sites. Protection of cultural resources by law enforcement is primarily a function of funding levels. A comparison of the qualitative protection levels by alternative is summarized in Table 38.

Table 38

Comparison of Levels of Protection of Cultural Resources

Alternative	Qualitative Level of Protection	Rationale
Proposed Action (10)	High	High level of funding for cultural resources and high funding in law enforcement and emphasis on control of unauthorized use.
Current (4)	Low	Emphasis placed only where opportunities exist.
RPA (3)	Moderate	Emphasis on control of unauthorized use in Salt-Verde Rivers and fuelwood areas.
1	Low	Low budget levels in law enforcement.
2	Low	Low budget levels in law enforcement.
6	Low	Low budget levels in law enforcement.
7	Moderate	Moderate level of law enforcement.
8	Moderate	Same as Alternative 7.
9	Low	Same as Alternative 6.

The potential for damage to cultural sites exists in all alternatives. Losses from inadvertent damage and vandalism are irreversible.

Wild and Scenic Rivers

Two river systems have been named by the National Park Service as qualified for classification under the Wild and Scenic Rivers Program. They are the East Verde River and Tonto Creek.

The East Verde River includes approximately 49 miles on National Forest Lands. In Alternative 7 all eligible segments are recommended for classification. This places 18 miles of river in "Wild" and 15 miles in "Recreation" categories. Only those segments falling within National Forest Lands would be classified.

Tonto Creek was broken into 2 segments. In Alternative 7, both segments would be recommended for classification. This would place 22 miles in the "Wild" category and 10 miles in the "Recreation" category.

In all other alternatives neither of the rivers are proposed for inclusion in the Wild and Scenic Rivers Program. However, the wild portions are protected since they are encompassed by the Mazatzal and Hells Gate wildernesses.

There are no irreversible or irretrievable recreation commitments associated with Wild, Scenic, or Recreation River classification.

Wildlife and Fish

Wildlife Habitat

Improvement of wildlife habitats will be attained through silvicultural activities, prescribed burning, vegetative manipulation, and improvement of range forage. These practices and actions will result in improved habitat conditions for certain management indicator species or groups of species (see Chapter 3 and Appendix D).

The Forest analysis of wildlife habitat improvement has been done cooperatively with the Arizona Game and Fish Department using data from the 1981 State Wildlife Comprehensive Plan (see Table 39). The analysis uses wildlife and fish visitor days use (hunting, fishing, and non-consumptive use) as an indicator of quality of wildlife habitat. Table 40 displays total wildlife recreation visitor days of use by 2030 as an indicator of wildlife habitat quality for comparison among alternatives.

Table 39

Qualitative Comparison of State Wildlife Comprehensive Plan Met by Each Alternative

Alternative	Qualitative Comparison	Rationale
Proposed Action (10)	High Level	Number of acres allocated to wildlife emphasis and high budget level to accomplish resource coordination and habitat improvement objectives.
Current (4)	Low Level	No allocation of acres to wildlife emphasis and low budget level to accomplish objectives.
RPA (3)	High level	Same as Alternative 8.
1	High level	Same as Alternative 8.
2	Low level	Same as Alternative 4.
6	Low level	Same as Alternative 9.
7	Moderate level	Moderate budget level to accomplish coordination and habitat improvement.
8	High level	Highest level of coordination and funds to accomplish habitat improvement objectives.
9	Low level	Lowest level of coordination and habitat improvement.

Table 40

Annual Average Wildlife Use (MRVD's) - by 2030

Alternative	Hunting & Fishing	Non-Consumptive* Use	Total
Proposed Action (10)	617	413	1,030
Current (4)	321	214	535
RPA (3)	709	474	1,183
1	720	482	1,202
2	335	224	559
6	256	171	427
7	591	395	980
8	691	462	1,153
9	259	173	432

*Non-consumptive equals 2/3 of consumptive use.

Alternatives 1, 3, 8, and the Proposed Action provide high levels of habitat quality. Under these alternatives, maximum suitable acreage is available for wildlife habitat improvement. Standards include provisions for forage openings, forage/cover ratio, water distribution, turkey roosts, hiding cover, etc. Alternatives 2, 4, 9, and 6 provide low levels of habitat improvement. Alternative 7 provides for a moderate level of habitat improvement. Acres of riparian habitat in acceptable ecological conditions for Periods 1, 3, and 5 are shown in Table 41. See Table 2 in Chapter 2 for rationale.

Table 41

Riparian-Habitat in Acceptable Ecological Conditions (M Acres)

	Alternative								
Period	Proposed Action (10)	Current (4)	RPA (3)	1	2	6	7	8	9
1	12.5	12.0	12.5	12.5	12.5	11.8	12.0	12.5	11.8
3	17.1	13.8	15.1	16.5	17.1	13.6	14.0	17.1	13.6
5	25.9	19.0	20.3	24.9	25.9	18.5	19.5	25.9	18.5

Cold Water Fish Habitat

The cold water fishing resource is limited primarily to those streams flowing from immediately under the Mogollon Rim.

The fish resource is primarily a put and take opportunity which is managed by the Arizona Game and Fish Department. Resource management activities in all alternatives on the Forest recognize the need for cold water fishing habitat and provide for protection of limited stream habitat. There are no differences among alternatives.

Warm Water Fish Habitat

The lower elevation rivers and reservoirs are a very important and intensively used warm water fish resource. Fish habitat management is closely coordinated with the Arizona Game and Fish Department. The greatest impact on the habitat and fishing resource is the number of boats and conflicting boating use.

Alternatives 3, 7, 8, and the Proposed Action have the most impact on warm water fishing as they all provide for recreation site development on the Salt and Verde reservoirs and result in user conflicts which can possibly reduce warm water fishing. Under these alternatives it is proposed to complete a study and recommendations, by 1990, of the use conflicts between various types of boating activity.

Threatened and Endangered Species (T&E)

All plant and animal Threatened and Endangered (T&E) habitats are maintained and protected in present conditions under all alternatives. Alternatives 1, 3, 8, and the Proposed Action provide opportunity for T&E habitat improvement for the bald eagle and investigation of other T&E plant and animal species needs. Specific impacts to T&E species are properly mitigated in all alternatives. Table 42 displays a qualitative comparison of the effects of management indicator and T&E species as it relates to present conditions.

Wildlife Habitat Diversity

Alternatives 1, 3, 8, and the Proposed Action provide the greatest opportunity for wildlife habitat diversity by providing for more uniform distribution of age classes in the Ponderosa pine/mixed conifer, rejuvenation of chaparral, more acres of chaparral in younger age classes, better water distribution, improved coordination of habitat needs with other resource activities. Under these alternatives, prescriptions for timber management, and for range forage and water yield improvement through prescribed burning in chaparral, benefit wildlife habitat diversity.

Wildlife Structures

Alternatives 1, 3, 8, and the Proposed Action will provide maximum opportunity to build structures for the improvement of wildlife habitat. These improvements will be emphasized in consumptive use areas thus enhancing hunting opportunities. All alternatives allow structure development through cooperative funding from timber sale receipts.

Management Indicator Species

Alternatives 3, 8, and the Proposed Action would produce a positive population trend for the largest number of management indicator species. Alternative 9 would provide the highest level of negative trends because of the management emphasis assigned and low budget levels to coordinate with other activities

or accomplish habitat improvement goals. Table 42 displays a qualitative comparison of the effects of management indicator species as it relates to present conditions. The three species predicted to decrease in the Proposed Action reflect responses to habitat in an improved management condition. The decreases will not affect viable populations of these species.

The following notation applies to Table 42:

+ = positive population trend

- = negative population trend

NC = no change in existing population. Direction of trend based on professional judgement of the net effect of resource emphasis, and wildlife budget which determines the level of coordination and habitat improvement expended. The large number of negative trends predicted in Alternative 9 result from management emphasis assigned and low budget levels to accomplish needed coordination and habitat improvement. Conversely the large number of positive trends anticipated in Alternatives 3, 8, and Proposed Action reflect different management emphasis as well as resources to accomplish needed coordination and direct habitat improvement.

Table 42

Qualitative Comparison of Impacts to Management Indicator and T&E Species Populations By Alternative

Indicator Species	Alternative: Proposed Action (10)	Current (4)	RPA (3)	1	2	6	7	8	9
Animals									
Abert's Squirrel	+	+	+	+	NC	+	NC	+	+
Arizona Grey Squirrel	+	NC	+	+	-	NC	-	+	-
Arizona Trout (T)	+	+	+	NC	NC	NC	NC	+	NC
Ash-Throated Flycatcher	+	NC	+	NC	NC	+	NC	+	-
Bald Eagle (E)	+	+	+	NC	NC	NC	NC	+	NC
Bell's Vireo	+	NC	+	NC	+	NC	+	+	-
Black Hawk	+	NC	+	NC	+	NC	+	+	-
Black-Chinned Sparrow	+	NC	+	-	NC	NC	NC	+	-
Black-Throated Sparrow	+	NC	+	-	NC	NC	NC	+	-
Bonytail Chub (E)	+	+	+	+	NC	NC	NC	+	NC
Brown Towhee	+	+	NC	NC	NC	NC	NC	+	+
Colorado River Squawfish (E)	+	+	+	+	NC	NC	NC	+	NC
Common Flicker	+	NC	NC	NC	NC	NC	NC	+	-
Elk	+	NC	+	+	-	-	-	+	+
Gila Topminnow (E)	+	+	+	NC	NC	NC	NC	+	NC
Gooshawk	+	NC	-	-	NC	NC	NC	+	+
Gray Vireo	-	NC	NC	-	NC	NC	NC	-	+
Hairy Woodpecker	+	NC	-	-	+	+	+	+	+
Hooded Oriole	+	NC	+	NC	+	NC	+	+	-
Horned Lark	+	+	+	+	NC	NC	NC	+	NC
Peregrine Falcon (E)	+	+	+	NC	NC	NC	NC	+	NC
Plain Titmouse	-	NC	-	-	+	+	+	-	-
Pygmy Nuthatch	+	+	-	-	+	+	+	+	-
Rufous-Sided Towhee	+	NC	NC	-	+	+	+	+	-
Savannah Sparrow	+	+	+	+	NC	NC	NC	+	-
Summer Tanager	+	NC	+	NC	+	NC	+	+	-
Townsends' Solitaire	-	-	-	-	NC	NC	NC	-	-
Turkey	+	NC	+	+	NC	NC	NC	+	-
Violet-Green Swallow	+	NC	NC	-	NC	NC	NC	+	-
Warbling Vireo	+	NC	-	NC	+	NC	+	+	-
Western Bluebird	+	NC	+	+	-	-	-	+	+
Western Wood Pewee	+	NC	-	NC	+	NC	NC	+	-
Woundfin (E)	+	+	+	NC	NC	NC	NC	+	NC
Yuma Clapper Rail (E)	+	+	+	NC	NC	NC	NC	+	NC
Plants									
Arizona Hedgehog Cactus (E)	+	+	NC	NC	NC	NC	NC	+	NC
Agave arizonica (E)	+	+	NC	NC	NC	NC	NC	+	NC

Environmental Consequences

Unavoidable adverse impacts include increased disturbance to wildlife due to higher levels of dispersed recreation use and temporary displacement during timber sale activities.

There are no irreversible resource commitments. The small variation in riparian habitat improvement and other habitat improvements between the Proposed Action and Alternative 8 does not represent a significant irretrievable resource commitment.

Range

Livestock Grazing

Livestock grazing will remain an important use under all alternatives. Table 43 displays for each alternative the estimated permitted use and grazing capacity over the first five time periods. Levels of estimated permitted use and grazing capacities are based on estimated land capabilities to produce forage for domestic livestock on a sustained yield basis. Because of the dynamic aspect of the human, biological, and climatic factors associated with predicting grazing capacity over a period of fifty years, output figures depicted for grazing capacity and permitted use in Tables 6 and 43 cannot be viewed as being precise or absolute in nature. Actual levels of permitted use and grazing capacity must be determined as a result of continued indepth studies evaluating the actual biological effects and response of the forage resource to improved and more intense range management practices over the planning period. Under all alternatives, permitted livestock use is balanced with forage capacity on an allotment by allotment basis as management plans employing improved management along with necessary changes in permitted numbers continue to be implemented and monitored over reasonable periods of time to verify original capacity estimates. Improved range management practices have not been employed on the Tonto National Forest to any great extent prior to the past 5-7 years. Increased levels of grazing capacity are being documented, however, on those allotments which have received improved management practices for sustained periods of time. Even these allotments will require continued monitoring to determine allotment capacity on a conclusive basis. Because of these factors, it is difficult if not impossible to predict grazing capacity over time relative to adjusted permitted levels of grazing and improved forms of range management. Under all alternatives, the balanced level of grazing capacity and permitted use will be the sum of the capacity for all allotments after allotment management plans have been implemented and monitored for a reasonable period of time on all allotments.

The range management objective is to bring the use of the forage resource into balance with the capacity of the resource. This is currently being done on an allotment by allotment basis as opportunities for negotiated livestock adjustments present themselves or as range analyses are completed on individual grazing allotments. The goal, therefore, is to have a management plan for each allotment with a permitted stocking level commensurate with capacity, basic land capabilities, and management objectives.

The various alternatives consider a variety of time frames for balancing permitted grazing use with capacity. Alternatives 3 and 4 provide for balancing in the fourth period, and Alternatives 1, 6, 7, 8, and 9 provide for balancing in the fifth period. Alternative 2 would balance in the first period and the Proposed Action balances permitted grazing use with grazing capacity in the second period.

Estimated grazing capacity for the Forest in 1980 was approximately 259,000 AUM's and permitted use was 428,000 AUM's. Balancing permitted use with grazing capacity requires that capacity be increased or permitted use be reduced or a combination of both. During the period of 1975 to 1985 the Forest has reduced permitted use by approximately 60,000 AUM's and presently has approved allotment management plans which employ varying levels of improved range management practices on approximately 45 percent of allotments which will be monitored over time to determine if action taken to date is sufficient to provide for sustained yield management of the forage resource. An additional 8,000 AUM's are on range protection and development non-use agreements pending final capacity studies.

The maximum range benchmark was developed with an objective of maximizing grazing capacity and shows the Forest has a maximum grazing capacity of 301,000 AUM's with predicted levels of grazing capacity of 259,000 AUM's and 260,000 AUM's respectively in the first and second decades. The maximum range benchmark does not balance grazing capacity and permitted use until the third decade at a level of 267,000 AUM's. Analysis for maximizing range capacity under maximum present net value strategy was not considered as an alternative since it was evident that comparable outputs of grazing capacity could be achieved in other alternatives.

Alternative 2 calls for balancing permitted grazing with the capacity allowed for livestock in the first period. This alternative features improved watershed condition while providing commodity outputs at levels compatible with the featured emphasis. This alternative would require Range O&M funding levels approximately double that which the Forest currently receives. This funding level would be essential to collect and prepare the range management resource and inventory data necessary to support the administrative decisions for major adjustments required in the first period to balance permitted use with identified capacity levels. Permitted grazing use would have to be reduced by approximately 158,000 AUM's or approximately 39% in the first period. The personnel and funding level required to develop enough sufficiently prepared adjustment cases to carry out the prescribed actions exceeds reasonable expectations. With such major reduction in a short time period, it is doubtful that many grazing permittees would survive economically. Studies by the Economic Research Service have shown that Tonto permittees are dependent on Tonto National Forest permits for about 75% of their forage needs and 24% dependent on other National Forests for a total dependency level of 99% on National Forest forage. Such adjustments would have negative economic and social effects on small communities within and adjacent to the Forest where ranching is a traditional way of life and is one of the primary businesses that contributes to the local economic base. Large scale permit reduction within a ten year time frame is also unreasonable from an administrative standpoint. Such decisions to reduce permitted use are subject to administrative appeal and political action in response to permittee requests. Past experience has shown that it takes 3 to 5 years to develop sufficient detailed data to support contested adjustment actions along with an additional 3 to 5 years to implement the funding. In addition, it is expected that political pressure generated in response to actions could cause reversals of proposed adjustment actions currently in progress and generally slow the progress presently being made. Additionally, the cumulative impact on the Region's capability to support adjustment actions on multiple Forests would be unreasonable.

Combinations of reductions in permitted use along with capacity enhancement through improved management practices is the most reasonable alternative for resolving this issue. The proposed action calls for balancing permitted use and capacity in the second period. This alternative would intensively manage range lands to approach their productive capability through a combination of reduced levels of permitted use and improved range management practices. The proposed action calls for balancing permitted use with capacity at a predicted level of 251,000 AUM's by the end of the second period. The significance of

the predicted 251,000 AUM figure relative to its absolute value has previously been discussed in this section, the critical point being that permitted use will not exceed capacity at the end of the second period. Balancing capacity in the first period under the same management strategy would not significantly alter the rate of range recovery; therefore, beneficial effects on wildlife and watershed conditions would be essentially the same.

Critical to achieving the objective of the Proposed Action is the pending levels required in both Range O&M and Range Improvements as indicated in Table 7. An increased funding level of approximately 40% from the current level of funding in Range O&M would be required for range studies supporting prescribed management actions and preparation of Allotment Management Plans, plan implementation, monitoring and ultimately final adjustments in permitted numbers and management to assure sustained yield management.

The variation in permitted use and capacity estimates between alternatives in any time period is a reflection of the effect of different alternative objectives and range improvement investment (see Table 44). In all cases, however, the range condition trend and diversity of plant species and communities are expected to improve over the planning period. Specific to range condition and percentage of total acres in satisfactory range condition, the Proposed Action and Alternative 2 provide for the greatest rate of range recovery in terms of acres of land brought forth from a current classification of unsatisfactory range condition to satisfactory condition. In the Proposed Action this occurs primarily from the overall improved quality of range management practices resulting from a relatively high level of both range O&M and range improvement funding and the greater percentage of acres allocated to intensive range management practices. In Alternative 2 this occurs primarily as a result of a large reduction in permitted numbers in the first period. Alternative 4 provides for similar improvement in range condition as the Proposed Action and Alternative 2, but at a slower rate due to lesser levels of range O&M and investment funding. Alternatives 3 and 1 provide for much slower but relatively moderate rates of improvement in range condition. With Alternatives 3 and 1, improvement is due to greatly reduced but still relatively high levels of investment in both O&M and range improvement investments and resulting levels in improved range management practices.

Alternatives 6, 7, 8, and 9 provide for the least rate of range condition improvement due to low investment levels in both range O&M and improvement and the extensive nature of the prescribed range management practices.

The Proposed Action, Alternative 3, and Alternative 4 strive to place moderate and highly suitable range on the Forest under intensive range management which seeks to optimize management, production and utilization of forage allocated to livestock use consistent with monitoring the environment and providing for multiple use of the range. Alternative 2 provides for quick balancing of permitted use with capacity through high levels of Range O&M funding but minimal emphasis on intensive range management practices. Other alternatives place minimal emphasis on intensive management. Suitable rangeland of low productivity potential and rangeland within existing wilderness, and other specially designated areas is managed to maintain livestock use within the capacity of the forage resource. Less intensive practices would be implemented to improve forage available for livestock use. Table 45 displays the distribution of the capable rangeland on the Forest.

Under all alternatives, the Forest would continue to seek opportunities for negotiated settlements on livestock number adjustments.

Table 43

Comparison of Annual Average Permitted Livestock Use and Grazing Capacity (MAUM'S) 1/

Period		Alternatives								
		Proposed Action (10)	Current (4)	RPA (3)	1	2	6	7	8	9
1	Permitted	397	404	405	405	249	404	405	405	403
	Capacity	247	245	253	252	249	248	250	251	248
2	Permitted	251	347	318	316	226	341	317	316	340
	Capacity	251	252	236	230	226	225	228	228	225
3	Permitted	272	338	284	287	202	285	285	285	284
	Capacity	272	261	219	207	202	201	204	204	202
4	Permitted	275	268	226	228	193	226	226	226	226
	Capacity	275	268	226	199	193	191	195	196	192
5	Permitted	278	278	226	204	197	196	200	201	197
	Capacity	278	278	226	204	197	196	200	201	197

1/ These values represent an average estimated capacity and permitted use for each 10 year period. Under all alternatives capacity is assumed to increase in the fifth period allowing increase in permitted use. For instance, estimated capacity and permitted use for the Proposed Action in the fifth period is 278,000 AUM's. Levels of estimated permitted use (and grazing capacities) are based on current estimated land capabilities to produce forage for domestic livestock on a sustained yield basis. Figures cannot be viewed as being absolute or precise as actual levels of permitted use and grazing capacities will depend greatly on more indepth studies and/or estimates, intensity and effectiveness of management, and actual response and improvement in the forage resource resulting from improved management practices.

Environmental Consequences

Table 44

Range Improvement Investment - Thousand Dollars Annually [1/]

Alternative	Funding Source	Periods 1	2	3	4	5
Proposed Action (10)	Forest Service	326	401	343	159	159
	Permittee	68	83	71	45	45
Current (4)	Forest Service	234	234	234	234	234
	Permittee	48	48	48	48	48
RPA (3)	Forest Service	93	93	133	133	133
	Permittee	22	22	22	22	22
1	Forest Service	85	85	129	129	129
	Permittee	21	21	21	21	21
2	Forest Service	200	200	88	88	88
	Permittee	37	37	11	11	11
6	Forest Service	58	58	88	88	88
	Permittee	11	11	11	11	11
7	Forest Service	58	58	87	87	87
	Permittee	13	13	13	13	13
8	Forest Service	59	59	88	88	88
	Permittee	14	14	14	14	14
9	Forest Service	56	56	84	84	84
	Permittee	11	11	11	11	11

1/ All costs discounted to 4th quarter 1980 dollars.

Table 45

Estimated Livestock Grazing System (M Acres)

	Alternatives[1/]								
	Proposed Action (10)	Current (4)	RPA (3)	1	2	6	7	8	9
No Capacity	902.4	902.4	902.4	902.4	902.4	902.4	902.4	902.4	902.4
Closed to Grazing	54.8	54.2	-0-	27.6	54.8	54.2	54.2	54.8	-0-
Extensive Management	903.4	1,274.8	1,811.5	1,943.3	1,916.1	1,916.7	1,916.7	1,916.1	1,970.9
Intensive Management	1,012.7	641.9	159.4	-0-	-0-	-0-	-0-	-0-	-0-
TOTAL:	2,873.3	2,873.3	2,873.3	2,873.3	2,873.3	2,873.3	2,873.3	2,873.3	2,873.3

1/ Management intensities: (1) Closed - excludes livestock grazing to protect other values or eliminate conflicts with other uses; (2) extensive - permitted use is within grazing capacity with minimal improvements only to extent needed to protect and maintain range resource in presence of grazing (Level B); (3) intensive - optimize production and utilization of forage allocated for livestock use consistent with maintaining the environment and providing for multiple use of the range. Improvements and practices used to improve forage supplies and uniform livestock distribution and forage use (Level C and D).

Environmental Consequences

All alternatives provide for adjustment of the designated wild burro territory beneath Four Peaks to reflect the historic range. The desirable herd size is 15 animals. Removal of excess animals would occur when inventories indicate herd size exceeds 25 animals.

The principle adverse effect would be that the local livestock industry would be subjected to significant change under all alternatives, both in the short- and long-term use, due to implementation of allotment management plans and necessary adjustments in permitted numbers of livestock to balance with the capacity of the range. Those permittees whose allotments are currently under approved management plans may also experience adjustments in permitted numbers of livestock as goals and objectives in approved allotment management plans are monitored over time. While most allotments with approved AMP's are considered to be properly stocked it is recognized that the final determination of allotment capacity must be made over an extended period of time through allotment monitoring.

Other adverse effects include localized soil loss following the balancing of capacity with permitted use until vegetative response is sufficient to fully stabilize the watershed and increased costs for grazing permittees to manage livestock under intensive management systems. Some irreversible soil loss will occur until watersheds are stabilized. There are no irretrievable resource losses.

Timber and Fuelwood

Timber

All timberlands were tested using the criteria for biological capability, availability, and physical suitability for timber production. This test resulted in a maximum of 122,612 acres being identified as suitable for timber production. An assumption in the analysis determining these acres was that the Sierra Ancha Experimental Forest would be available under alternatives emphasizing optimum timber production. This assumption is displayed in Alternatives 1, 3, and 9. Other alternatives display suitable acres which are a function of the particular alternative goals and objectives. Table 46 displays the suitable land by alternative.

Forests are managed according to specific silvicultural treatments. These treatments affect timber yields and the age structure of regenerated stands by producing even-aged or uneven-aged stands of trees.

Even-aged management is characterized by a forest made up of a mosaic of even-aged stands. Each stand contains trees of essentially the same age with different stands representing different age and size classes within the rotation period.

Even-aged stands are achieved through regeneration systems that re-establish a stand within a short time after final harvest. The shelterwood system results in even-aged stands and is used on the forest. Uneven-aged management (managing for multi-age stands) is not used.

The shelterwood regeneration system removes mature trees in a series of harvests called preparatory, seed, and final removal harvests.

Preparatory cuts are usually made approximately 20 years before rotation age to stimulate cone production. The seed cuts are made at rotation age and reduce tree densities to a level that opens the forest floor to sunlight and provides a mineral seedbed while leaving enough seed trees to naturally regenerate the stand. The removal cut is made within 10 to 20 years to remove the seed trees after the regenerated stand has become established. If natural regeneration should fail, the site is planted. Where an adequately stocked understory of poles, saplings, or seedlings exist beneath the overstory, the preparatory and seed cuts are not necessary.

Intermediate harvests or commercial thinnings are utilized in all stands and prescriptions except low intensity after reaching a merchantable size. These usually are scheduled on a 20 year cycle for the life of a stand. The objective of the intermediate cuts is to maintain an appropriate growing stock level to achieve the maximum growth potential of the site. Intermediate cuts also provide the opportunity to remove diseased or damaged trees, thus promoting healthier and more vigorous stands.

Timber harvest is also used to meet other multiple use objectives. Alternatives 1, 3, and 9 provide for some stands to be cut down to a basal area of 40 square feet per acre for increased water production objectives. The standard silvicultural practices would reduce growing stock levels to a basal area of 70 square feet per acre.

Alternatives 3, 8, 9, and the Proposed Action incorporate timber prescriptions which retain dense pole stands (100 square feet growing stock levels) for squirrel habitat. In addition, 12 - 14 seed trees per acre are carried on an extended rotation to age 180 - 240 to provide vertical diversity. Refer to Appendix E, Financial Analysis, for a detailed description of timber harvest prescriptions.

Long-term sustained yield capacity (LTSYC) is the highest nondeclining wood yield from suitable lands consistent with multiple use objectives of the alternative and a specified management intensity. LTSYC is based on the assumption that the Forest is in a fully managed condition. It is a function of the amount and productivity of suitable acres, and the management intensity of prescriptions allocated and scheduled for an alternative.

The President's Revised Statement of Policy PL 96-514 (12/12/80) 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 Statement recognizes that it will take time to achieve these goals, thus it requires that by Period 5 growth on commercial timber lands be brought to and maintained, where possible, at 90 percent of the long-term sustained yield capacity (LTSYC). The equation is:

$$\frac{\text{Period 5 growth}}{\text{LTSYC}} \times 100 = \text{percent potential growth is of LTSYC}$$

Long-term sustained yield capacity of wood fiber output is equivalent to growth over time. If timber land does not have a high growth rate by Period 5, then it will take much longer to achieve harvest levels or outputs at the LTSYC level and the Statement of Policy goal will not be achieved. Measures which could be implemented during the first 50 years to attain 90 percent of LTSYC can be found under Annual Growth Rate, Appendix E.

Tables 47, 48, 49, and 50 display timber suitability classification, major timber harvest prescription variables, average annual harvest levels, and a comparison of LTSYC with Period 5 growth.

Table 46

Timber Suitability Classification

Land Classification	Alt. RPA, 1, 9	1/ Alt. 6 Current	2/ Alt. PA, 2, 7	3/ Alt. 8	Previous Timber Plan
Nonforest Land	996,880	996,880	996,880	996,880	2,648,300
Forest Land (F.L.)	1,876,412	1,876,412	1,876,412	1,876,412	(included above)
F.L. withdrawn from timber production	375,921	375,921	375,921	375,921	7,600 (included above)
F.L. not capable of prod. crops of industrial wood	1,343,217	1,343,217	1,343,217	1,343,217	(included above)
F.L. physically unsuitable (not restockable in 5 yrs., etc.)	18,641	18,641	18,641	18,641	38,600
Forest Land - Inadequate info.	N/A	N/A	N/A	N/A	not known
Tentatively Suitable F.L.	138,633	138,633	138,633	138,633	not known
Not appropriate For. Land because of:					
- Nontimber Values	N/A	N/A	N/A	N/A	not known
- Mgmt. requirements	13,770	13,770	13,770	13,770	21,900
- Cost inefficiency	4,066	22,001	15,371	4,066	22,000
Unsuitable Forest Land	1,753,800	1,773,550	1,766,920	1,755,615	not known
Total Suitable Forest Land	122,612	102,862	109,492	120,797	174,953
Total National Forest Land	2,873,292	2,873,292	2,873,292	2,873,292	2,873,292

1/ Excludes Sierra Ancha Experimental Forest, Pinal Mountains and slopes over 40%.

2/ Excludes Sierra Ancha Experimental Forest and Pinal Mountains.

3/ Excludes Sierra Ancha Experimental Forest.

Table 47 .

Summary of Major Timber Harvest Prescription Variables

Alternative	Acres of Average Residual Growing Stock Levels 40 Sq. Ft.	70 Sq. Ft.	100 Sq. Ft. 1/	Logging Method	Remarks
Proposed Action (10)		90,400	19,092	Tractor, Cable	Provides optimum level of wildlife cover and vertical diversity. Integrates intensive timber management, wildlife, and recreation prescriptions.
Current (4)		102,862		Tractor	
RPA (3)	39,300	47,600	35,712	Tractor, Cable	Attains Tonto's share of RPA targets assigned in the Regional Guide.
1	122,612			Tractor, Cable	
2		109,492		Tractor, Cable	
6		102,862		Tractor	
7		109,492		Tractor, Cable	
8		102,100	18,697	Tractor, Cable	Same as Proposed Action.
9	36,600	75,000	11,012	Tractor, Cable	

Snags will be provided for and managed to meet or exceed regional guidelines in all alternatives. Where snags are lacking, they will be provided by leaving seed trees from regeneration cuts to become snags.

1/ Slopes less than 40%.

Table 48

Average Annual Timber Harvest Schedules by Decade

	Alternative								
	Proposed Action (10)	Current (4)	RPA (3)	1	2	6	7	8	9
Period 1									
Total Harvest (MMBF) 1/	7.9	8.2	18.0	7.7	8.7	4.7	8.9	7.8	8.0
Period 2									
Total Harvest (MMBF)	13.8	7.5	17.4	10.9	12.3	4.7	12.3	13.6	13.8
Period 3									
Total Harvest (MMBF)	16.5	12.1	17.7	10.5	15.0	4.8	15.0	18.4	19.7
Period 4									
Total Harvest (MMBF)	16.8	12.4	19.4	12.6	15.2	4.8	15.2	19.1	20.7
Period 5									
Total Harvest (MMBF)	16.7	11.3	18.8	10.9	13.1	4.8	13.1	18.3	20.5

1/ Sawtimber and roundwood product volumes. Refer to Appendix E, Tables 84 and 85 for detailed breakdown.

Table 49

Average Annual Long-Term Sustained Yield Compared to Achievement of 90 Percent of Potential Growth in the Fifth Time Period

	Alternative								
	Proposed Action (10)	Current (4)	RPA (3)	1	2	6	7	8	9
Growth - MCF 1/	39,460	26,130	49,610	23,280	29,370	17,800	29,370	42,790	39,750
LTSYC - MCF	50,617	37,893	58,311	29,337	42,517	22,285	42,517	54,787	50,902
% of LTSYC	78	69	85	79	69	80	69	78	78

1/ MCF = Thousand cubic feet.

Environmental Consequences

Fuelwood

The supply of fuelwood consists of four categories: (1) non-sawlog species such as pinyon-pine, juniper, and Gambel oak; (2) unsalvaged natural mortality; (3) commercial sawlog species of unmerchantable size surplus to growing stock needs; and (4) unmerchantable portion of trees harvested for sawlog and roundwood products.

The Forest does not have a fuelwood inventory upon which to develop an annual sustained harvest schedule. Current estimated annual commercial harvest of fuelwood is 1.9 million board feet, while an estimated 1.8 million board feet of dead and downed material is removed as personal use fuelwood. Currently, use of logging debris for fuelwood is limited because of a lack of public preference for the material.

Accessibility is the key factor when considering availability of fuelwood for personal use. Accessible fuelwood for personal use is defined as being within 300 feet of a road or travelway open and suitable for use by four-wheel drive vehicles. A key consideration to meeting the increasing demand for fuelwood is providing road access to areas of currently inaccessible suitable fuelwood producing land. The supply of preferred fuelwood species on currently accessible areas would probably be depleted with the first decade of current or slightly increased rate of demand. Table 50 displays estimated volume of fuelwood that could be produced from all suitable acres by alternative. There is a constant output per decade over the planning period because practices to increase yield, such as vegetation manipulation, special silvicultural treatments, and costs of constructing access roads to inaccessible areas, are not considered economical and are not a part of the analysis. Changes in yield by alternative are based upon access considerations, and results of land treatments for other alternative objectives.

Table 50

Fuelwood Production (MBF)

Alternative	Average Annual Fuelwood Production First Fifty Years MMBF
Proposed Action (10)	10.1
Current (4)	7.3
RPA (3)	14.0
1	13.4
2	9.8
6	7.0
7	12.9
8	13.6
9	9.2

Alternatives 1, 3, 7, and 8 provide more available fuelwood because of vegetative treatments to increase water yield and provide for wildlife habitat diversity. Alternatives 4 and 6 provide the lowest level of fuelwood harvest

due to low capital investment funding level for road access to inaccessible areas. Alternative 2 and the Proposed Action provide a moderate increase in fuelwood to respond to higher expected demand while maintaining vegetative cover for improving watershed condition. Alternative 9 represents a moderate increase over current due to emphasis on harvesting wood products while being limited on funding for road access to inaccessible fuelwood areas.

There are no adverse environmental effects.

Construction of timber harvest roads is an irretrievable commitment as long as they are retained for management purposes. The difference of 10.1 MMBF in first period average annual timber harvest and 3.7 MMBF in fuelwood harvest between the Proposed Action and Alternatives 1 and 3 respectively are also irretrievable losses.

Water

Water Yield

Opportunities to increase water yield have been identified in the Ponderosa-pine and chaparral vegetative types with an optimum increase in yield estimated between 75,000 and 85,000 acre feet per year. Table 51 displays annual water yield by alternative and the increase above current yield. Alternatives 1, 3, 7, 8, and the Proposed Action provide for vegetative treatments resulting in increased water yield. These treatments would open the chaparral and tree canopy.

Table 51

Water Yield by Alternative (Average Annual M Acre Feet)

	Period 5	
Alternative	Water Yield	Acre Feet Change From 1980 (349 Thousand Ac. Ft.)
Proposed Action (10)	394	+45
Current (4)	332	-17
RPA (3)	405	+56
1	419	+70
2	332	-17
6	332	-17
7	398	+49
8	400	+51
9	334	-15

Environmental Consequences

Watershed Condition and Soils

All alternatives will have a general positive impact on watershed condition as range forage conditions improve. Soil erosion will decrease as vegetative cover increases and soil stabilizes. Timber harvests would be located and scheduled to keep sediment yield within acceptable levels. Vegetative treatments and road construction under Alternatives 1, 3, 7, 8, and the Proposed Action could result in some short-term accelerated soil erosion. A comparison of acres in satisfactory or better watershed conditon by decade is displayed in Table 53.

Water quality would be expected to improve slightly as the condition of range allotments improve and riparian areas are stabilized and protected. Chemical water quality will improve as mine acid drainage problems are corrected adjacent to streams on the Forest.

Soil loss is estimated by the Universal Soil Loss Equation (USLE). USLE utilizes several soil and environmental changes including the amount of effective ground cover, to quantify soil loss. Estimates provided by USLE were modeled in FORPLAN and are displayed in Table 52.

Table 52

Average Annual Soil Loss - M Tons

	Alternative								
Period	Proposed Action (10)	Current (4)	RPA (3)	1	2	6	7	8	9
1	1311	1307	1454	1454	1311	1307	1435	1447	1307
2	1186	1189	1315	1315	1148	1180	1299	1309	1180
3	1062	1071	1175	1175	984	1053	1162	1171	1052
4	938	953	1036	1036	820	926	1026	1033	925
5	814	835	896	896	659	801	890	895	800

Table 53

Comparison of Acres in Satisfactory or Better Watershed Condition by Decade (Millions of Acres)

	Alternative								
Period	Proposed Action (10)	Current (4)	RPA (3)	1	2	6	7	8	9
1	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
2	1.0	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
3	2.7	1.8	1.8	1.8	2.7	1.4	1.8	1.8	1.4
4	2.8	2.3	2.1	1.9	2.8	1.8	1.9	1.9	1.8
5	2.8	2.8	2.6	2.5	2.8	2.4	2.5	2.5	2.4

Adverse environmental effects include additional waste water problems as private lands within the Forest are subdivided. Future mining development could also degrade water quality in localized areas. Research by the Rocky Mountain Forest and Range Experiment Station indicates that vegetative manipulation of chaparral will increase on site soil losses; particularly for the first three years after treatment. Their research also indicates that nitrates may be increased as well as the risk of downstream flooding.

Some irreversible soil loss will occur in all alternatives as specific areas and drainages adjust to new hydrologic gradients. There are no irretrievable losses.

Other irreversible effects will be reflected in small amounts of soil loss induced through vegetative modification. The difference of 22,000 acre feet in average annual water yield in the first period between the Proposed Action and Alternative 1, is an irretrievable resource loss.

Minerals

Limited detailed knowledge exists as to the mineral potential of the Forest. However, there is continuing interest in exploration for energy and non-energy mineral resources. All alternatives recognize the impacts of mineral development to the extent that all mineral exploration and development activities will be conducted in a timely process in accordance with applicable laws and regulations. Protection of surface resources while permitting exploration for and extraction of mineral resources, will be emphasized.

Certain lands have been withdrawn from mineral prospecting, exploration, and development under various authorities to provide necessary protection from surface disturbing activities associated with mining. In addition, the 1964 Wilderness Act specified that as of December 31, 1983, wilderness areas would be withdrawn from all forms of appropriation under the mining laws and from disposition under all laws pertaining to mineral leasing and all amendments thereto with the exception of valid claims existing on or before December 31, 1983. Table 54 lists withdrawals.

Table 54

Withdrawals M Acres

Type of Withdrawals	Alternative								
	Proposed Action (10)	Current (4)	RPA (3)	1	2	6	7	8	9
Reclamation	176.7	176.7	176.7	176.7	176.7	176.7	176.7	176.7	176.7
Orme Dam Reservoir	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Watershed Research	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Wilderness Water Sources	.7	.7	.7	.7	.7	.7	.7	.7	.7
Wildlife Exclosure	.1	.1	.1	.1	.1	.1	.1	.1	.1
Experimental Forest	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6
Historical Site	.5	.5	.5	.5	.5	.5	.5	.5	.5
Organizational Site	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Roadside Zone	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1	6.1
Recreation Sites	3.1	1.5	3.2	1.5	1.5	1.5	4.0	2.3	1.5
Administrative Site	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Research Plots	.4	.4	.4	.4	.4	.4	.4	.4	.4
Research Natural Area	.5	.5	.5	.5	.5	.5	.5	.5	.5
Wild and Scenic River Study:									
Scenic	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Wild	17.7	17.7	17.7	17.7	17.7	17.7	17.7	17.7	17.7
Existing Wilderness:									
Superstition Wilderness	159.7	159.7	159.7	159.7	159.7	159.7	159.7	159.7	159.7
Sierra Ancha Wilderness	20.9	20.9	20.9	20.9	20.9	20.9	20.9	20.9	20.9
Pine Mountain Wilderness (Tonto)	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5
Mazatzal Wilderness	251.9	251.9	251.9	251.9	251.9	251.9	251.9	251.9	251.9
Hell's Gate	36.8	36.8	36.8	36.8	36.8	36.8	36.8	36.8	36.8
Salt	32.8	32.8	32.8	32.8	32.8	32.8	32.8	32.8	32.8
Salome	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9
Four Peaks	53.5	53.5	53.5	53.5	53.5	53.5	53.5	53.5	53.5

Table 54 (continued)

Withdrawals M Acres [1/]

Type of Withdrawals	Alternative								
	Proposed Action (10)	Current (4)	RPA (3)	1	2	6	7	8	9
Proposed Research Natural Areas:									
Upper Fork Parker Creek	1.3	-	-	-	1.3	-	-	-	-
Picket Post Mountain	1.2	-	-	-	1.1	-	-	-	-
Buckhorn Mountain	2.8	-	-	-	2.8	-	-	-	-
Hauter Wash	.7	-	-	-	-	-	-	-	-
State Natural Areas:									
Fossil Springs	.02	-	-	-	.02	-	.02	-	-
Sycamore Creek	.06	-	-	-	.06	-	.06	-	-
Botanical Areas:									
Blue Point Cottonwood	.5	-	.5	-	-	-	.5	.5	-
Desert Botanical Garden	1.2	-	-	-	1.2	-	-	-	-
Superstition Mountain Museum	.1	-	-	-	-	-	.1	-	-

A review and assessment of existing withdrawals is required by Section 204 of the Federal Land Management and Policy Act. Present direction to all agencies is to review withdrawals by 1991, and revoke those which create an unnecessary encumbrance on the land.

1/ Acres are not additive as there is duplication of acreage in Reclamation, Orme Dam Reservoir, Recreation Sites, and Wild and Scenic River Study withdrawals.

Environmental Consequences

Most of the withdrawals contain lands that are not demonstrated or theoretically favorable for the occurrence of locatable, salable, or leasable mineral deposits; that is, there is an absence of known deposits and of geologic conditions that are favorable for the occurrence of undiscovered deposits. Although the potential for mineral resources in these areas cannot be precluded, it is considered to very speculative.

Exceptions are the Sierra Ancha Wilderness and Experimental Forest, the Mazatzal Wilderness, and the Salt River Wilderness. The Sierra Ancha Wilderness and the Sierra Ancha Experimental Forest include approximately 9,280 acres and 5,120 acres, respectively, that are demonstrated and theoretically favorable for uranium and chrysotile asbestos, due to the outcroppings of favorable horizons of the Apache Group formation. Approximately 1,280 acres of the Mazatzal Wilderness are similarly rated for base and precious metals. The Salt River Wilderness contains about 2,880 acres in the Chrysotile area that are theoretically favorable for geothermal resources. Other notable withdrawals include: 1,189 acres for campgrounds and recreation sites and 1,074 acres for roadside zones in the areas around Globe and Superior that are theoretically favorable for base and precious metal deposits; 960 acres of the Salome Wilderness that are theoretically favorable for uranium deposits; and about 3,600 acres of the Verde River and Salt River reclamation withdrawals near Horseshoe Dam and Roosevelt Lake that are theoretically favorable for deposits of zeolites.

Unless otherwise withdrawn from mineral entry all National Forest lands are subject to locatable mineral exploration and development under the 1872 mining laws. Locatable minerals include valuable metals such as gold, silver, and various high quality stones. Environmental impacts are mitigated through approval of a plan of operation by the Forest.

Leasable minerals are generally oil and gas--energy minerals. The prospecting, exploration, and development of leasable minerals are at the discretion of the Federal Government. Based upon review of potential impacts the Forest recommends lease approval to the Bureau of Land Management (BLM). The BLM administers lease exploration and development with the participation of the Forest Service. Recommendations for availability of lands for leasing and stipulations necessary to protect surface resources are based on the degree of protection needed on each area to meet multiple-use objectives.

Table 55 summarizes leasing recommendations by alternative. Areas available for leasing are based on considerations of soil stability and proximity to special features such as research natural areas, administrative sites, riparian areas, and developed recreation sites.

Table 55

Mineral Leasing Recommendations (M Acres)

Lease Category	Alternative								
	Proposed Action (10)	Current (4)	RPA (3)	1	2	6	7	8	9
No Restrictions	2,251.3	2,265.7	2,260.6	2,266.2	2,259.2	2,265.8	2,258.1	2,262.0	2,265.7
Lease Without Surface Occupancy Special Areas 1/	10.2	.5	.4	0	7.0	.4	1.2	1.0	.5
No Leasing 2/	586.0	586.0	586.0	586.0	586.0	586.0	586.0	586.0	586.0
Limited Surface Occupancy Other 3/	25.8	21.1	26.3	21.1	21.1	21.1	28.0	24.3	21.1

1/ Research Natural Areas, Botanical Areas, State Natural Areas, and Superstition Mountain Museum.

2/ Existing wilderness.

3/ Sierra Ancha Experimental Forest, roadside zones, recreation and administrative sites.

Common variety minerals such as stone, sand, gravel and pumice may be sold at the discretion of the Forest under a permit system or provided free to Federal, State, and local agencies for road and highway construction and maintenance. All alternatives provide common variety minerals within management requirements designed to protect soil, water, and visual resources.

Impacts from mineral prospecting, exploration, and development are difficult to predict since the timing and location of work are controlled by the private sector in response to supply and market prices.

Adverse impacts which cannot be avoided include: 1) Semi-primitive motorized, non-motorized, and dispersed recreation may foster conflicts by bringing visitors into contact with mineral activities. Such contacts may be abrupt and could generate negative feelings about authorized mineral-resource uses. 2) Important cultural and historical resources may constrain development of mineral resources by imposing costly mitigation measures, or by requiring relocation of planned facilities. Some unique areas may be withdrawn completely or partially from mineral entry. 3) Strong emphasis on maintaining visual quality affects all phases of mineral development which require ground disturbance on a moderate to large scale. Management prescriptions which emphasize visual quality impact mineral development by requiring such measures as vegetation screens, dispersed or buried facilities, and unobtrusive structures. 4) Protection of the watershed affects both development and abandonment of mineral facilities. This includes strict control of mine wastewater, mill tailings, waste liquids, open pit mine location, and construction of well pad facilities. During abandonment, reclamation measures are required to control soil erosion and contamination of the watershed, including filling, contouring and revegetation.

Irreversible impacts include the removal of both leasable and locatable minerals materials. Irretrievable effects include locatable and leasable mineral exploration and development precluded as a result of withdrawals and leasing stipulations.

Lands

Lands related activities support other resource management. All alternatives have support costs built in to provide needed work. Table 56 displays the estimated annual lands program budget by alternative for the first two time periods. The costs do not change after the second period.

Much resolution of occupancy trespass is related directly to completing survey of property boundaries. All alternatives provide emphasis to accomplishing these surveys by the year 2000. The backlog of needed rights-of-way would be eliminated by the year 2000 under all alternatives.

Land exchanges would remain at the current level of approximately 300 acres per year for all alternatives. The Proposed Action provides for changes in currently identified base for exchange lands in the Payson and Young areas. A reduction of 4,500 acres of base-for-exchange lands is needed in the Payson vicinity to reflect results of recent master planning by that city. There is a need to increase base-for-exchange lands in the vicinity of Young, by 600 acres to meet projected community expansion needs.

The Proposed Action includes direction which will provide necessary reviews and recommendation for various withdrawal terminations, extensions, and additions.

Table 56

Annual Average Lands Program Budget by Alternative (Thousand $) 1/

Alternative	Program	Periods 1	2
Proposed Action (10)	Lands Management	80	80
	Land Line Location	36	28
Current (4)	Lands Management	84	84
	Land Line Location	29	29
RPA (3)	Lands Management	57	57
	Land Line Location	27	27
1	Lands Management	55	55
	Land Line Location	27	27
2	Lands Management	57	57
	Land Line Location	29	29
6	Lands Management	57	57
	Land Line Location	29	29
7	Lands Management	56	56
	Land Line Location	27	27
8	Lands Management	56	56
	Land Line Location	27	27
9	Lands Management	55	55
	Land Line Location	28	28

1/ All cost calculations are discounted to 1980, 4th quarter dollars.

Facilities

Transportation System

Maintenance of the road and trail system is prerequisite to protecting investments as well as providing safe and enjoyable use. Reconstruction of substandard travelways indirectly benefit soil and water resources by reducing erosion and sedimentation. Closure and rehabilitation of unneeded travelways reduce erosion and sedimentation and adverse effects of travel on wildlife. Adverse effects include disturbance and harassment of wildlife in breeding, feeding, and habitat areas by traffic.

The road system will be managed through specific management objectives and traffic regulations. Management of one road may consist of closing the road to public use while management of another road might consist of allowing high public use year-round. Different methods of management affect the way in which a road is maintained. Road maintenance is classified according to five levels. Each level includes an objective for travel management. Various road maintenance levels by alternative are presented in Table 57. A brief description of each level follows:

Level 1 - Roads are not open to traffic; they are maintained to protect the road investment and its surrounding resources. These roads may be opened for a specific activity and returned to Level 1 upon completion of the activity.

Level 2 - Roads are maintained open for limited passage of traffic. Roads in this maintenance level are primitive type facilities intended for high clearance vehicles. Passenger car traffic is not a consideration.

Level 3 - Roads are maintained open and safe for travel by a prudent driver in a passenger car. However, user comfort and convenience is not considered a priority.

Level 4 - Roads are maintained to provide a moderate degree of user comfort and convenience at moderate travel speeds.

Level 5 - Roads are maintained to provide a high degree of user comfort and convenience. These roads are normally two lane with aggregate or paved surface.

The discussion of the transportation system in Chapter 3 identified 3,810 miles of existing road on the Forest, not including State and County highways. Table 57 displays the disposition of the road system by alternative. Final selection of road maintenance levels and identification of specific roads to be stabilized and returned to vegetative production will be subject to further public involvement and environmental analysis following implementation of the Forest Plan.

Table 57

Disposition of Roads by Alternative

Alternative	Total Miles Currently On System	Miles of Road System by Road Maintenance Levels: Obliterate	1	2	3	4	5	Total Miles Remaining On System
Proposed Action (10)	3810	607	242	2246	480	140	95	3203
Current (4)	3810	0	76	2889	610	190	45	3810
RPA (3)	3810	745	102	1638	1090	140	95	3065
1	3810	745	242	1640	948	190	45	3065
2	3810	1533	192	940	860	190	95	2277
6	3810	0	42	2923	670	150	25	3810
7	3810	675	242	1278	1320	200	95	3135
8	3810	680	242	1305	1288	200	95	3130
9	3810	0	42	2223	1310	190	45	3810

Road Density by Alternative

	Alternative-Miles/Square Mile (Fifth Period)								
	Proposed Action (10)	Current (4)	RPA (3)	1	2	6	7	8	9
Road Density 1/	0.86	1.02	0.82	0.82	0.61	1.02	0.84	0.84	1.02

1/ Wilderness Area acreage excluded from land base for Road Density calculation.

Road Disposition

The Proposed Action and Alternatives 1, 2, 3, 7, and 8 remove roads from the system because of soil and water degradation, and/or other resource considerations such as the need to reduce harassment of wildlife while maintaining reasonable access to National Forest lands. Some irreversible soil loss will continue to occur until roads contributing to soil and water degradation are obliterated.

Alternatives 4, 6, and 9 provide the maximum miles of road but fail to resolve conflicts between roads and resource needs. Irreversible soil loss will continue under these alternativs because roads contributing to soil and water degradation are not stabilized and returned to vegetative production.

Alternatives 7, 8, and 9 emphasize maintenance of the road systems for passenger car access but respond poorly to the need for challenging roads for high clearance and specialized vehicles.

The number of miles of existing trails on the Forest will meet public need during the planning period except in the area adjacent to the metropolitan area. Much of the existing problems with the trail system is poor condition due to lack of maintenance. The result is a need for major rehabilitation on some trails.

Alternatives 1, 3, 7, 8, and the Proposed Action provide for development of approximately 44 miles of trail adjacent to the metropolitan area and major rehabilitation of nearly 60 percent of the trail system that is in poor condition, in the first time period. The results of this program would be less expensive maintenance cost over the long-term, improved watershed conditions, enhancement of visitor experience, and protection of public health and safety.

Alternatives 2, 4, 6, and 9 would result in an increase in substandard trail miles resulting in more soil erosion and safety hazards for trail users. Trail system maintenance and construction by alternative is presented in Table 59.

Table 59

Trail System Condition by Alternative

	Trail System Maintenance and Construction			
	Avg. Annual Miles of Mantenance/Rehabilitation for Periods 1 - 5		Avg. Annual Miles of Construction/Reconstruction for Periods 1 - 5	
Alternative	Wilderness	Non-Wilderness	Wilderness	Non-Wilderness
Proposed Action (10)	96	37	2.8	4.0
Current (4)	46	89	0.0	0.4
RPA (3)	58	46	2.0	5.2
1	66	49	3.7	9.3
2	82	26	4.5	0.0
6	36	40	0.0	0.0
7	79	41	4.3	5.1
8	74	43	4.1	6.5
9	36	39	0.0	0.0

Utility Corridors

As the population of the Phoenix metropolitan area increases, coupled with demands elsewhere in the State and in southern California, demands will increase for various utilities. Transmission corridors for electricity, gas and oil cross the Tonto. In all alternatives, existing rights-of-way have been designated as utility corridors for utility transmission facilities. Proposals for additional corridors will be evaluated in accordance with the Council of Environmental Quality Regulations [40 CRF 1500]. The accompanying Transportation System and Utilities Corridor Map shows locations of all existing corridors.

Proposals from Arizona Department of Transportation for widening of State Highways across the Forest are reviewed to assure protection or mitigation of disturbance to cultural and natural resources on National Forest land. Proposals currently being reviewed include segments of State Highways 87, 188, and 260.

Protection

Law Enforcement

Under Alternatives 3, 7, 8, and the Proposed Action, a high level of law enforcement will be emphasized in high use recreation areas and fuelwood areas. Action will be initiated to resolve the backlog of occupancy trespass cases by the year 2000.

Under Alternative 2, increased enforcement of ORV violations would be emphasized to reduce effects such as soil erosion and vegetation damage, in order to protect watershed condition.

Under Alternatives 1, 2, 4, 6, and 9 violations of State and Federal laws will continue to increase in popular areas as use increases. Occupancy trespass, vandalism, and ORV problems will continue with limited opportunities to resolve.

Air Quality

The only planned activity which will have an effect on air quality is prescribed fire. Current conditions should be maintained under all alternatives.

Approximately 1/30 of the suitable chaparral acreage would be treated annually Estimated particulates that would result from prescribed fire are shown in Table 60.

Table 60

Extensive Prescribed Fire Treatment - Acres Annually (Period 1)

	Vegetative Type		
Alternative	Ponderosa Pine	Chapparal	Estimated Particulate Emissions (Tons)
Proposed Action (10)	250	19,700	5,120
Current (4)	100	0	5,500
RPA (3)	250	20,613	5,350
1	250	20,613	5,350
2	250	0	138
6	0	0	0
7	250	0	138
8	250	20,613	5,350
9	250	20,613	5,350

Negative effects on air quality will be minimized by restricting the use of prescribed fire to times when smoke dispersal and burning conditions are most compatible with meteorological conditions. Additional requirements are included in the Forest-wide management prescriptions found in the Forest Plan. Unavoidable adverse effects are the short-term effects on air quality, but there will be no significant impairment of air quality. There are no irreversible or irretrievable losses.

Fire Management

The risk of fire ignitions will increase under all alternatives as more people use the Forest. However, this increase in risk can be mitigated to tolerable levels through fuel treatment and fire prevention programs.

Fuel loadings will be reduced primarily through the use of prescribed fire. In addition, fuels will be removed by the public and commercial fuelwood sales. Under all alternatives, activities to minimize losses to wildfire will include appropriate suppression action on all wildfires and extensive use of prescribed fire as a management tool.

Intensities of wildfires will be lower when fires occur within areas managed with prescribed fire. This will be most prevalent in Alternatives 1, 3, 7, 8, and the Proposed Action.

Over the long-term, wildfire occurrence and intensity would probably be increased due to the natural accumulation of ground fuels. Other adverse effects which cannot be avoided are: 1) Temporary to long-term reductions in visual quality, and recreation opportunities because of wildfire; and 2) increased soil loss and decreased watershed condition in proportion to the size and intensity of wildfires.

Irreversible effects include long-term soil loss. Irretrievable effects include lowered soil productivity due to catastrophic fires.

Integrated Pest Management

Prevention of insect and disease infestations, usually through cultural or mechanical means, is the long-range pest management objective on the Forest. Population buildups will be monitored, and if potential epidemics are identified, ground surveys will be made. If determined to be serious, suppression measures will be taken to control populations until reduced to an endemic level.

Cultural or mechanical means of prevention are usually accomplished through vegetation manipulation activities associated with the long-term management of timber, range, and wildlife. Practices include thinning, harvesting, and utilization in timber management; and utilization, revegetation, mechanical chopping and raking, and prescribed fire in range and wildlife management.

Forest-wide management requirements provide for monitoring insect infestations and disease outbreaks through aerial surveys and ground checking. Integrated pest management prevention and suppression are applied under all alternatives. Monitoring needs are most intense under alternatives having the least vegetation manipulation such as Alternatives 2, 4, 6, and 9.

There are no adverse or irreversible environmental effects. Reduced wood fiber production from suitable timber lands because of dwarf mistletoe is an irretrievable loss.

Special Area
Designations

Natural areas reviewed and recommended in the various alternatives include research natural areas, State recommended natural areas, and two botanical areas of which one would be managed cooperatively with the Desert Botanical Garden in Phoenix. Table 61 displays recommended natural areas and alternatives to which they are assigned.

All currently recommended areas in Table 61 are not grazed except for the Bush Highway Research Natural Area, and a portion of Sycamore Creek. Grazing would not be excluded from Sycamore Creek where it currently takes place if the area is designated a natural area under the State Parks Board program. However, grazing would be eliminated from the Bush Highway RNA.

Table 61

Special Area Recommendations

Area and Kind 1/	Vegetative Types	Acres	Included in Alternatives
Bush Highway RNA (E)	Creosote bush, Palo Verde	488	1,2,3,4,6,7,8,PA
Buckhorn Mountain RNA (P)	Interior Chaparral	2,810	2,PA
Upper Forks Parker Crk RNA (P)	Woodland/Ponderosa pine	1,288	2,PA
Picket Post Mtn. RNA (P)	Desert	1,120	2,PA
Haufer Wash RNA (P)	Semi-desert Grassland and Desertscrub	680	PA
Desert Botanical Garden BA	Desert	1,200	2,PA
Blue Point Cottonwoods BA	Desert Riparian	480	3,7,8,PA
Sycamore Creek NA	Desert Riparian	60	2,7,PA
Fossil Springs NA	Riparian	20	2,7,PA
Superstition Museum	Desert	60	7,PA

1/ RNA(E) - Existing Research Natural Area; RNA(P) - Proposed Research Natural Area; BA - Botanical Area; NA - State Natural Area.

There are no adverse or irreversible environmental effects. Irretrievable effects result from withdrawal from mineral leasing and development, and resource outputs either reduced or lost as a result of special area designation.

Environmental Consequences

SECTION B
ECONOMIC AND
SOCIAL CONSIDERATIONS

Economic Efficiency Analysis

National Forest Management Act (NFMA) regulations [36 CFR 210.12] require extensive analysis of economic efficiency in the formulation, estimation of effects and evaluation of alternatives. In addition, the Congressionally revised Resource Planning Act Statement of Policy requires that National Forests be managed to maximize 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. PNV measures the net economic benefits to the public for all resources which have a market value or which were given an assigned value in the planning process.

Maximization of present net value 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 the alternative.

PNV was calculated by FORPLAN based upon costs for labor, capital and materials used to support the management direction of each alternative and upon revenue generated from the production of goods and services. Costs included budgets for fire suppression, timber purchaser credit, livestock permittee investment, and cable logging costs.

Revenues included market prices for timber, range, and developed recreation, and assigned prices for water yield, wildlife, dispersed recreation, and wilderness recreation. Revenues from minerals production were calculated by hand and used to adjust PNV. Refer to Appendix B for detailed calculation of Minerals PNV.

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 the total expenditures necessary to produce both priced and nonpriced benefits are counted as costs. As a consequence, those alternatives with a relatively greater focus on priced outputs are characterized by the highest calculated PNV's.

The Maximum PNV Assigned Value Benchmark provides the greatest monetary benefits for the costs incurred. PNV is reduced when the alternatives considered in detail are constrained to meet the objectives and goals of the alternatives. Comparing the PNV of the alternatives to the Maximum PNV Assigned Benchmark provides a measure of the financial trade-offs or opportunity costs of an alternative.

Benefit-cost analysis is a process used to estimate the relationship of probable future dollar benefits and costs associated with resource development projects or, in this case, Forest Plan alternatives. The analysis indicates whether the ratio of benefits to costs justifies the alternative from an economic standpoint. The analysis emphasizes economic efficiency in resource use; however, it is not the only basis for selecting an alternative.

In benefit-cost analysis, the term benefit is defined as the value of products and services that result from a Forest Plan alternative. Costs are defined as the value of inputs used in establishing, maintaining, or operating the alternative. Everything included in the analysis must somehow be assigned a dollar value. Forest resource outputs which cannot be assigned dollar values are not included in the analysis.

Benefits and Costs

Benefit/cost ratios were calculated for each alternative as another measure of economic efficiency.

Table 62 displays benefit, cost, and PNV trade-offs from the maximum PNV assigned benchmark and benefit/cost ratios for the alternatives.

A detailed comparison of trade-offs is summarized in the present net value trade-offs section in Chapter 2.

Table 62

Cumulative Benefits, Costs and Present Net Value at the End of the Planning Horizon - MM 1980, Fourth Quarter Dollars Discounted At 4 Percent

		Alternative 1/								
	Max PNV Assigned	Proposed Action (10)	Current (4)	RPA (3)	1	2	6	7	8	9
Present Value Benefits	3681.0	3099.8	2613.8	3576.6	3387.4	2735.5	2058.2	3392.3	3392.8	2118.7
Present Value Costs	314.3	250.0	237.3	309.5	219.9	215.8	168.7	538.9	281.2	177.9
Present Net Value	3366.7	2849.8	2376.5	3267.1	3167.5	2519.7	1889.5	2853.4	3111.6	1940.8
Benefit/Cost Ratio	11.7	12.4	11.0	11.6	15.4	12.7	12.2	6.3	12.1	11.9

1/ Max PNV assigned benchmark included as a reference point.

Returns to the Treasury and Counties

Each year the Forest Service through the U.S. Department of the Treasury returns 25 percent of the gross revenue collected by the Forest Service to the States for disbursement to Counties based on the percentage of the National Forest within the County.

Counties also receive payments in lieu of taxes. This program is administered by the Bureau of Land Management, Department of Interior. The program is dependent on annual Congressional appropriations rather than Forest receipts and, therefore, are not included in the analysis.

Table 63 displays estimated U.S. Treasury and "25 percent fund" returns to the Counties. The estimates are based on returns generated by timber harvest, grazing use, and developed recreation use. These figures are for comparative purposes only. As estimates, the figures are not a contract between the Forest Service and the Counties to provide the amount of funding displayed. Changes in market prices and willingness to purchase by the private sector based on demand can cause widely fluctuating revenues.

Table 63

Estimated U.S. Treasury Revenues and Returns to Counties - MM Dollars (Per Period)

	Alternative								
	Proposed Action (10)	Current (4)	RPA (3)	1	2	6	7	8	9
Period 1									
Treasury	21.5	18.5	32.4	18.9	17.1	14.3	19.1	18.9	18.6
County	5.4	4.6	8.1	4.7	4.7	3.6	4.8	4.7	4.7
Period 2									
Treasury	25.6	17.9	32.4	21.1	23.7	13.6	25.3	26.9	26.5
County	6.6	4.5	8.1	5.3	6.2	3.4	6.3	6.8	6.6
Period 3									
Treasury	30.0	24.0	31.8	19.4	20.6	12.9	29.2	33.3	34.3
County	7.5	6.0	8.0	4.9	5.3	3.2	7.3	8.3	8.6
Period 4									
Treasury	30.8	23.6	32.6	23.9	25.1	12.3	29.7	33.9	35.3
County	7.7	5.9	8.1	6.0	6.3	3.1	7.4	8.5	8.8
Period 5									
Treasury	30.0	19.6	29.9	20.6	19.7	12.1	21.5	31.9	34.2
County	7.5	4.9	7.5	5.2	4.9	3.0	5.4	8.0	8.6

Environmental Consequences

Employment and Income

Each alternative would have a unique effect on employment, population, and total income patterns within the zone of influence of the Tonto. Differences are mostly a function of output levels that would be produced under each alternative. Of primary importance to the regional economic situation is livestock grazing and tourism. However, in reality, alternatives would have very little effect on the overall economy in the zone of influence due to the size of the Maricopa County economy. Each alternative was analyzed by a computer Input-Output (I/O) model in comparison with the current situation (Alternative 4). Results of analysis by the I/O model for Gila and Maricopa Counties are summarized in Table 64, which displays potential employment and income changes as a result of changes in levels of production of Forest outputs relative to Alternative 4.

Impacts on Pinal and Yavapai Counties between alternatives are so minor that available I/O model analysis would not be meaningful. In recent years, much of the timber output from the Forest has been processed at mills in Navajo County. A share of the timber related employment shown in Table 64, actually occurs in Navajo County.

The I/O model 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 will seem low due to inflation since 1977, but figures can still be used to rank alternatives. They are not absolute indicators. The I/O model projects employment and income potential only. There is no guarantee these exact levels of employment and income will occur. All changes shown are less than one percent of that employment sector as a whole and should be considered insignificant.

Social Effects

The impact of any alternative on the lifestyle of central Arizona will be negligible. Ranching will continue on rangeland which will become more productive and stable over time. The Proposed Action and other alternatives featuring development of more recreation sites and expanded dispersed recreation will provide optimum opportunity for urban and rural based recreationists to enjoy the natural environment. Expanded wilderness as result of the 1984 Arizona Wilderness Act will meet projected demand for that type of use as well as provide additional desert ecosystems to the National Wilderness Preservation System. Wildlife enthusiasts will benefit under all alternatives but particularly Alternatives 1, 3, 7, 8 and the Proposed Action which feature wildlife habitat integration in all resource activities.

Some rural residents resent the outside influence of the metropolitan area. They feel the land should be managed for their benefit. Resident needs versus larger population interests are felt regarding availability and use of fuelwood and recreation and wilderness opportunities and values. Alternatives proposing additional recreation sites include considerable development adjacent to the metropolitan area.

None of the proposed management alternatives is expected to result in any significant change in present use of the National 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.

Table 64

Employment and Income During First Decade in the Zone of Influence Attributable to Tonto National Forest, by Alternative

ALTERNATIVE	Total 1/ Employment	Employment Sector 1/ Timber	Livestock	Tourism	Other	Income 2/ Million 1977 $
			Gila County			
TOTAL COUNTY 3/	7772	342	45	2022	5363	128.5
No Action Level (Alt. 4) 4/	2336	20	40	1679	597	30.3
Change from No Action by Alternative:						
1	+41	+123	0	-73	-9	+1.7
2	+231	+4	0	+130	+97	+3.5
3	+589	+8	0	+381	+200	+8.7
6	-298	-1	0	-210	-87	-4.2
7	+868	+1	0	+557	+310	12.8
8	-87	0	0	-73	-14	-1.2
9	+829	+7	0	+535	+287	12.2
Proposed Action	+89	+2	0	+30	+57	+1.4
			Maricopa County			
TOTAL COUNTY 3/	422,688	5,242	1,583	136,945	278,918	8,492.7
No Action Level (Alt. 4) 4/	6735	72	67	3889	2707	110.8
Change from No Action by Alternative:						
1	-323	-2	-5	-169	-147	-5.9
2	+114	+1	+1	+25	+87	+2.3
3	+960	+4	+13	+447	+496	+18.0
6	-611	0	0	-179	-432	-10.7
7	+1292	+9	+19	+620	+644	+24.0
8	-202	-2	-3	-111	-86	-3.8
9	+1179	+5	+17	+567	+590	+21.9
Proposed Action	+52	+1	+1	0	+50	+1.0

1/ Annual average number of jobs. Includes part-time and seasonal. An "0" equals no change from No Action alternative.

2/ Model in terms of 1977 economic data. If income were indexed in current dollars, the relative ranking of alternatives would remain the same, since income figures would be multiplied by the same factor.

3/ Total employment and incomes existing in that County.

4/ Portion of County employment and income attributed to Tonto National Forest. Employment is a potential figure only; there is no guarantee that this amount of employment would occur.

Environmental Consequences

Native Americans

The American Indian Religious Freedom Act requires Federal agencies to evaluate their policies and procedures in consultation with native leaders of traditional religions in order to determine mitigation necessary to protect and preserve Native American religious practices. Consultation to date has been through the public involvement process with the Fort Apache, San Carlos, Fort McDowell, Salt River, and Tonto-Yavapai Apache Indian tribes. No conflicts have been identified.

All alternatives continue to protect Native American religious sites and areas through cultural resource surveys and contact with the tribes.

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 65 compares the alternatives to the targets assigned for Periods 1 and 5, respectively.

All alternatives fail to meet RPA targets in developed recreation. The RPA targets exceed the benchmark for developed recreation and, therefore, is outside the decision space for any alternative. (See PNV Trade-offs Discussion in Chapter 2.)

Mineral operating plans are based on projections of activity from historical data. The number of plans could fluctuate widely because of the speculative nature of mineral development. Land purchase is accomplished with Land and Water Conservation Funds. These funds have been severely cut back. Since the Forest has not received funding over the past four fiscal years no land purchases are projected.

Table 65

Comparison of RPA Targets with Average Annual Outputs - Periods 1 and 5

Output-Activity	Unit of Measure	Target	Alternative: Proposed Action (10)	Current (4)	RPA (3)	1	2	6	7	8	9
					Period 1						
Recreation											
Dev.	MRVD 2/	2,628	1,869	1,867	1,910	1,871	1,867	1,867	1,978	1,911	1,867
Disp.	MRVD 1/	2,591	4,307	3,114	5,248	5,252	4,090	3,737	4,273	4,474	3,768
Trail Const.	Mile	2.6	9.5	.4	17.0	6.5	6.4	0	20.2	20.0	0
Wildlife Hab. Improve.	MAc	2.1	5.3	2.1	2.1	5.0	0	0	0	8.0	0
Permitted Use	MAUM	410	397	404	405	405	249	404	405	405	403
Timber											
Sales	MMBF	10.2	7.9	8.2	18.0	7.7	8.7	4.7	8.9	7.8	8.0
Reforest.	Ac	129	100	100	100	100	100	65	100	100	100
TSI	Ac	505	1,000	1,000	1,000	1,000	1,000	711	1,000	1,000	1,000
Minerals	Plans	132	132	132	132	132	132	132	132	132	132
Fuel Treat.	MAc	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Lands Purch.	Ac	275	0	0	0	0	0	0	0	0	0
					Period 5						
Recreation											
Dev.	MRVD 3/	4,779	2,300	2,200	2,625	2,240	2,200	2,200	3,243	2,631	2,200
Disp.	MRVD	3,125	6,476	4,388	7,958	7,978	5,874	5,411	6,448	6,798	5,454
Trail Const.	Mile	5.9	4.5	.4	2.6		3.2	0	4.2	4.1	0
Wildlife Hab. Improve.	MAc	1.6	10.0	.7	1.6	9.0	0	0	0	12.0	0
Permit Use	MAUM	225	278	278	226	204	197	196	200	201	197
Timber											
Sales	MMBF	18.0	16.7	11.3	18.8	10.9	13.1	4.8	13.1	18.3	20.5
Reforest.	Ac	210	100	100	100	100	100	65	100	100	100
TSI	Ac	93	1,000	1,000	1,000	1,000	1,000	711	1,000	1,000	1,000
Minerals	Plans	188	188	188	188	188	188	188	188	188	188
Fuel Treat.	MAc	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lands Purch.	Ac	2	0	0	0	0	0	0	0	0	0

1/ Includes wildlife and fishing RVD's.

2/ The alternatives include 330,000 RVD's as a result of recreational facilities constructed by the Bureau of Reclamation on Roosevelt Lake.

3/ The alternatives include 663,000 RVD's as a result of recreational facilities constructed by the Bureau of Reclamation on Roosevelt Lake.

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 are energy producing products such as fuelwood, oil, and gas.

Wildland livestock grazing, which is considered more energy efficient than livestock feedlots, will not significantly increase from the present under any alternative.

The extraction of minerals is a legitimate use of the National Forest, and most of the Tonto will be open to development under all alternatives. The management alternatives do vary in the amount of restrictions that would be placed on developers due to withdrawals and leasing stipulations.

Floodplain Management

The proposed management alternatives will generally improve floodplains. This will result largely from improved range management practices that will improve watershed conditions. This, in time, will reduce peak flows and allow riparian vegetation to re-establish itself. Alternatives 1, 3, 8, and the Proposed Action have the greatest potential to improve floodplain management.

Where practical, developments such as roads, trails, and administrative sites will be located outside the floodpain. However, some recreation developments have proven compatible with floodplains. Where no threat is posed to lives or property, such developments may be built in floodplains. In this case, developments will be designed to withstand flooding, or will be of minimal cost so that periodic replacement is economically feasible.

Hazards

The potential for identified hazards to cause damage to life, property, or resources will vary by management alternatives. However, in all cases the potential will be offset by increasing mitigation measures such as more fire protection or more direct practices to prevent accelerated erosion and flooding.

Other Agency Plans

There are no conflicts with other agency plans.

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 by the end of Period 5. Short-term uses include timber and fuelwood harvest, all recreation uses, livestock grazing, mineral extraction, and special land uses.

Environmental Consequences

Soil and water are the primary resources upon which productivity is based. Short-term uses which damage soils and soil-water relationships impair long-term productivity. Management requirements provide for protection of long-term productivity by requiring short-term uses to mitigate or enhance effects on soil and water resources.

All of the management alternatives will provide multiple use products and benefits to the public while protecting or enhancing basic environmental quality. The difference between alternatives is in the mixes of outputs and values. The same basic management practices will be used under all alternatives, where appropriate, to produce goods and services. The Tonto is capable and suitable for management under any of the alternatives without impairment of long-term productivity. Under Alternatives 1, 3, 7, 8, and the Proposed Action, some vegetative types may be temporarily converted to conditions that are unlike their natural wild land conditions. The Proposed Action balances permitted livestock use with capacity in the second period. Alternative 2 balances capacity with use in the first period. Alternatives 3 and 4 balance capacity with use in the fourth period, while Alternatives 1, 6, 7, 8, and 9 balance capacity with use in the fifth period. There may be some short-term reduction in land productivity on some grazing allotments as intensive range management is being established during the first two periods of this Plan. However, as allotments are properly stocked and intensively managed, range condition and land productivity will improve. As long as wild lands are managed to support people's needs and desires, there is always the chance a disaster such as flood or fire will occur that will affect long-term productivity on any given area. All alternatives minimize this probability and the extent of occurrence.

Irreversible or Irretrievable Commitments of Resources

Irreversible commitments are resource uses which affect the nonrenewable resource--soils, minerals and cultural sites or areas. These commitments are considered irreversible because the resource has: 1) Deteriorated to the point that renewal can occur only over a long time period or at great expense; or 2) the resource has been destroyed or removed.

Some irreversible soil loss will occur in all alternatives on localized areas because of the length of time required to return land to its former condition because of the desert environment found over much of the Tonto National Forest. Small amounts of soil loss will be induced through road or trail construction and mineral development that requires open pit mining or mine tailing dumps, and through vegetative modification.

Extraction of minerals will occur in all alternatives. This is an irreversible commitment--once the mineral is removed it is no longer available for future use.

Cultural sites can be inadvertantly destroyed in all altenatives despite efforts to locate and protect the sites or mitigate the impacts. The potential for vandalism of cultural sites is highest in Alternatives 1, 2, 4, 6, and 9 because of the low level of law enforcement protection. The resulting loss of information is irreversible.

Irretrievable resource commitments result from decisions which reduce production or use of renewable resources. Irretrievable commitments represent opportunities foregone for Period 1 when the plan is in effect and reflect trade-offs made to integrate multiple-use considerations or meet budget limitations. Significant irretrievable effects are summarized in Table 66.

Environmental Consequences

Table 66

Average Annual Irretrievable Resource Commitments for the First Time Period

Output/Alternative		PA	Current (4)	RPA (3)	1	2	6	7	8	9
Recreation										
Developed	MRVD	109	111	68	107	111	111	0	67	111
Wildlife	MRVD	55	208	4	0	186	316	105	22	312
Dispersed	MRVD	890	1930	0	0	976	1199	874	754	1172
Wilderness	MRVD	896	0	1017	1017	824	719	839	890	801
Range										
Permitted	MAUM	8	1	0	0	1	1	0	0	2
Capacity	MAUM	6	8	0	1	4	5	3	2	5
Timber										
Sawtimber	MMBF	9	9	0	9	9	12	9	9	9
Products	MMBF	1.2	0.9	0	1.4	0.4	1.6	0.4	1.3	1.1
Fuelwood	MMBF	4	6	0	1	4	7	1	1	5
Water Yield	MAcFt	22	46	14	0	46	46	17	16	44

Adverse Environmental Effects Which Cannot Be Avoided

Unavoidable adverse environmental effects result from managing the land for one set of resource uses at the expense of the use or condition of other resources. Management requirements in prescriptions mitigate most adverse effects by limiting the extent and duration of impacts.

Unavoidable environmental effects are:

Recreation - Increased conflict between user groups and deterioration of developed recreation sites because of use in excess of capacity and reduced service level management in some alternatives.

Wilderness - In some alternatives wilderness values are reduced where recreation use exceeds capacity and management is at reduced service level, or where livestock improvements conflict with wilderness values and recreation use.

Air Quality - Temporary reduction of air quality through prescribed burning and activities creating dust.

Wildlife and Fish - There will be increased disturbance to wildlife due to higher levels of dispersed use, and temporary displacement during timber sale activities.

Range - The local livestock industry would be subjected to significant change under all alternatives, both in short and long-term use, due to implementation of allotment management plans and necessary adjustments in permitted numbers of livestock to balance with the capacity of the range. Costs for grazing permittees to manage livestock under intensive management systems will increase.

Soil and Water - Localized soil loss following the balancing of capacity with permitted use until vegetative response is sufficient to fully stabilize watersheds. Increased water quality problems through waste water disposal as private lands within the Forest are subdivided. Future mining development could degrade water quality in localized areas for short periods of time.

List of Preparers

5

The Tonto National Forest Proposed Land and Resource Management Plan and Draft Environmental Impact Statement were prepared by a team of individuals of varied specialties and backgrounds. Throughout the planning process, an interdisciplinary team approach was used to develop the proposed Forest Plan and alternatives to it. The following are those who helped in preparation of the documents.

John Bedell, Deputy Forest Supervisor

B.S. - Forestry, University of Arizona, 1964.

Snoqualmie National Forest - Junior Forester; Coronado National Forest - Watershed Specialist Staff; Coconino National Forest, Beaver Creek District - Assistant Ranger; Apache-Sitgreaves National Forests - Hydrologist; Regional Office, Albuquerque - Soil, Water, State, and Private Forestry; Santa Fe National Forest, Cuba District - Ranger.

Provided overall direction and guidance for Forest Planning effort. Participated as member of the Management Team.

Berwyn L. Brown, Forest Planning Staff

B.S. - Forest and Range Management, Colorado State University, 1963.
M.A. - Public Administration, University of New Mexico, 1979.

Bighorn National Forest, Tongue Ranger District - Forester, Pre-Sale and Sale Administration; Black Hills National Forest, Harney Ranger District - Forester, Special Uses and Range Administration; Black Hills National Forest, Harney Ranger District - District Timber Staff; Routt National Forest, Middle Park District - Ranger; Sante Fe National Forest, Cuba District - Ranger.

Overall responsibility for the amendment to the first Draft EIS and Plan.

Wayne Buckner

B.S. - Forestry, Iowa State University, 1961.

Clearwater National Forest - Land Line Location, Land Exchange; Beaverhead National Forest, Wise River District - Timber Management Assistant; Tonto National Forest, Payson District - Recreation and Lands Staff; Carson National Forest - Lands Staff; Carson National Forest, Questa District - Ranger; Tonto National Forest, Tonto Basin District - District Ranger; Gila National Forest, Silver City District - Ranger.

Developed management concerns as member of the Management Team; reviewed steps in planning process; developed and reviewed management prescriptions.

William R. Burton, Operations Research Analyst - Computer Specialist

B.S. - Agriculture, University of California at Davis, 1962.
M.S. - Agricultural Economics, University of California at Davis, 1963.

State of Washington - Research Analyst; Army Corps of Engineers, Seattle - Regional Economist.

Resource data base manager; provided socioeconomic information for the planning process. Assisted in development of Tonto DE-FORPLAN computer model. Assisted in editing all planning documents.

List of Preparers

John Caffrey, Pleasant Valley District Ranger

B.S. - Forest Management, Oregon State University, 1966.

Cibola National Forest, Mt. Taylor District - Timber, Fire, Recreation, and Lands Staff; Coronado National Forest, Safford District - Grazing and Recreation Staff; Santa Fe National Forest, Pecos District - Timber and Fire Staff; Apache-Sitgreaves National Forests, Alpine District - Timber Staff.

Developed management concerns as member of the Management Team; reviewed steps in planning process; developed and reviewed management prescriptions.

Lowell T. Cartwright, Cave Creek District Ranger

B.S. - Forest Management, Colorado State University, 1966.
M.S. - Wildlife Management, University of Wyoming, 1975.

Tongass National Forest - Forester; Payette National Forest, Council Ranger District - Forester; Rio Grande National Forest - Wildlife Biologist; San Juan National Forest, Pine Ranger District - Ranger.

Reviewed steps in the planning process.

Hilton K. Cass

B.A. - Geology, Augustana College, 1971

M.S. - Geology, University of Idaho, 1974

N.L. Industries - Exploration Geologist; Bureau of Land Management, Richfield (Utah) District - Geologist; Bureau of Land Management, Phoenix District - Geologist; Southwestern Region, USDA Forest Service, Arizona Zone Office - Geologist.

Prepared review of mineral occurrences and report on mineral potential for Tonto National Forest. Developed estimate of mineral benefit values.

Thomas Chappell, Assistant Forest Engineer

B.S.- Agricultural Engineering, Virginia Polytechnic Institute and State University, 1965.

M.S.- Agricultural Engineering, Virginia Polytechnic Institute and State University, 1967.

Southern Experiment Station - Engineering Research; Olympic National Forest - Civil Engineer.

Member of Interdisciplinary Team; provided transportation system, engineering, and facility information for the planning process.

List of Preparers

Gerald F. Ewart, Assistant Fire Management Officer

Angeles National Forest, Valyermo District - Fire Crew, Fire Prevention Technician; San Bernardino National Forest, Cajon District - Fire Prevention Technician, Tanker Foreman, Hotshot Crew Foreman, Hotshot Superintendent, Assistant Fire Management Officer; San Bernardino National Forest - Assistant Dispatcher; San Bernardino, Arrowhead District - Fire Management Officer.

Member of Interdisciplinary Team; provided fire management information for the planning process.

Larry Allen Forbis, Wildlife Biologist

B.S. - Wildlife Management, Colorado State University, 1967.
M.S. - Range Management, University of Wyoming, 1969.

Angeles National Forest, Wildlife Biologist; Klamath National Forest - Wildlife Biologist.

Member of Interdisciplinary Team; provided fish and wildlife information for the planning process.

Glen J. France, Landscape Architect

B.L.A. - Landscape Architecture and Environmental Planning,
Utah State University, 1976.

Cokeville, Wyoming - Landscape Architect and City Planner; Region 4, Regional Office- Assistant Landscape Architect; Grand Mesa Uncompahgre and Gunnison National Forest - Landscape Architect and Assistant Landscape Architect; Tonto National Forest - Assistant Landscape Architect.

Designed and prepared graphic layout for the amended Land Management Plan and Environmental Impact Statement.

Philip M. Gilman

B.S.- Forestry Management, Humboldt State University, 1960.

Rogue River National Forest, Union Creek District, Timber, Range, Recreation, Lands, Watershed, Minerals Staffs; Rogue River National Forest - Recreation Administration; Wenatchee National Forest - Recreation Administration; Ochoco National Forest - Planning Staff; Tonto National Forest - Planning Staff Officer; Washington Office - Program Development and Budget.

Overall responsibility for the Land and Resource Management Plan including coordinating, directing, and reviewing work products resulting in the Forest Plan and Draft EIS.

Gary W. Holder, Range Staff Assistant

B.S. - Range Management, Texas Tech University, 1969.

Kaibab National Forest, Big Springs District - Game Range Analyst; Kaibab National Forest, Jacob Lake District - Game Range Analyst; Tonto National Forest, Payson District - Range and Wildlife Staff; Carson National Forest - Range Staff Assistant.

Member of Interdisciplinary Team; provided range management information for the planning process.

List of Preparers

Joel C. Johnstone

B.A. - Anthropology, University of New Mexico, 1974 (Computer Science minor).

Tonto National Forest - Assistant Forest Archeologist; Tonto National Forest - Computer Specialist (two years), Cibola National Forest - Computer Specialist.

Assisted in computer systems application and analysis applicable to the Forest Plan.

John B. Kelsey, Soil Scientist

B.S. - Soils, Water, Engineering, University of Arizona, 1973.
Tonto National Forest - Soils Scientist.

Member of Interdisciplinary Team; provided soils information for planning process.

James L. Kimball, Forest Supervisor

B.S. - Forestry, Michigan State University, 1957.

Huron-Manistee National Forest, Mio District - Forester; Chequamegon National Forest, Washburn District - Assistant Ranger; Missouri National Forest, Cassville District - Assistant Ranger; Mark Twain National Forest, Winona District - Assistant Ranger; Mark Twain National Forest - Planner; Ottawa National Forest, Bessemer District - Ranger; Chippewa National Forest, Lydick Lake Job Corps - Center Director; Office of Economic Opportunity, Washington, D.C. - Staff Assistant; President's Council for Youth Opportunity, Washington, D.C. - Representative from Agriculture and Interior; Division of Manpower and Youth Program, Washington Office - Staff Assistant; Prescott National Forest - Forest Supervisor; Apache-Sitgreaves National Forests - Forest Supervisor.

Provided overall direction and guidance for Forest Planning effort; recommended approval of final products throughout planning process. Participated as member of the Management Team.

Joyce H. Magidson, Public Information Officer

B.S. - Mass Media Communication, Northwestern University, 1968.

Water Resources Council, Upper Mississippi River Basin Commission - Public Involvement Coordinator; Water Resources Council, Great Lakes Basin Commission - Public Involvement Coordinator; Corps of Engineers, North Central Division, Chicago - Public Involvement Coordinator; Corps of Engineers, Ohio River Division, Pittsburg District - Public Involvement Coordinator; Institute of Water Resources, Ft. Belvoir, Virginia - Consultant.

Developed management concerns as member of the Management Team; reviewed steps in planning process; developed and reviewed management prescriptions.

Richard C. Martin, Hydrologist

B.S. - Range Management, University of Arizona, 1967.
M.S. - Watershed Management, University of Arizona, 1976.

Sitgreaves National Forest, Chevelon District - Range Conservationist; Carson National Forest - Hydrologist; Carson National Forest - Planner.

Member of Interdisciplinary Team; provided water resource information for the planning process.

List of Preparers

Martin McAllister, Forest Archeologist

B.A. - Anthropology, University of California, San Diego, 1970.
M.A. - Archeology, San Diego State University, 1976.

Past President of Arizona Archeological Council; Governors Advisory Commission for Archeology; Tonto National Forest - Cultural Resource Management.

Member of Interdisciplinary Team; provided cultural resource information for the planning process.

Ernest McCrary, Fire, Timber, Watershed Staff

B.S. - Forestry and Range, Colorado State University, 1954.

Rocky Mountain Forest and Range Experiment Station, Big Horn National Forest - Range Research; Kaibab National Forest, Chalender District - Assistant Ranger; Kaibab National Forest - Assistant Range Staff; Coronado National Forest, Safford District - Ranger; Prescott National Forest - Fire, Timber, Watershed Staff.

Developed management concerns as member of the Management Team; reviewed steps in planning process; developed and reviewed management prescriptions.

James A. Mercer, Timber Sub-staff

B.S. - Forest Land Management, Northern Arizona University

Gila National Forest, Luna Ranger District - Forester.

Member of Interdisciplinary Team; provided timber information for the planning process including the development of an adequate range of economic, production and scheduling options for FORPLAN.

James W. Payne, Public Affairs Assistant

B.A. - Mass Media Communications, Fresno State University, 1971.

Sierra National Forest - Engineering Technician; Mountain Equipment, Inc., California - Equipment Tester (Backpack and mountaineering equipment testing and promotion on yearlong Round The World Expedition); Sierra National Forest-Hotshot Fire Crew; Tonto National Forest, Tonto Basin Ranger District - Range Technician; Mesa Ranger District - Wilderness Ranger, Recreation Foreman (Lower Salt River Recreation Area and Saguaro Lake), Fire Prevention Technician.

Edited second Draft EIS; responsible for public involvement and analysis of public comments.

John Petroski, Cave Creek District Range Technician

B.S. - Range Management, Arizona State University, 1982.

Tonto National Forest - Wildlife Biological Aid; Tonto National Forest - Data Management and Cartography.

Provided assistance in resource data compilation for DE-FORPLAN computer model, developed and drafted map data.

List of Preparers

Lee Redding, Recreation and Wilderness Staff

B.S. - Forestry, Mississippi State University, 1957.

Umpqua National Forest, Steamboat District - Engineer, Timber Sale Administrator, Timber Sale Preparation Chief; Umpqua National Forest, Tiller District - Timber Management Assistant, Assistant Ranger; Wasatch National Forest, Kamas District - Recreation and Lands Staff; Coconino National Forest, Sedona District - Ranger; Apache-Sitgreaves National Forests - Recreation and Lands Staff.

Developed management concerns as member of the Management Team; reviewed steps in planning process; developed and reviewed management prescriptions.

Ronald A. Senn, Tonto Basin District Ranger

B.S. - Forest Watershed Management, University of Arizona, 1972.
M.S. - Range Watershed, University of Arizona, 1977.

Rocky Mountain Forest and Range Experiment Station - Forestry Research Technician; University of Arizona - Forest Research Assistant; Bureau of Land Management, Boise District - Supervisory Range Conservationist; Tonto National Forest - Assistant Forest Planner.

Developed capability area maps, responsible for development and analysis process of Tonto DE-FORPLAN computer model, coordinated and reviewed work completed by the Interdisciplinary Team; as a member of the Management Team, reviewed steps in planning process.

Deborah L. Sewell

B.A. - Journalism/Art, Central State University, Oklahoma, 1973.

Tonto National Forest - Visitor Information Specialist; Tonto National Forest - Public Information Specialist; National Forests in Florida - Public Information Specialist; Tonto National Forest - Public Affairs Specialist; Department of Interior - Public Affairs Specialist.

Responsible for public involvement and analysis of public comment and all mailing lists, assisted in editing of all planning documents. Designed and prepared graphic layout for first Draft Environmental Impact Statement and Land Management Plan.

Walter E. Shjeflo

B.S. - Civil Engineering, North Dakota University, 1949.

Ulteig Engineering Corporation, North Dakota - Resident Engineer; North Dakota State Highway Department - Location and Design Engineer; Kootenai National Forest - Location Engineer, Assistant Forest Engineer; Nezperce National Forest - Assistant Forest Engineer; Tonto National Forest - Forest Engineer.

Developed management concerns as member of the Management Team; reviewed steps in planning process; developed and reviewed management prescriptions.

List of Preparers

Larry Soehlig, Lands and Minerals Staff

B.S. - Forestry, University of Missouri, 1958.

Cibola National Forest, San Mateo District - Assistant District Ranger; Cibola National Forest - Recreation Sub-staff; Cibola National Forest, Sandia District - Assistant District Ranger; Apache National Forest - Timber Sub-staff; Apache National Forest, Alpine District - Range Staff; Apache National Forest, Springerville District - Recreation and Fire Staff; Coconino National Forest - Lands Sub-staff; Carson National Forest, Jicarilla District - District Ranger; Cibola National Forest, Mountainair District - Ranger; Lincoln National Forest - Planning and Information Staff.

Developed management concerns as member of the Management Team; reviewed steps in planning process; developed and reviewed management prescriptions.

David M. Stewart, Range and Wildlife Staff

B.S. - Agriculture, University of Arizona, 1968.

Apache National Forest, Alpine District - Range Conservationist; Carson National Forest, Tres Piedres District - Range Conservationist; Carson National Forest, Canjilon District - Ranger; Tonto National Forest, Globe District - Ranger.

Developed management concerns as member of the Management Team; reviewed steps in planning process; developed and reviewed management prescriptions.

Hugh Thompson

B.S. - Forestry and Range, Colorado State University, 1965.

Coconino National Forest, Elden District - Range, Wildlife, and Watershed Staff; Sitgreaves National Forest, Pinedale District - Range, Wildlife, and Watershed Staff; Carson National Forest, Tres Piedres District - Range, Wildlife and Watershed Staff; Carson National Forest, Taos District - Ranger; Tonto National Forest, Payson District - Ranger; Gila National Forest - Range Staff.

Developed management concerns as member of the Management Team; reviewed steps in planning process; developed and reviewed management prescriptions.

Jerald D. Tower

B.S. - Range Science, Brigham Young University, 1968.
M.S. - Wildland Ecology, University of Nevada, 1970.

Coconino National Forest, Flagstaff District - Range and Wildlife Staff; Coconino National Forest, Sedona District - Range and Wildlife Staff; Gila National Forest - Range Staff Assistant; Tonto National Forest, Cave Creek District - Ranger.

Developed management concerns as member of the Management Team; reviewed steps in planning process; developed and reviewed management prescriptions.

List of Preparers

Don Van Driel, Mesa District Ranger

B.S. - Forestry, Arizona State College, 1964.

Lincoln National Forest, Mayhill District - Range, Wildlife, Recreation, and Lands Staff; Kaibab National Forest - Jacob Lake District Ranger, Wildlife and Timber Staff; Coconino National Forest, Long Valley District - Range, Wildlife, Recreation, and Lands Staff; Coronado National Forest, Nogales District - Recreation and Lands Staff.

Developed management concerns as member of the Management Team; reviewed steps in planning process; developed and reviewed management prescriptions.

Robert O. Wagenfehr, Timber, Fire, and Watershed Staff

B.S. - Forestry, Northern Arizona University, 1966

Coconino National Forest, Morman Lake Ranger District - Forestry Technician; Tonto National Forest, Payson Ranger District - Forestry Technician; Kaibab National Forest, Jacob Lake Ranger District - Timber Forester; Kaibab National Forest, Williams Ranger District - Recreation and Lands Staff; Santa Fe National Forest, Tesuque Ranger District - Assistant Ranger; Lincoln National Forest, Smokey Bear Ranger District - Recreation, Lands, and Fire Staff; Southwestern Regional Office - Assistant Director Cooperative Forestry; Apache-Sitgreaves National Forests, Lakeside Ranger District - District Ranger.

Reviewed draft Statement and Plan and participated as a member of the management team.

Warren G. Weinel, Assistant Recreation and Wilderness Staff

B.S. - Forestry, University of Idaho, 1959.

Prescott National Forest - Outdoor Recreation Study Assistant; Apache National Forest, Black River District - Timber Sub-staff, Assistant Ranger; Apache National Forest, Quemado District - Timber Staff; Tonto National Forest, Tonto Basin District - Assistant Ranger; Tonto National Forest, Mesa District - Forest Wilderness Coordinator; Tonto National Forest, Cave Creek District - Assistant Ranger; Tonto National Forest - Assistant Recreation and Lands Staff.

Member of interdisciplinary Team; provided recreation and wilderness information for the planning process.

Larry Widner, Globe District Ranger

B.S. - Forestry, Michigan State, 1964.

Tonto National Forest, Globe District - Minerals Staff; Tonto National Forest, Pleasant Valley District - Timber Staff; Apache-Sitgreaves National Forests, Clifton District - Fire, Timber, Recreation, Lands, and Special Uses Staff; Carson National Forest, Tres Piedres District - Timber Staff; Tonto National Forest - Timber Sub-staff.

Developed management concerns as member of the Management Team; reviewed steps in planning process; developed and reviewed management prescriptions.

Member of interdisciplinary Team; provided timber information for the planning process.

List of Preparers

Charles C. Wildes, Deputy Forest Supervisor

B.S. - Forestry, University of Montana, 1969.

Region One - 6 seasons USDA Forest Service, fire, timber, wildlife; Alaska - 2 seasons Bureau of Land Management, fire; Sitgreaves National Forest - Junior Forester; Coconino National Forest, Long Valley Ranger District - Timber Staff; Tonto National Forest, Payson Ranger District - Recreation, Lands, Minerals, Timber Staff; Apache-Sitgreaves, Heber Ranger District - District Ranger.

Reviewed Proposed Tonto National Forest Plan and Draft Environmental Impact Statement. Provided direction for responses to public comment generated from the Draft Environmental Impact Statement. Participated as a member of the Management Team.

Ron N. Wilson, Landscape Architect

B.S. - Landscape Architecture, Washington State University, 1971.

Gila National Forest - Landscape Architect; Gila National Forest, Wilderness District - Visitor Information Specialist; Lincoln National Forest - Landscape Architect.

Member of interdisciplinary Team; provided recreation and visual resource information for the planning process.

L. C. Winkle

Siuslaw National Forest - Administrative Assistant; Deschutes National Forest - Administrative Assistant; Okanogan National Forest - Administrative Officer; Tonto National Forest - Administrative Officer.

Developed management concerns as member of the Management Team; reviewed steps in planning process; developed and reviewed management prescriptions.

Consultation with Others

6

Mailing List

Copies of the Tonto National Forest proposed Land and Resource Management Plan and Environmental Impact Statement were distributed to the following organizations and agencies. In addition, individuals specifically requesting copies of the EIS and Proposed Forest Plan were mailed a copy. Those individuals requesting information on the Proposed Forest Plan were mailed a Summary. The distribution list for the Summary is not included in this document because of its length.

Federal

Apache-Sitgreaves National Forest
Army Corps of Engineers
Beaver Creek District Ranger
Blue Ridge District Ranger
Bureau of Indian Affairs
Bureau of Land Management
Bureau of Reclamation
Carson National Forest
Coconino National Forest
Coronado National Forest
Council on Environmental Quality
Department of Housing and Urban Development
Environmental Protection Agency
Federal Highway Administration
Fish and Wildlife Service
Forest Service, Southwestern Region
Forest Service, Washington Office
Heber District Ranger
Kaibab National Forest
Monongahela National Forest
National Park Service
Prescott National Forest
Sante Fe National Forest
Secretary's Office, U.S. Department of Agriculture
Soil Conservation Service
State Conservationist
Tonto National Monument
U.S. Bureau of Mines
U.S. Department of Interior
U.S. Fish and Wildlife Service
U.S. Geological Survey
U.S. Representative John McCain
U.S. Representative Morris K. Udall
U.S. Representative Bob Stump
U.S. Representative Eldon Rudd
U.S. Representative James Kolbe
U.S. Senator Barry Goldwater
U.S. Senator Dennis DeConcini
Verde District Ranger

State

Arizona Attorney General
Arizona Commission of Agriculture and Horticulture
Arizona Department of Transportation
Arizona Department of Water Resources
Arizona Game & Fish Department
Arizona Historical Preservation Officer
Arizona Office of Tourism
Arizona Outdoor Recreation Coordinating Commission
Arizona Resources Information System

Consultation with Others

Arizona Secretary of State
Arizona State Clearing House
Arizona State Department of Health Services
Arizona State Department of Mineral Resources
Arizona State Land Department
Arizona State Parks Board
ASU Center for Environmental Studies
Arizona State Treasurer
Arizona Water Commission
Governor Bruce Babbitt
Governor's Commission on Arizona Environment
Office of Economic Planning & Development

Local

Arizona Association of Counties
Central Arizona Association of Governments
City of Apache Junction Manager
City of Globe Manager
City of Mesa Manager
City of Miami Manager
City of Payson Manager
City of Scottsdale Manager
City of Superior Manager
Gila County Board of Supervisors
Gila County Planning & Zoning Commission
Gila County Sheriff's Department
Maricopa County Association of Governments
Maricopa County Board of Supervisors
Maricopa County Cooperative Extension Service
Maricopa County Parks & Recreation Department
Maricopa County Sheriff's Department
Navajo County Board of Supervisors
Payson Unified School District #10
Pinal County Board of Supervisors
Pinal County Sheriff's Department
Yavapai County Board of Supervisors
Yavapai County Sheriff's Department

Indian Tribes

Fort McDowell Mohave-Apache Community Council
Navajo/Hopi Unity Committee
Salt River Pima-Maricopa Community Council
San Carlos Apache Tribal Council
Tonto Apache Indian Tribal Council
White Mountain Apache Tribal Council

Organizations/Industries

American Camping Association
Amselco Exploration, Inc.
Anam, Incorporated
Arizona Archeological Society
Arizona Cattle Growers Association
Arizona Chapter Wildlife Society
Arizona Conservation Council
Arizona Desert Bighorn Sheep Society

Consultation with Others

Arizona Desert Racing Association
Arizona Mining Association
Arizona Natural Heritage Program
Arizona-New Mexico, American Fisheries Society
Arizona Outdoor Writers Association
Arizona Parks & Recreation Association, Inc.
Arizona Public Service
Arizona Roamers
Arizona Sportsmasters
Arizona State Association of Four-Wheel Drive Clubs
Arizona State Horseman's Association
Arizona Water Resource Committee
Arizona Wilderness Coalition
Arizona Wildlife Federation
Arizona Wildlife Society
Arizona Youth Hostels
Arizonans for Wild and Scenic Rivers
ASARCO, Inc.
Audubon Society
Bacon's Boots and Saddles
Berna Accounting Services
Boyce Thompson Arboretum
Camp Creek Summer Home Association
Camp Verde Weather Service
Canyon Lake Marina
Carefree Chamber of Commerce
Cave Creek Improvement Association
Central Arizona Project Association
CITCO
Coconino Sports
Common Cause
Conscientious ATV Riders
Conservation Committee
of the Cave Creek Improvement Association
Continental Materials Corporation
Crabtree Wash Summer Home Association
Dames and Moore
Defenders of Wildlife
Desert Bares
Desert Botanical Garden
Desert Saddle Bags
Desert Tortoise Council
Desert Voyagers
Diamond Point Summer Home Association
Earth First !!!
Ecological Services
Ellison Creek Summer Home Association
Eloy Enterprise
Environmental Impact Services
Evergreen Lumber Co., Inc.
Federal Timber Purchasers Association
Friends of the River
Gila County Citizens for Conservation
Gila County Gem and Mineral Society
Globe/Miami Chamber of Commerce
Greater Arizona Bicycling Association
Grinnell Natural History
Inland Forest Resource Council
Interaction Systems, Inc.
Izaak Walton League of America
Johnson Ranch Partnership
Kaibab Industries

Consultation with Others

Kerby Furniture, Inc.
Lakeview Trailer Park
League of Women Voters
Manterola Sheep Company
Maricopa Audubon Society
Mesa Chamber of Commerce
Miller Enterprises, Inc.
Minerals Exploration Coalition
Mountain Bell
National Campers and Hikers Association, Inc.
National Forest Products Association
National Forest Recreation Association
National Offroad Bicycle Association
National Speleological Society
Nature Conservancy
Nerco Mining Company
Newmont Exploration Limited
Oil and Gas Conservation Commission
OW Ranch
Pacific Mutual Life
Payson Chamber of Commerce
Penoll Company
Phelps Dodge Corporation
Pine/Strawberry Land Use Association
Pinto Valley Copper Corporation
Road and Trail Association
Roosevelt Lake Marina
Safari Club, International, Phoenix Chapter
Saguaro Lake Guest Ranch, Inc.
Saguaro Lake Marina
Salt River Project
Salt River Recreation, Inc.
Salt River/Apache Trail Association
Scottsdale Chamber of Commerce
See Canyon Summer Home Association
Sierra Club
Society of Range Management
Southwest Forest Industries
Southwest Total Area Radio System
Sunshine Enterprises, Inc.
Superstition Mountain Historical Society
Telluride Whitewater
Texasgulf Minerals and Metals, Inc.
Thompson Draw Summer Home Association
Tonto Cattle Growers Association
Tonto Cattlegrowers & Gila County Cattlegrowers Assn.
Tonto Grazing Advisory Board
Tonto Natural Resource Conservation District
Tonto Wilderness Group
Tucson Audubon Society
Twin Lakes Trailer Court
Twitty, Sievwright & Mills
Union Oil Company of California
United 4-Wheel Drive Association
U.S. Borax
Utah International, Inc.
Western Regional Council
Western Wood Products Association
Westinghouse Electric Corporation
Wilderness Challenge
Wilderness Institute, University of Montana
Wilderness Society
Wildlife Society
Andy Worden & Associates
Wyoming Mineral Corporation

Consultation with Others

Libraries

Apache Junction Public Library
Arizona City Community Library
Arizona State University Library
Avondale Public Library
Black Canyon City Library
Buckeye Public Library
Camp Verde Community Library
Casa Grande Public Library
Chandler Public Library
Chino Valley Library
Clifton City - Greenlee County Library
Cochise County Library
Coolidge Public Library
Cottonwood Public Library
El Mirage Public Library
Flagstaff City-Coconino County Library
East Flagstaff Community Library
Florence Public Library
Fort McDowell Indian Library
(Glendale) Velma Teague Library
Globe City Library
Greer Memorial Library
Isabelle Memorial Library
(Lakeside) Wallace H. Larson Memorial Public Library
Maricopa Community Library
Maricopa County Library
Mesa Public Library
Miami Memorial-Gila County Library
Northern Arizona University Library
Old Dominion Library
Payson Public Library
Peoria Public Library
Phoenix Public Library
Pinal County Free Library
(Pine-Strawberry) Isabelle Hunt Memorial Library
Prescott City-Yavapai County Public Library
Prescott Valley Public Library
St. Johns - Apache County Library
Salt River Tribal Library
San Carlos Public Library
Scottsdale Public Library
Sedona Public Library
Show Low Public Library
Snowflake Public Library
Springerville Public Library
Sun City Library, Inc.
(Sun City West) R.H. Johnson Library
Superior Public Library
Tempe Public Library
Tolleson Public Library
Tucson Public (Pima County) Library
University of Arizona Library
Wickenburg Public Library
Young Public Deposit Library

Consultation with Others

Individuals

Allen, Don
Alexander, Dave
Alexander, Jim
Almond-Blum, Rita
Anderson, Cleo J.
Andrews, Paul
Aneas, Joe
Annerino, John
Antilla, Larry
Arlotta, Anthony Jr.
Armstead, Ronald W. & Dolly A.
Arnold, Joseph F.
Avery, Ben

Baldwin, Kerry
Baldwin, Tanna
Baltic, Tony
Barger, R.D.
Barrie, Stephen
Barsamian, Lorretta Kahn
Bartes, Louis
Beaver, William
Beggs, Robert W.
Behan, R. W.
Bengson, Stu
Bennett, J.
Berger, Leon
Bergthold, Patricia
Bisby, Frances M.
Black, Maleese M.
Blackwood, John
Blaney, Tom
Blumm, Patrick G.
Bohme, William E.
Bosh, Joni
Brault, Henri
Briggs, Philip
Brock, John H.
Brock, Robert
Brooks, John
Brown, Fred O.
Brown, Muri R.
Bunch, Ken
Burney, Michael S.
Bussiere, Michelle
Butler, Kenneth I.

Calabro, Ellen
Camp, Robert G. Sr.
Cantou, Pierre M.
Carey, Henry
Carlson, Richard. L.
Caron, Dick
Carpenter, Scott
Carr, John N.
Campbell, Erick
Casanova, Frank
Casillas, Robert P.
Christiana, David
Clinchy, Arthur H.
Cline, Pat
Cline, Raymond M.
Cline, Steve
Cogut, Ted
Collamer, Noel
Colley, Frances Sparkes
Conway, Betty Sue
Conway, Bill & Penny
Cooper, Jackie & Helen
Copenhaver, Connie
Cosaboom, Mary
Copenhaver, Connie
Cosaboom, Mary
Croon, Drew
Crossman, Alan E.
Cummins, W. F.

Dahl, Kevin
Davis, Dan & Marie
Davis, Frank R.
Davis, Gregory, E.
Davis, Jerry W.
Davis, William A.
Dawson, Jack
Daniel, Dave
Delph, Edwin K.
DeMuth, Carol
Denton, Jack
Dickens, Glen C.
Downey, Carolyn B.
Dryer, John
Dudding, Charles W.
Durand, Steve
Durnez, Michael

Eastridge, Darlene
Ebert, Jim
Edwards, Theresa W.
Ellis, Bruce
Elmore, Carroll M. & Fern B.
Engel-Wilson, Carolyn
Engman, Robert M.
Evans, James E.

Fibel, Herb
Finkelstein, David
FitzSimons, Mary & Jim
Folson, Judy
Forrest, John B. Jr.
Fulton, Mike

Gaiffe, Yvonne
Gallizioli, Steve
Garcia, Margot W.
Garst, Dale
Gaskill, Veryl D.
Gayer, Eleanor
Geisinger, Jim
George, Brian
Geringer, Maurice & Violet

Consultation with Others

Gibbons, Beverly L.
Gilbert, A.G.
Glinski, Richard
Godfrey, Ralph G.
Goldsmith, Kenneth M.
Gonnerman, Paul R.
Graf, William L.
Grantham, Walter M.
Gregory, Michael
Gressley, Randy
Griffin, Jacque
Griffin, John A.
Grove, Ron
Guthauser, Roland H.

Haardt, Theo H.
Hale, Glenn
Hale, Ralph D.
Hawker, C. R.
Hamilton, Caryolyn J.
Hayden, William J.
Heineman, Thomas E.
Hemphill, Russell
Herron, James C.
Hohman, Judy
Holaday, Bobbie
Hohman, Judy
Holaday, Bobbie
Holder, Mitchell
Hollamon, C. L.
Hoopes, Myron & Donelle
Hopkins, Larry
Horejsi, Ronald G.
Horvath, Frank
Houser, Dick
Hunt, Constance
Hunsaker, Walter & Susan

Jennings, Glenn
Johns, Michael A.
Johnson, Caleb H.
Johnson, Raymond C.
Jones, K. Bruce
Jones, Lee A.
Jones, Sue

Kannegaard, Barb
Kay, J. W. "Dutch"
Keane, John L.
King, Dennis M.
King, Roger
Kiefer, John
Kintigh, Keith
Kirkpatrick, Christine
Kollenborn, Thomas J.
Konemann, Warren A.
Koppinger, Douglas
Krass, Meg
Kretsch, Ellen

Laizure, Nancy
Lane, Thoron
Lange, Richard C.
Langstaff, Larry

LeCount, Al
Leech, George William
Leonard, Joan Lee
Lesch, Richard J.
Lewis, Linda
Lister, Frank
Loew, Edmund A. Jr.
Lofgren, Sue
Lorenz, Ronald
Lorenz, Shirley
Lupe, Ronnie
Lundberg, Lea J.
Lynyholm, Donavon

MacDonald, F. J.
Macy, Jerry
Maloney, Mr. & Mrs. W. T.
Markowski, Mr. & Mrs. Don
Marsik, George A.
Matson, Jim
Mayer, Elaine
McDonald, C. A.
McDonald, Patrick
McEnaney, Bill
McKain, John J.
McKinney, Margaret L.
Meadows, Warren D.
Medrano, Beth
Meltz, Harry
Meneely, Scott
Meredith, Ted O.
Milch, Lawrence J.
Miller, Anton Rocky
Miller Walter
Mitchell, J. D.
Mitchell, Jay D.
Moore, Robert
Morison, F. H.
Moseley, Claire M.
Mure, John P.
Murphy, F. H.
Myhrman, Matt

Neal, Troy & Judy
Nelson, Ervin E. Jr.
Nisbet, P. A.
Nobbe, Fred J.
Nolan, Patrick D.
Norton, Jim
Nunham, Ina B.
Nygren, Andrea

Odell, Glenn
Ohmart, Robert
Olsen, John
Osen, Harriet G.
O'Toole, Randal
Overhamm, Dick

Palmer, Charles R.
Palmrose, Ken
Pamperis, John F.
Patten, Duncan T.
Patten, Eva
Perry, James L.

Consultation with Others

Pawlowski, Michael R.
Pax, Leonard
Pearman, Eleanor E.
Pederson, Dean N.
Pederson, Roy R.
Pelech, Walter & Dorothy
Peterson, Ace H.
Phillips, Patti
Phillips, Ronald M.
Phillips, Rose Marie
Pinneo, James E.
Platts, Geoffrey
Plaza, Pauline D.
Polhamus, James A.
Poulson, John
Premeau, Don
Purinton, Donald

Quimby, Bill

Rambo, Curt & Margaret
Ramona, Ron
Randall, Peggy
Randall, Robert G.
Randall, W.A. Jake
Randall, Wendall A.
Ranney, Wayne
Rapaport, Walter
Rasmussen, Barry & Margaret
Reed, Bob R.
Reid, Brian
Richwine, William
Riley, Cynthia
Ring, Ray
Robbins, Gary E.
Rogers, Jefferson Z.
Romeyn, Daryl A.
Rose, Robert O.
Rottas, Ray
Rountree, Carl
Rowden, Alice

Saffert, Arthur W.
Sanders, Jerry
Sauer, Nancy
Saunders, Charles H.
Sawyer, W. Philip
Scheldig, Paul A.
Schemnity, Sandy
Schields, Ivan J.
Schlecht, B. G. & Della
Schlentz, Mary
Schober, Donna J.
Schoenwetter, James
Schoeph, John M.
Schuetz, Bob
Schuster, Nancy L.
Selfert, Gerald W.
Sewell, Debee
Shanks, Bern
Shannon, Elizabeth
Sheppard, Lynn M.
Shields, Jacqueline
Shuyler, Wayne
Simon, Jack H.
Simon, J. & William Bruder
Skaggs, Robert W.
Slater, Peggy
Slentz, John R.
Small, George
Small, Harry E.
Smith, Andres T.
Smith, Dan
Smith, Donald R.
Smith, Phyllis
Smith, Reginald G.
Smith, Rob
Soderquist, Todd
Sowers, Jerry R.
Splendoria, Frank
Spidel, Frances & Denny
Staff, Leonard E.
Stahle, Jaynie
Stair, John
Stickler, Tim D.
Stillions, Sylvia R.
Strausberg, Robin
Strupp, Robert A.
Swanson, John R.
Swick, Susan

Talbott, Harold E.
Taylor, Williard W.
Thompson, Bruce K.
Thompson, H. L.
Thompson, R. L.
Thude, John
Thurman, Leonard E.
Tidwell, James M.
Travis, Betty
Trujillo, Adolph B.
Tucker, Roy

Underhill, A. H.
Upham, Richard

Vaaler, Jim
Vandenhoff, Barbara
Van Gasse, Jerry
Vasquez, Cesareo
Vensel, George

Wainwright, Gordon
Walker, Jesse James Jr.
Walsh, Jeffrey
Weber, Mrs. Arthur H.
Whitney, John A. III
Whitney, Peter J.
Wilkinson, Professor Charles F.
Williams, Gordon & Kathleen
Wilson, F. Van
Wise, David R.
Wister, Leonora
Withrow, Clay
Witzeman, Robert
Woods, June E.
Worden, Marshall A.
Wright, Tom

Consultation with Others

Wolf, David
Wrobley, Ray
Wrona, Nancy C.
Young, Bill
Zache, Robert J.
Zwaneveld, Pete

Glossary

GI

Accessibility - The relative ease or difficulty of getting to or from someplace.

Acre Foot - A water volume measurement equal to the amount of water that would be required to cover one acre to a depth of one foot.

Age Class - Interval of years, commonly 20, into which trees are grouped for management. Example: 1-20 years, 21-40 years.

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 allowable sale quantity."

Alternative - One of several policies, plans, or projects proposed for decision-making.

Amenity - The pleasurable, educational, or aesthetic features of the land or resources.

Analysis Area (AA) - One or more sites combined for the purpose of analysis in formulating alternatives and estimating various impacts and effects.

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 those goods and services.

Animal Unit Month (AUM) - The quantity of forage required by one mature cow (1000 lbs.), or the equivalent, for one month.

Arterial Roads - Primary travel routes that provide service to a large land area and which usually connect with public highways or other Forest Service arterial roads.

Avoidance Area - An area having one or more physical, environmental, institutional, or statutory impediment to corridor designation.

Basal Area (BA) - Measurement of how much of a site is occupied by trees. Basal area is determined by measuring the square feet of the diameter of all trees in an area at breast height (4.5 feet).

Base Sale Schedule - A schedule in which the planned sale and harvest for any future decade is equal to or greater than planned sale and harvest for preceding decade of the planning period. The planned sale and harvest for any decade is not greater than the long-term sustained-yield capacity (this definition expresses the principle of nondeclining flow).

B/C Values - See benefit/cost ratio.

Benchmark (BM) - 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.

Benefit/Cost Ratio - Total discounted benefits of an activity divided by total discounted costs.

Best Management Practices - Practices that can be used to control or prevent water pollution from nonpoint (or dispersed) sources.

Big Game - The larger species of wild animals that are hunted, such as elk, deer, bighorn sheep, and javelina.

Glossary

Biological Potential - Maximum production of a selected organism that can be attained under optimum management.

BLM - Bureau of Land Management.

Board Foot - Measure of an amount of timber equivalent to a piece 12"x12"x1". The boards bought at a lumber store are a little smaller because they have been planed or made smooth.

Cable Logging - A method for transporting logs from stumps to collecting points which utilizes a cable system as the main device for moving them.

Canopy - The more or less continuous cover of branches and foliage formed collectively by the crown of adjacent trees and other woody growth.

Capable Range - Land that produces forage for animal consumption without impairing other forage values; generally considered as land that is not being cultivated.

Capability Area - An area of land delineated for the purpose of estimating responses to various management practices, resource values, output coefficients, and multi-resource or joint production functions. Capability areas may be synonymous with ecological land units, ecosystems, or land resource units. Capability areas are the single geographic delineations used to describe characteristics of land and resources in integrated Forest planning.

Carrying Capacity - The maximum stocking rate possible without inducing damage to vegetation or related resources. Expressed in AUM's. May vary from year to year due to fluctuating forage production.

CEQ - Council on Environmental Quality.

CFR - Code of Federal Regulations.

Chemical Water Quality - Measurements of chemical parameters (alkalinity, dissolved oxygen, dissolved iron, etc.) used to describe the quality of water.

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.

Collector Roads - Roads that serve smaller land areas and are usually connected to Forest arterial roads or public highways. Collector roads collect traffic from local roads and terminal facilities and are operated for constant use.

Commercial Forest Land - See (Forest Land) Capable.

Constrained Maximum Level Alternative - Highest level of particular output that could be produced over time, subject to production of minimum acceptable levels for all other outputs.

Constraint - A quantification of the minimum or maximum amount of an output or cost that could be produced or incurred in a given time period.

Cord (cds) - A unit of gross volume measurement for stacked round or split wood. A standard cord is 4'x4'x 8' or 128 cubic feet. A standard cord may contain 60 to 100 cubic feet of solid wood depending on the size of pieces and and compactness of stack.

Corridor - A linear strip of land identified for the present or future location of transportation or utility rights-of-way within its boundaries.

Cost Coefficients - Values which relate an acre of land to a particular dollar cost in a specific period of time.

Glossary

Critical Habitat - That portion of a wild animal's habitat that is critical for the continued survival of the species.

Culmination of Mean Annual Increment (CMAI) - The age at which the average annual growth is greatest for a stand of trees. Mean annual increment is expressed in cubic feet measure and is based on expected growth according to the management intensities and utilization standards assumed in accordance with 36 CFR 219.16(a)(2)(i) and (ii). Culmination of mean annual increment includes regeneration harvest yields and any additional yields from planned intermediate harvests.

Cultural Resource - Physical remains and conceptual content or context concerning potential knowledge about past human cultural systems of an area, which are useful for making land use planning decisions.

Current - The program level currently in effect.

Cutting Cycle - The planned, recurring period of time between successive cuttings or harvests in a stand of trees.

Data Base - See Resource Data Base.

DBH - Diameter at breast height. Diameter of a tree approximately 4.5 feet above the ground.

DE-FORPLAN - A specific linear programming computer model designed for use in Forest Service planning.

DEIS - Draft Environmental Impact Statement.

Demand Trends - Expected future need or desire for outputs, services, and uses.

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. A departure can be characterized as a temporary increase, usually in the beginning decade(s) of the planning period, over the base sale schedule that would otherwise be established, without impairing future attainment of the Forest's long-term sustained-yield capacity.

Developed Recreation - Recreation that requires facilities that result in concentrated use of an area. Examples are campgrounds and picnic areas. Facilities might include: roads, parking lots, picnic tables, toilets, drinking water, and buildings.

DIB - Diameter inside bark. The measured diameter of a tree excluding the bark.

Dispersed Recreation - In contrast to developed recreation sites, dispersed recreation areas are the lands and waters under Forest Service jurisdiction which are not developed for intensive recreation use. Dispersed areas include general undeveloped areas, roads, trails, and water areas not treated as developed sites.

Diversity - The distribution and abundance of different plant and animal communities and species within the area covered by a land and resource management plan.

Dwarf Mistletoe Rating - Measure of the severity of mistletoe infection in Ponderosa-pine.

Ending Inventory (EI) - Standing timber volume at the end of the planning horizon sufficient to maintain perpetual timber harvest.

Ecosystem - The system formed by the interaction of a group of organisms and their environment.

Glossary

Endangered Species - Any species which is in danger of extinction throughout all or a significant portion of its range.

Environmental Assessment (EA) - An analysis of all actions and their predictable short and long-term environmental effects, which include physical, biological, economic, and social factors and their interactions. Also, a concise public document required by the regulations for implementing the procedural requirements of the National Environmental Policy Act of 1969. (Note:) The Environmental Assessment (EA) replaced the Environmental Assessment Report (EAR).

Environmental Impact Statement (EIS) - The version of 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. A formal document which must follow the requirements of NEPA, the Council on Environmental Quality (CEQ) guidelines, and directives of the agency responsible for the project proposal.

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 Timber Management - The combination of actions that results in the creation of stands in which trees of essentially the same age grow together.

Even-Flow - Continuous supply of products over a given time period.

Floodplain - Land adjacent to a channel which is covered with water when the stream overflows its banks.

Forage - All nonwoody plants (grass, grass-like plants, and forbs) and portions of woody plants (browse) available to domestic livestock and wildlife for food. Only a portion of a plant is available for forage if the plant is to remain healthy.

Forest-wide Management Requirements - A set of statements which define or indicate acceptable norms, specifications, or quality that must be met when accomplishing an activity or practice under a given set of conditions on the Forest.

Forest Land - Land at least 16 percent stocked by forest trees of any size, or formerly having had such tree cover, and not currently developed for nonforest use.

(Forest Land) Not Capable - Forest land not capable of growing industrial crops of wood, at least at the minimum biological growth potential of 20 cubic feet per acre annually as established in the Regional Plan. Forest land not capable is classed as land not suited for timber production.

(Forest Land) Capable - Forest land that is producing or is capable of producing crops of industrial wood and (a) has not been withdrawn by Congress, the Secretary, or the Chief; (b) existing technology and knowledge is available to ensure timber production without irreversible damage to soils, productivity, or watershed conditions, and (c) existing technology and knowledge, as reflected in current research and experience, provides reasonable assurance that adequate restocking can be attained within 5 years after final harvesting.

(Forest Land) Capable But Not Available - Capable forest land which has been legislatively or administatively withdrawn from timber production by the Secretary or Chief of the Forest Service. Capable but not available forest land is classed as not suited for timber production.

Glossary

(Forest Land) Capable-Reserved - Capable forest land which has been legislatively withdrawn or administratively withdrawn from timber production on a permanent basis. Examples are wilderness areas, primitive areas, research natural areas, special interest areas, or similar formal withdrawals approved by the Chief of the Forest Service or higher authority.

(Forest Land) Capable And Available - Capable forest land which has not been legislatively withdrawn or administratively withdrawn from timber production by the Secretary or the Chief of the Forest Service. This classification includes RARE II Further Planning Areas and administrative designation, below the Chief's level, withdrawing land from timber production.

Forest Plan - A process, required by Congress, for assessing economic, social, and environmental impacts, which describes how land and resources will provide for multiple use and sustained yield of goods and services.

FSM - Forest Service Manual.

Fuel Treatment - A re-arrangement or disposal of natural or activity fuels to reduce fire hazard. Fuels are defined as both living and dead vegetative materials consumable by fire.

Full Capacity (FC) - Land which is presently stable. Vegetative ground cover is maintaining soil loss within tolerance levels. These areas are used to determine the estimated grazing capacity.

Full Service Level - Management of developed recreational facilities to provide optimum maintenance.

Grazing Capacity - The maximum number of animals that can graze an area without damage to the vegetation or related resources.

Grazing Permittee - An individual who has been granted a permit to graze livestock for a specific period on a range allotment.

Growing Stock Level (GSL) - The stand density level, usually expressed as number of trees per acre or area per acre in square feet, required to maintain an optimum growth through life of a stand. Trees per acre at 10 inch dbh and above equals the square basal area per acre.

Habitat - The environment of an animal. It can be water for fish and aquatic insects; rocks for bats, and some species of birds; or desert and forested areas for many mammals, birds, and reptiles.

Herbicide - A chemical compound used to kill or control growth of undesirable plant species.

Improvements - Man-made developments such as roads, trails, fences, stock tanks, pipelines, power and telephone lines, survey monuments, and ditches.

Input-Output Analysis (IO) Model - A quantitative study of the interdependence of a group of activities based on relationship between inputs and outputs of the activities. The basic tool of analysis is a square input-output table, interaction model for a given period that shows simultaneously for each activity the value of inputs and outputs, as well as the value of transactions within each activity itself. It has especially been applied to the economy and industries into which the economy can be divided.

Integrated Pest Management - A management strategy for suppression of forest pests which integrates silvicultural, mechanical, biological, and chemical suppression strategies which achieve greater efficiency and safety than the same strategies used alone.

Glossary

Interdisciplinary Team (ID) - A group of individuals with skills from different resources. An ID team is assembled because no single scientific discipline is sufficient to adequately identify and resolve issues and problems. Team member interaction provides necessary insight to all stages of the process.

Interpretive Sites - A developed site at which a broad range of natural or cultural history is interpreted or described for the enjoyment and education of the public.

Issue - A subject or question of widespread public discussion or interest regarding management of National Forest System Lands and identified through public participation.

Landline - Property boundary location of the Tonto National Forest.

Leasable Minerals - Coal, oil, gas, phosphate, sodium, potassium, oil shale, and geothermal steam.

Linear Program Model - Mathematical method used to determine the best use of resources to achieve a desired result when limitations on available resources can be expressed in the form of equations.

Linear Programming - A mathematical technique for determining the effects of alternatives on resource allocation.

Locatable Minerals - Hardrock minerals which are mined and processed for the recovery of metals. May include certain nonmetallic minerals and uncommon varieties of mineral materials such as valuable and distinctive deposits of limestone or silica. May include any solid natural inorganic substance occurring in the crust of the earth, except for common varieties of mineral materials and leasable minerals.

Long-Term - Action governed by the Forest Plan generally taking place over a period longer than 10 years from the present.

Long-Term Sustained Yield Capacity (LTSYC) - The highest uniform wood yield from lands being managed for timber production that may be sustained under a specified intensity of management.

Long Term Sustained Yield Link (LTSYL) - Requirement that the net merchantable timber volume harvested (MCF) in the last period is less than or equal to long run sustained yield.

M - 1,000 units.

MAcFT - One thousand acre feet of water.

Management Area - An area that has common direction throughout that differs from neighboring areas. The entire Forest is divided into management areas. Each is described, and policies and prescriptions relating to their use are listed.

Management Concern - A matter of importance to management of National Forest System Lands, which is identified internally by the agency.

Management Direction - A statement of multiple use and other goals and objectives, management prescriptions, and associated standards and guidelines for governing them.

Management Indicator Species (MIS) - A species whose presence in a certain location or situation at a given population level indicates a particular environmental condition. Their population changes are believed to indicate effects of management activities on a number of other species or water quality.

Glossary

Management Practice - A specific action, measure, or treatment.

Management Prescription - Management practices selected and scheduled for application in a specific area to attain multiple use and other goals and objectives.

Management Team - Decision-making group consisting of the Forest Supervisor, Program Staff Officers, and District Rangers.

Marginal Analysis - A type of analysis in which the only costs and benefits considered are those about which decisions can be made. Fixed benefits and costs are not considered.

Maximum Modification (VQO) - A visual quality objective meaning man's activity may dominate the characteristic landscape but should appear as a natural occurrence when viewed as background.

MBF - One thousand board feet of timber.

MCF - One thousand cubic feet.

Mean Annual Increment - The total increment of merchantable volume growth per acre, up to a given age, divided by that age. Culmination of mean annual increment is the stand age where the mean annual increment of growth is greatest or reaches its highest point.

MIH Codes - Management Information Handbook codes.

Mineral Entry - The right under the Mining Law of 1872 to enter nonwithdrawn public domain land, such as National Forests, and to explore for, extract, and sell certain mineral materials (locatable minerals), protected by the filing of a lode, placer, or mill site claim.

Minimum Level Management - The management strategy that would meet only the basic statutory requirements of administering unavoidable, nondiscretionary land uses, preventing damage to adjoining lands of other ownerships, and protecting the life, health, and safety of incidental users.

MAUM - One thousand animal unit months.

MM - One million units.

MMBF - One million board feet of timber.

MMR - Minimum Management Requirements. The minimum legal management requirements to be met for accomplishing the goals and objectives of the National Forest System [36 CFR 219.17].

Modification (VQO) - A visual quality objective meaning man's activity may dominate the characteristic landscape but must, at the same time, utilize naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed in foreground or middle-ground.

MRVD - Thousand recreation visitor days.

Multiple Use - The management of all various renewable surface resources of 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 land will be used for less than all of the resources; and harmonious and coordinated management of various resources, each with the other, without impairment of productivity of the land, with consideration being given to relative values of the various resources, and not necessarily the combination of uses that will give the greatest dollar return or the greatest unit output.

Glossary

Natural Register of Historic Places - A listing (maintained by the U.S. National Park Service) of areas which have been designated as being of historical significance.

Natural Area - Natural plant communities of interest to the Arizona Parks Board to be protected for demonstration and study purposes in a natural undisturbed setting.

NEPA - National Environmental Policy Act.

Net National Forest Ownership - The acreage of Federal lands which have been designated by Executive order or statute as National Forest, National Grasslands, or Purchase Units.

NFMA - National Forest Management Act.

No Action Alternative - The most likely condition expected to exist in the future if current management direction would continue unchanged.

No Capacity (NC) - These areas are not capable of being grazed by domestic livestock under reasonable management goals. Capacity should not be assigned to these areas.

Non-commercial Forest Land - See (Forest Land) Not Capable.

Non-Consumptive Species - Animal species that are not usually hunted in Arizona.

Non-declining Yield (NDY) - 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.

Non-Forest Land - Land that has never supported forests and lands formerly forested where use for timber utilization is precluded by development for other use. Includes areas used for crops, improved pasture, residential areas, improved roads of any width and adjoining clearings, and powerline clearing of any width. If intermingled in forest areas, unimproved roads and nonforest strips must be more than 120 feet wide, and clearings more than one acre in size to qualify as nonforest land. Nonforest land is classified as land not suited for timber production.

Nongame Wildlife - Species of animals which are not managed as a sport hunting resource.

Non-structural Range Improvement - A modification of existing vegetation to improve the grazing resource. Examples are spraying or plowing sagebrush and seeding to grass.

Objective - A clear and specific statement of planned results to be achieved within a stated time period. Results indicated in the statement of objectives are those which are designed to achieve the desired state of process represented by the goal. An objective is measurable and implies precise time-phased steps to be taken and resources to be used which, together, represent the basis for defining and controlling work to be done.

Obliteration - The returning of land occupied by a road or trail to production.

Occupancy Trespass - The illegal occupation or possession of National Forest land.

Off-Road Vehicles (ORV) - This includes all motorized means of transportation; passenger cars, four-wheel drive vehicles, trail bikes, and snowmobiles that are capable of traveling over land where no road exists.

On Site Soil Loss - Soil loss associated with a specific test site. The movement of soil from the point at which it was formed to another location.

Opportunity Costs - The value of benefits foregone or given up due to the effect of choosing another management alternative that either impacts existing outputs or shifts resources away from other activities so that they are no longer produced and their benefits are lost.

Output Coefficient - Values which relate an acre of land to a particular quantity of output in a specific period of time.

Overstory - Relative to even-aged stands: mature trees which overtop younger trees.

Partial Retention (VQO) - A visual quality objective which in general means man's activities may be evident but must remain subordinate to the characteristic landscape.

Patented Mining Claim - A claim made by a qualified person for possession of locatable minerals on public land (e.g., National Forests). A properly recorded claim entitles the claimant to reasonable access to the claim and exclusive right to extract and sell valuable minerals from the claim. Unpatented mining claims may be occupied and used solely for mining and related activity.

Perennial Stream - Streams that flow throughout the year and from source to mouth.

Persons At One Time (PAOT) - A recreation capacity measurement term indicating the number of people that can comfortably occupy or use a facility or area at one time.

Planning Criteria - Criteria prepared to guide the planning process and management direction.

Planning Period - The 50-year time frame (1980-2030) for which goods, services, and effects are projected in the development of the Forest Plan.

Pole Timber - As used in timber survey, a size class definition, trees 5.0 to 8.9 inches at DBH. As used in logging operations, trees from which pole products are produced, such as telephone poles, pilings, etc.

Potential Capacity PC) - Land where current soil loss (CSL) exceeds tolerance soil loss (TSL) because it does not have sufficient vegetative ground cover to protect the soil. This land has the potential to recover. There will usually be some use by livestock since these areas are not normally fenced. Portions of these areas may be part of the grazing capacity but usually have lower allowable use factors.

Precommercial Thinning - An operation to remove excess trees in young stands to maintain a specified stocking level. The stocking level is commonly expressed as basal area per acre for trees over 5 inches in diameter or as a number of stems per acre for smaller trees. Thinning also provides a means for controlling species composition and stand quality through selection of trees that are to remain in the stand.

Prescribed Fire - Fire burning under conditions specified in an approved Plan to dispose of fuels, control unwanted vegetation, stimulate growth of desired vegetation, change successional stages, etc., to meet range, wildlife, recreation, wilderness, watershed, or timber management objectives.

Prescription - See Management Prescription.

Present Net Value (PNV) - Discounted benefits less discounted costs associated with providing all outputs to which monetary values can be assigned.

Glossary

PVB - Present value benefits. Cumulative discounted benefits at a 4 percent interest rate.

PVC - Present value costs. Cumulative discounted costs at a 4 percent interest rate.

Preservation (VQO) - A visual quality objective that provides for ecological change only.

Primitive ROS Class - A classification of the recreation opportunity spectrum characterized by an essentially unmodified environment, where trails may be present but structures are rare, and where probability of isolation from the sights and sounds of man is extremely high.

Range Allotment - An area designated for the use of a prescribed number of cattle or sheep, or by common use by both under one plan of management.

Reclamation - Returning disturbed lands to a form and productivity that will be ecologically balanced and in conformity with a predetermined land-management Plan.

Record of Decision - Documentation of what the decision was, the date, and a statement of reasons for the decision.

Recreation Capacity - The number of people that can enjoy a recreation opportunity at any one time without substantially diminishing the quality of the experience sought after.

Recreation Opportunity Spectrum (ROS) - A land classification system which categorizes National Forest land into six classes, each class being defined by its setting and by the probable recreation experiences and activities it affords. The six classes in the spectrum are: Primitive, semi-primitive non-motorized, semi-primitive motorized, roaded natural, rural, and urban.

Recreation Residence Site - House or cabin permitted on National Forest land for recreational use of the owner, but not as a primary residence.

Recreation Visitor Day (RVD) - Recreational use of National Forest land which aggregates 12 hours. It may consist of one person for 12 hours, two people for six hours, or any combination that totals 12 hours.

Reduced Service Level - Management of developed recreation facilities below optimum maintenance standards.

Reforestation - Natural or artificial restocking of an area with forest trees.

Reforestation Backlog - Areas that need to have trees re-established. Reforestation can be done by planting, seeding, or preparing the site for natural regeneration.

Regeneration - (1) The actual seedlings and saplings existing in a stand; (2) the act of establishing young trees naturally or artificially.

Regeneration Cut - Removal of trees with the intention of establishing a new crop of seedlings.

Removal Cut - See shelterwood cut.

Research Natural Area - Natural plant communities that have not been modified by man, and are protected and studied to learn more about the ecosystem.

Resource Data Base - Information about resources stored in a computerized system.

Rest-Rotation - A grazing system in which the pastures being rotated receive non-use for a period of plant recovery.

Retention (VQO) - A visual quality objective which, in general, means man's activities are not evident to the casual forest visitor.

Revegetation - Re-establishment and development of a plant cover. Revegetation may take place naturally through the reproductive processes of existing flora or artificially through direct action of man.

Riparian - Land areas which are directly influenced by water. Usually have visible vegetative or physical characteristics showing this water influence. Streamsides, lake borders, or marshes are typical riparian areas.

Roads, Arterial and Collector - Arterial and collector roads are the highest standard roads in the Forest Development System. These roads provide efficient, improved access to large land areas and generally connect to or are extensions of the public road system.

Roads, Local - Local roads are usually one-lane roads constructed to serve a dominant use or resource. Local roads do not access large land areas, as they are more site specific than arterial and collector roads.

Roads, Temporary - Temporary roads are low-level roads constructed for a single purpose and short-term use. Once use of the road has been completed, it is obliterated, and the land it occupied is returned to production.

Road Density - Measure of the degree to which the length of road miles occupies a given land area, e.g., one mi/sq. mi. is one mile of road within a given square mile.

Roaded Natural ROS Class - A classification of the Recreation Opportunity Spectrum that characterizes a predominately natural environment with evidence of moderate permanent alternate resources and resource utilization. Evidence of 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.

Rocky Mountain Yield (RMYLD) - Acronym for Rocky Mountain Yield, a computer program used to simulate timber growth based on site index, basal area, species, mortality, mistletoe and silvicultural objectives.

Rotation - The planned number of years between the start of a crop of trees and final harvest. Rotation age will vary according to geographic location, tree species, and management objectives.

Roundwood - Trees that are used without being milled (fence posts, telephone poles, pulpwood, etc.).

RPA - Forest and Rangeland Renewable Resource Planning Act of 1974.

Rural ROS Class - A classification of Recreation Opportunity Spectrum that characterizes an area in which the sights and sounds of man are prevalent and the landscape has been considerably altered by the works of man.

Salvage - Dead or dying trees which occur in excess of those needed for wildlife, aesthetics, or other purposes. These trees are harvested for products.

Sapling - As used in timber survey, a size class definition; trees 1.0 to 4.9 inches at DBH.

Sawtimber - As used in timber survey, a size class definition; trees larger than 9 inches at DBH.

Glossary

Sediment - Solid material, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water, gravity, or ice and has come to rest on the earth surface either above or below sea level.

Sediment Yield - Amount of soil washed into a water course.

Seed Cut - See Shelterwood Cut.

Seedling - As used in timber survey, a size class definition; trees less than one inch at DBH.

Semi-Primitive Motorized ROS Class - A classification of Recreation Opportunity Spectrum characterized by moderately dominant alterations by man, with strong evidence of primitive roads and/or trails.

Semi-Primitive Non-motorized ROS Class - A classification of the Recreation Opportunity Spectrum characterized by few and/or subtle modifications by man, and with a high probability of isolation from the sights and sounds of man.

Sensitivity Level - As used in Visual Quality Management, a particular degree or measure of viewer interest in scenic qualities of the landscape.

Shelterwood Cut - An even-age regeneration system where mature trees are removed in two or more cuts. (1) The preparatory cut removes a portion of the mature trees and is intended to make the remaining trees more wind firm; preparatory cuts may be omitted where windfall is not a major concern. (2) The seed cut removes additional trees with the intent of allowing additional sunlight to reach the forest floor. The new trees become established following the seed cut. (3) The removal cut removes the last of the mature trees.

Silviculture - A combination of actions whereby forests are tended, harvested, and replaced.

Site Index - A numerical evaluation of the quality of land for plant productivity especially used in Forest land, where it is determined by the rate of growth in height on one or more of the tree species. A particular measure of site class, based on the height of the dominant trees in a stand at an arbitrarily chosen age.

Slash - Debris left after logging, pruning, thinning, or brush cutting, and large accumulation of debris after wind or fire. Includes logs, branches, bark, and stumps.

Snag - A standing dead tree, used by many birds for nesting, roosting, perching, courting, and/or foraging for food. Many mammals also use snags for denning and foraging for food.

"Snag" Policy - See Wildlife Tree Policy.

Softwood - A conventional term for both timber and trees belonging to the botanical group, Gymnospermae.

Soil Loss - The estimated quantity of soil moved by sheet and rill erosion. The Universal Soil Loss Equation is used to predict soil loss. Soil loss rarely equals sediment yield to a water course.

Strata Analysis Level and Timing (SALT) - Computer program for scheduling timber harvest on commercial forest lands.

Structural Range Improvement - Any type of range improvement that is man-made (fences, corrals, etc.).

Glossary

Succession - An orderly process of biotic community development that involves changes in species, structure, and community processes with time; it is reasonably directional and, therefore, predictable.

Suitable Range - Range accessible to livestock or wildlife, and which can be grazed on a sustained yield basis without damage to other resources.

Suitable Timber Lands - Forest lands to be managed for timber production.

Sustained Yield - The achievement and maintenance in perpetuity of a high-level annual or regular periodic output of various renewable resources of the National Forest without impairment of the productivity of the land.

Thinning - Cutting made in an immature crop or stand, primarily to accelerate the diameter increment (annual growth) of the residual trees, but also by suitable selection, to improve the average form of the trees that remain.

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.

Tiering - Incorporating information contained in an EIS (Environmental Impact Statement), such as the Forest Plan EIS, by reference in subsequent environmental documents.

Timber Stand Improvement (TSI) - Usually related to activities conducted in young stands of timber to improve growth rate and form of the remaining trees, e.g., thinning, pruning, fertilization, and control of undesirable vegetation.

Travelway - 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.

Unconstrained Maximum - Level of management defined as the highest possible level of a given output along with the costs associated with achieving it.

Uneven-Aged Timber Management - The combination of actions that result in the creation of forests in which trees of several or many ages grow together; achieved through selection harvest.

Universal Soil Loss Equation (USLE) - An equation used to express the methodology used in estimating the sheet and rill erosion of a specific soil relative to its characteristics. Factors involved are: soil erodibility, percent canopy cover, percent total ground cover, canopy height, slope length and percent grade, slope shape, surfce cover type, and rainfall. The result of this data is expressed in tabular form through the use of a computer program.

Unpatented Mining Claim - A mining claim to which the Federal Government has granted the claimant all surface and some or all mineral rights. Patented mining claims are private land and may be sold or used for other than mining activity, such as residential or recreational use.

Urban ROS Class - A classification of Recreation Opportunity Spectrum in which the natural setting is dominated by man-made structures and the sights and sounds of man predominate.

Utility Corridor - A tract of land of varying width forming a passageway through which various commodities such as oil, gas, and electricity are transported.

Variety Class - A particular level of diversity of landscape character.

Glossary

Vegetative Manipulation - The change of one vegetation type to another. Manipulation can be done by a tractor, chemicals, or fire. Usually vegetation manipulation is done to increase forage for livestock and can be a beneficial tool for wildlife.

Vertical Diversity - Diversity in an area that results from the complexity of the above ground structure of the vegetation; the more tiers of vegetation or more diverse the species make-up, or both, the higher the degree of vertical diversity.

Visitor Information Services (VIS) - A service provided to the public by National Forests in which the public is supplied with information regarding opportunities or activities on National Forest land; usually but not restricted to recreational opportunities.

Visual Management Program - Also referred to as "Landscape Management," "Visual Resource Management," or "Visual Management"; the art and science of planning and administering the use of Forest lands in such ways that visual effects maintain or upgrade man's psychological welfare. The planning and design of visual aspects of multiple-use land management.

Visual Quality Objective VQO - A desired level of excellence based on physical and sociological characteristics of an area. Refers to degree of acceptable alteration of the characteristic landscape. The five levels are Preservation, Retention, Partial Retention, Modification, and Maximum Modification.

Water - Streams, sloughs, estuaries, and canals 120 feet or more in width; and lakes, reservoirs, and ponds more than one acre in area.

Water Rights - A right to the use of water, such as for irrigation, wildlife, etc.

Water Yield - Total net amount of water produced on the Forest including streamflow and groundwater recharge.

Watershed - Entire area that contributes water to a drainage or stream.

Watershed Condition - A measure of the ability of a watershed to provide a sustained and orderly flow of water while maintaining soil productivity.

Wetlands - Areas with shallow standing water or seasonal to year-long saturated soils (Includes bogs, marshes, and wet meadows).

Wilderness - The National Wilderness Preservation Act of 1964 defines a wilderness as an area of undeveloped public land designated by Congress that has the following characteristics: (1) Affected primarily by forces of nature, where man is a visitor who does not remain. Wilderness may contain ecological, geological, or other features of scientific, educational, scenic, or historical value. (2) Possesses outstanding opportunities for solitude or a primitive and unconfined type of recreation. (3) An area large enough so that continued use will not change its unspoiled natural condition.

Wildlife Habitat - Sum total of environmental conditions of a specific place occupied by a wildlife species or a population of such species.

Wildlife Structure - A site specific improvement of wildlife or fish habitat, e.g., spring development or dugout to provide water, brushpile for cover, nest-box for birds, or rock and log placement in a stream for fish cover and pool creation.

Wildlife Tree Policy - A policy that encourages the preservation of snags for wildlife use; optimum numbers are 20-30 snags per 10 acres.

Glossary

Withdrawal - Withholding an area of Federal land from settlement, sale, location, or entry, under some or all of the general land laws, for the purpose of limiting activities under those laws in order to maintain other public values in the area or reserving the area for a particular public purpose or program.

Appendices

Appendix

A Public Involvement

B Description of Analysis Process

C Threatened and Endangered Species

D Management Indicator Species

E Timber Analysis

F Environmental Consequences of the Central Arizona Project

Appendix

A

INTRODUCTION

Forest plans developed from the land and resource management planning process determine how the lands within the National Forest System will be managed. The public was encouraged to participate throughout the process to help Forest Service managers formulate land management decisions that accurately represent local and national needs.

The purpose of public involvement is to broaden the information base upon which land and resource management decisions are made; to insure that the Forest Service understands the needs, concerns, and values of the public; to inform the public of Forest Service land and resource planning activities; and to provide the public with an understanding of Forest Service programs and proposed actions. Public involvement activities are structured to comply with the requirements of the National Forest System Land and Resource Management Planning regulations [36 CFR, Part 219] and Council on Environmental Quality Regulations for implementation of the National Environmental Policy Act [40 CFR, Parts 1500-1508].

TONTO NATIONAL FOREST PUBLIC INVOLVEMENT PLAN

Overview

Since six of the seven Arizona National Forests began the Land Management Planning process at the same time, a coordinated public involvement effort was made to insure a consistent approach, and to avoid duplication of effort on the part of the Forest Service and other entities participating in the planning process. The coordinated effort is reflected in the Tonto National Forest Public Involvement Plan.

The initial Tonto National Forest Public Involvement Plan covered the period July 23, 1980 through July 1983. This included: (1) the opportunity for public comment to be incorporated in preparation of the Environmental Impact Statement and Forest Plan, (2) public review and comment on the statement and plan, (3) incorporation of public comment and re-issuance of the Environmental Impact Statement and Forest Plan.

A draft Tonto National Forest Environmental Impact Statement and Forest Plan were published for public review on January 18, 1983. However, in October 1982 the Ninth Circuit Court of Appeals, a Federal Court in California whose jurisdiction extends over Arizona, made a major decision affecting Forest Plans in Arizona. The Ninth Circuit Court upheld a lower court decision ruling against the Federal Government in the State of California v. Block lawsuit dealing with the adequacy of the Roadless Area Review and Evaluation (Rare II) EIS. In their October 1982 ruling, the Court confirmed the District Court ruling that found the major deficiences of the EIS were: Failure to adequately address site-specific impacts, lack of an adequate range of alternatives, and failure to provide sufficient opportunities for public comment.

During the late spring of 1983, the Secretary of Agriculture directed the Forest Service to re-evaluate all roadless areas for their wilderness potential, and to incorporate the analysis and recommendations in the land management planning process. All of the Arizona Forests coordinated a public involvement effort to involve those persons, agencies and organizations who were interested in the roadless area re-evaluation.

Following are synopses of the public involvement plans developed specifically for the land management planning effort.

Appendix

Public Involvement
7/23/80 - 7/83

Prior to initiating formal public involvement a statewide mailing list was developed by mailing interest response cards to all entities known to have an interest in the management of Arizona National Forests. The statewide mailing list was initially constructed by combining the existing mailing lists of all six National Forests in Arizona and hand-culling the duplicates. The Tonto added the names and addresses of people whose names appeared in files, special use permittees, bidders, etc. In addition, 32,000 response interest cards were mailed to 1979 Christmas Tree permit applicants. Approximately 10 percent responded and were added to the mailing list.

The statewide and individual Forest mailing lists have been updated on a continuing basis as other individuals and organizations have become involved through notification efforts (TV, Radio, Newspapers, Public Meetings, Federal Register).

Public involvement was done on six levels. These were: (1) Scoping of State, and Federal Agencies, (2) scoping of statewide user and interest groups, (3) statewide general public meetings, (4) local Forest and Ranger District public meetings, (5) internal employee involvement, and (6) coordination with local government entities and Indian tribes. Items one, two and three were conducted on a statewide basis in concert with the Kaibab, Coconino, Apache-Sitgreaves, and Prescott National Forests. The latter three items involved the Tonto National Forest in concert with adjoining National Forests.

News media releases and notification of those on mailing lists preceded all formal public participation activities. Notification included dates, locations, and purposes of various meetings. Following is a listing of the formal statewide activities, and activities which dealt primarily with the Tonto National Forest.

October, 1980

Public notification through news media and personal letters (statewide).

October, 1980

Letters mailed to 38 Federal and State agencies and to 30 statewide user groups and organizations announcing the 10/23/80 scoping sessions.

October, 1980

Briefing for Governor and staff.

October-November, 1980

Scoping meetings with Indian tribes (statewide) Tonto National Forest contacts included Fort McDowell, San Carlos, and Salt River Pima.

October-November, 1980

Briefing for County Boards of Supervisors (statewide).

October 23, 1980

Two statewide issue scoping sessions were held in Phoenix, Arizona.

Eleven (11) persons, representing 8 State agencies, attended the session held for State, Federal and local agencies. Each agency stated they would submit written comments.

Seven (7) persons, representing six organizations, attended the session held for statewide user groups and organizations.

The Congressional delegation was consulted and briefed.

October-November, 1980

Twenty-two thousand response booklets were distributed to individuals and organizations statewide to: (1) Give an overview of Land and Resource Management Planning; (2) explain why the Forest Service was involved in Land and Resource Management Planning; (3) explain what the Forest Service needed from the public. The booklet was sectioned by Forests, including general descriptions of each Forest, and response pages categorized by resource elements. Each National Forest resource element response page included a brief description of how that element related to that particular Forest. The text was written in general style; factual statements were made to stimulate opinions and response, rather than direct it. Self-addressed return envelopes were included.

November, 1980

Statewide issue scoping meetings for the public were held as follows:

In November, 1980, 26 public meetings were held across Arizona. This included 5 statewide meetings and 21 local meetings on various Arizona National Forests.

Date	Location	No. Attendees	No. Organizations
November 6, 1980	Flagstaff	55	12
November 12, 1980	Tucson	34	7
November 13, 1980	Phoenix	66	12
November 15, 1980	Tempe	50	9
November 20, 1980	Phoenix	116	24

Local meetings to obtain public input specifically for the Tonto National Forest were held as follows:

Date	Location
November 5, 1980	Payson
November 6, 1980	Globe
November 18, 1980	Young
November 19, 1980	Tonto Basin

A total of approximately 160 persons attended the four meetings.

In addition, involvement workshops for Tonto National Forest employees were conducted between October 27, 1980 and November 19, 1980.

April, 1981

Feedback to participants in the planning process-results of statewide and local meetings and responses to booklets.

August, 1981

Feedback to participants in the planning process-approved issues, concerns, and opportunities.

May, 1982

The Analysis of the Management Situation (AMS) and an AMS Executive Summary was prepared. Both documents were reviewed by District Rangers and Supervisor's Office staff specialists in a meeting with the ID Team. It was then reviewed with other Forest employees and adopted as a working document for field personnel and incorporated into the Draft Environmental Impact Statement and Draft Forest Plan.

Appendix

January, 1983

Initial mail distribution January 18, 1983 of the Tonto National Forest Land Management Plan and Environmental Impact Statement included 400 EIS/Forest Plan packets, and 1,550 summaries of the EIS/Forest Plan. In addition, 350/Forest Plan and summaries were distributed during the 90 day comment period following publication of the EIS/Forest Plan.

February-March, 1983

Local meetings to answer questions relating to the Tonto National Forest Land Management Plan and Environmental Impact Statement, were held as follows:

Date	Location
February 15, 1983	Mesa
February 16, 1983	Phoenix
Febraury 17, 1983	Phoenix
March 1, 1983	Young
March 2, 1983	Payson
March 9, 1983	Punkin Center
March 10, 1983	Globe
March 14, 1983	Cave Creek

A total of approximately 270 people attended the eight meetings.

Tonto National Forest employee meetings were held between January 11, 1983 and January 21, 1983.

Public Involvement Roadless Area Re-Evaluation

July, 1983

Public notification of roadless area re-evaluation through news media and personal letters (statewide).

August, 1983

During August, 1983, 30 public meetings were held across Arizona. This included 2 statewide meetings and 28 local meetings on various Arizona National Forests.

Statewide meetings for the public were held as follows:

Date	Location
August 3, 1983	Tucson
August 4, 1983	Phoenix

A total of 130 people attended the two statewide meetings.

Local meetings to obtain public input specifically for the Tonto National Forest were held as follows:

Date	Location
August 10, 1983	Payson
August 11, 1983	Globe
August 16, 1983	Cave Creek
August 18, 1983	Mesa
August 24, 1983	Pleasant Valley
August 25, 1983	Tonto Basin

A total of 80 people attended these six meetings.

By the conclusion of the public comment period on September 30, 1983, 102 letters had been received relative to the roadless area re-evaluation.

Public Involvement 1/15/85 - 4/30/85

Initial mail distribution January 15, 1985 of the Tonto National Forest Land Management Plan and Environmental Impact Statement included 511 EIS/Forest Plan packets, and 1,694 summaries of the EIS/Forest Plan. In addition, 93 Forest Plan packets were distributed during the 90 day comment period following distribution of the Plan.

Although scheduled public meetings were not held during the 90 day review period, Forest personnel met upon request with individuals, agencies, and interest groups to answer questions regarding the draft Statement and Plan.

ISSUES, CONCERNS, and OPPORTUNITY IDENTIFICATION PROCESS

Summary

Issue-concern identification was developed in two phases: (1) Preliminary issue identification; (2) supplementary-issue identification through direct involvement of the public.

Preliminary issues and concerns were identified by the ID and Management Teams of the Tonto National Forest, and other State and Federal agencies. These issues were derived from:

1. Past public involvement activities over the past two years,
2. Existing plans (both Forest Service and other agencies),
3. National Forest Management Act (NFMA) regulations,
4. Political activity related to the Forest in recent past,
5. Letters and inquiries from the public during the recent past,
6. Appeals concerning Forest Service actions during the recent past, and
7. National and Regional issues and concerns.

Thirty-eight problem statements were developed as a result of the preliminary analysis.

Phase II involving the public was carried out during October, November, and December, 1980. This phase generated twenty thousand comments. As mentioned earlier in this report, these comments were the result of 5 statewide public meetings, 21 local public meetings (statewide), 2 statewide scoping sessions for other agencies and organized user grooups, and distribution of 22,000 response booklets.

Issue, Concern and Opportunity Development

After public comments were received, they underwent content analysis to determine the nature of public response. Comments were categorized and entered into a computer data base by resource element and geographic area of concern.

Using the content analysis data base, the Tonto National Forest Inter-disciplinary Team screened responses applicable to the Tonto National Forest to be considered for inclusion in the final public issues and opportunities.

Appendix

The following criteria were used:

1. Was comment Forest-wide in scope? (Generally pertaining to two or more Ranger Districts).

2. Was comment within the Forest Supervisor's legal or delegated authority to resolve?

3 Was comment within the land's physical and biological capabilities?

4. Could comment be resolved through plan implementation, rather than before implementation?

After the ID Team screened the public comments, issue statements were written by resource element (which included applicable statements from the preliminary issues). The Forest Management Team reviewed these statements and the public comments and provided some additional public issue statements and management concerns.

As the final step in the process, the issue and concern statements were categorized by the seventeen management concerns listed in the Planning Regulations [CFR 219.10], and refined further into thirteen issue and six opportunity statements to be addressed in the Environmental Impact Statement.

The issues, concerns, and opportunities to be addressed in the planning process were approved by the Regional Forester on June 23, 1981. They establish the scope of the EIS [40 CFR 1501.7 and 1508.25].

Following publication of the Environmental Impact Statement and Forest Plan in January of 1983, various resource managers including the Forest Supervisor, Deputy, various staff officers, and members of the ID and Core Teams, spoke to groups, organizations, etc., upon request to explain the Environmental Impact Statement (EIS) and Forest Plan and to answer questions. Requests included meetings with various members of the Sierra Club, Salt River Project personnel, Cattlemen's Association, Wildlife Federation, Gila County Board of Supervisors, Gila County Planning and Zoning Commission personnel, and the Tonto Recreation Concessionaires. The 90-day comment period ended April 22, 1983; 899 responses were received representing approximately 1,380 comments. Comments were analyzed and summarized by the Core and ID Teams, at which time a new issue, mining, was brought out and added to the original identified issues. Results of the comment analysis were studied and, if viable, incorporated in this EIS.

Following the February 1, 1983 announcement by Secretary Crowell that each National Forest would incorporate into their Forest Plan a re-analysis of the Roadless Areas identified in the RARE II study, the Tonto National Forest issued a letter to that effect to all recipients of the Executive Summary, Environmental Impact Statement or Proposed Forest Plan. A News Release was also issued announcing the initiation of the re-evaluation of roadless areas.

The Forest then proceeded to gather any new information available regarding the wilderness quality and unique attributes of each RARE II area, including an analysis of all rare and endangered species of flora or fauna found in each area. A study was also undertaken to define the locatable and manageable boundaries of each area, in recognition of some changes that had occurred in the use of certain areas during the intervening years since the RARE II study was concluded.

Two statewide meetings were held August 3 and 4 where maps were displayed of the re-defined manageable and locatable boundaries, as compared with previously disclosed boundaries under the RARE II study. Public comment was solicited on all the areas within the National Forests in Arizona at these meetings. From August 10-25, six local meetings were held in each of the Forest's six Ranger Districts to discuss the roadless areas within the Tonto National Forest.

Appendix

Information about each original RARE II boundary area, each roadless area with re-defined manageable and locatable boundaries and variances of the identified roadless area boundaries submitted by the Arizona Wilderness Coalition was subjected to computer analysis for a range of wilderness alternatives identified in the Environmental Impact Statement.

The public comment period ended on September 30, 1983, after which the 102 letters or statements which had been received were reviewed and a content analysis performed. Other than the proposed boundary adjustments submitted by the Arizona Wilderness Coalition, no other new issues surfaced.

Subsequent to public involvement and agency recommendations, the Arizona Wilderness Act was passed on August 28, 1984. This Act added an additional 224,340 acres to the 361,650 acres of wilderness on the Tonto National Forest. The passage of this Bill has enabled the Forest to proceed with analysis and not consider alternatives of wilderness or nonwilderness for fifteen identified roadless areas.

CONSULTATION WITH OTHERS

Other Agencies and Indian Tribes

During the initial phase of public involvement (issue development) the following agencies were contacted by mail:

Federal

Army Corp of Engineers
Bureau of Indian Affairs
Bureau of Land Management
Council on Environmental Quality
Department of Housing and Urban Development
Environmental Protection Agency
Federal Highway Administration
Fish and Wildlife Service
National Park Service
Soil Conservation Service
Tonto National Monument
U. S. Geological Survey

State

Arizona Attorney General
Arizona Commission of Agriculture and Horticulture
Arizona Department of Transportation
Arizona Game & Fish Department
Arizona Historical Preservation Officer
Arizona Office of Tourism
Arizona Outdoor Recreation Coordinating Commission
Arizona Resources Information System
Arizona Secretary of State
Arizona State Clearing House
Arizona State Department of Health Services
Arizona State Department of Mineral Resources
Arizona State Land Department
Arizona State Parks Board
Arizona State Treasurer
Arizona Water Commission
Governor Bruce Babbitt
Governor's Commission on Arizona Environment
Office of Economic Planning & Development

Appendix

Local

Central Arizona Association of Governments
City of Apache Junction Manager
City of Globe Manager
City of Mesa Manager
City of Miami Manager
City of Payson Manager
City of Scottsdale Manager
City of Superior Manager
Gila County Board of Supervisors
Gila County Planning & Zoning Commission
Gila County Sheriff's Department
Maricopa County Association of Governments
Maricopa County Board of Supervisors
Maricopa County Cooperative Extension Service
Maricopa County Parks & Recreation Department
Maricopa County Sheriff's Department
Navajo County Board of Supervisors
Payson Unified School District #10
Pinal County Board of Supervisors
Pinal County Sheriff's Department
Yavapai County Board of Supervisors
Yavapai County Sheriff's Department

The purpose of these contacts was to explain the planning process and obtain input for development of issues.

As the planning process progressed, formal and informal consultation was done by Forest personnel to discuss problems, answer questions and review other agency planning documents. Contacts were made with:

U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service was involved with the selection of management indicator species and descriptions of future conditions, and especially involved in Section 7 of the Endangered Species Act consultation relative to effects of the proposed action on Threatened and Endangered Species.

Bureau of Land Management

There are 20 miles of common adjacent boundary with the Bureau of Land Management (BLM), all of which is managed by the BLM Phoenix District Office. Coordination with the BLM is primarily in regard to fire and recreation management.

Primary consultation has been through review of the Environmental Impact Statement and Forest Plan.

Bureau of Reclamation and Salt River Project

Six reservoirs on the Salt and Verde Rivers are managed by the Salt River Project (SRP) for the benefit of downstream water users. These dams and reservoirs are located on National Forest System lands withdrawn for reclamation purposes and operated under authority granted by the Bureau of Reclamation. National Forest resource management and development activities within the reclamation withdrawals are planned and coordinated with the Bureau of Reclamation and SRP to assure compliance and coordination with these agencies. Consultation has taken place through the scoping phase and with review of the Environmental Impact Statement and Forest Plan.

National Park Service

The Tonto National Monument is located on 1,120 acres of National Park Service land within the Forest. There are six miles of common boundary with the Monument. Coordination affects recreation, range, and fire management. Primary consultation has taken place through review of the Environmental Impact Statement and Forest Plan.

Central Arizona Water Control Study

Representatives of the Tonto National Forest have participated in various planning phases of the Central Arizona Water Control Study (CAWCS). CAWCS was used as the basis for recreation site development proposals on Roosevelt Lake. Decisions on site development and operation and maintenance for Roosevelt Lake have been incorporated into the Forest Plan in accordance with the Bureau of Reclamation Environmental Impact Statement filed on February 10, 1984, for the Central Arizona Project.

State Lands

Seventy-two miles of common boundary are shared with the State of Arizona. All adjacent State lands are managed by the State of Arizona Land Department except Lost Dutchman Park which is administered by the Arizona Parks Board. Coordination affects recreation, fire, range, and wildlife management.

Primary consultation has taken place through review of the Environmental Impact Statement and Forest Plan.

Arizona Game and Fish Department

The State agency most affected by planning and management activities on the Forest is the Arizona Game and Fish Department. Throughout the planning process, close contact and coordination has been maintained with this agency to assure incorporation of State of Arizona Comprehensive Wildlife Plan objectives. Approximately 30 meetings and workshops were held with the Arizona Game and Fish Department to produce several studies such as the Fisheries Inventory, Fishing Effort and Harvest by Arizona's Licensed Resident Anglers, 1981 Angler Preference Survey, and Cold and Warm Water Plans. These studies were, in turn, used as source documents. The Arizona Game and Fish Department also helped with the selection of management indicator species, descriptions of desired future conditions, outputs, and species density information, and water inventories.

Arizona Rangeland Advisory Council

Two meetings were held to discuss issues and concerns, development of alternatives, and proposed plan.

State Natural Areas Advisory Board

The Tonto National Forest facilitated a field trip to all proposed research natural areas.

Arizona Outdoor Recreation Coordinating Committee

Three meetings were held to discuss the land management planning progress.

Governor's Council on Arizona Environment

Several meetings were held to discuss the land management planning progress.

Appendix

County Governments

Coordination with Gila, Maricopa, Pinal, and Yavapai counties primarily includes recreation management, law enforcement, solid waste and sewage disposal, land adjustment, and road system management. Since nearly 56 percent of the land area of Gila County is National Forest, coordination with that County has been particularly active. This includes continuous consultation with the County Board of Supervisors throughout the planning process and status reports at Board Meetings. The purpose of these contacts was to obtain their evaluation of effects of alternative on County programs and budgets.

Phoenix Area Recreation Planners

Informal meetings to discuss the land management planning progress.

Maricopa County Parks and Recreation

One meeting to discuss land management planning progress.

Indian Lands

Indian tribes located adjacent to and within the Tonto National Forest were contacted during the initial scoping phase and were sent follow-up letters asking for information about uses and religious or symbolic significance of lands within the Forest [36 CFR 219.8 and PL 95-341, American Indian Religious Freedom Act]. These included the Fort Apache, San Carlos, Fort McDowell, Salt River, and Tonto-Yavapai Apache Indian Tribes. Specific follow-up supplemental letters were also sent to the tribes to invite participation and response. One response was received, following the initial EIS, from the White Mountain Apache Tribe.

Representatives from the Tonto, and Apache-Sitgreaves National Forests, met with San Carlos tribal officials to discuss effects of the roadless area re-evaluation on tribal lands. Primary concern centered around Class I air pollution standards.

Other coordination between Indian tribes and the Tonto National Forest vary by reservation. These include:

Reservation	Primary Coordination
Fort Apache	Fire management, rafting on the Salt River
San Carlos	Fire management, fire crews
Fort McDowell	Recreation management, range management
Salt River	Recreation management
Tonto - Yavapai Apache	Fire management, utility and road corridors

References - Other Agency Plans Consulted

The following documents were reviewed to insure the objectives of other Federal, State and local governments and Indian tribes were considered; and, that where conflicts with Forest Service planning exist, alternatives for resolution are considered in the planning process.

Arizona Game and Fish Department, 1981. Comprehensive Plan.

The Arizona Wildlife and Fisheries Comprehensive Plan agreed to between the Arizona Game and Fish Department and Forest Service Region 3, establishes goals and objectives for selected game species and their habitats on the Tonto National Forest. Those goals and objectives were integrated into the data base standards and guidelines and analysis of alternatives to the proposed action in the Tonto planning process. Where possible, the proposed action optimized the fisheries and wildlife resource outputs to meet those goals and objectives.

Appendix

Arizona Department of Transportation, 1980. Traffic on the Arizona State Highway System.

Maricopa County Highway Department, 1980. Maricopa County 1980 Road Map and Traffic Volume Statistics.

The above traffic records were used in preparing the facilities section (Pages 7 and 8) of the Analysis of the Management Situation.

Arizona Office of Economic Planning and Development, 1976. Proposed Natural Areas in Arizona - a summary.

This report referenced areas within the National Forests of Arizona, which in the judgement of the State of Arizona, could make a contribution to the State of Arizona "Natural Areas" system. Two areas on the Tonto National Forest were identified; Blue Point Cottonwoods and Sycamore Creek. The Environmental Impact Statement and Tonto Forest Plan recommend Botanical Area designation for Blue Point Cottonwoods and Natural Area designation (under State criteria) for Sycamore Creek.

Arizona Outdoor Recreation Coordinating Commission, 1978. Arizona Statewide Comprehensive Outdoor Recreation Plan.

This recreation plan is developed by the State of Arizona to assure the enhancement, protection and enjoyment of the natural environmental in Arizona. It serves as an umbrella mechanism for coordinating recreation planning and development throughout the State.

The information provided in this document represents a cross-section of the public need and desire for recreation experiences and facilities. These needs and desires were developed from a series of public workshops held statewide. As such, it provides the Forest with an excellent information base upon which to develop a recreation program for the Tonto National Forest.

In order of priority the public identified the following needs:

1. Picnicking sites.
2. Camping sites.
3. Baseball and softball facilities.
4 Fishing waters with related safe and easy access.
5. Open space.
6. Bicycling paths.
7. Soccer facilities.
8. Nature study.
9. Hiking and jogging trails.
10. Target ranges.

Seven of the 10 priorities are recreation activities that can be provided by the Forest, this information was valuable in helping to develop the recreation program to meet these needs.

Priorities 1, 2, 4, 5, 8, 9 and 10 are recreation activities which can be provided by the Forest, and were analyzed in the alternatives developed for the Environmental Impact Statement.

Arizona Department of Economic Security, 1981. Population Counts of Places in Arizona - 1980 Census. Arizona State Data Center, Population Statistics Unit.

Census data was used to project population trends and demand for Forest resources in both the Analysis of the Management Situation and the Environmental Impact Statement.

None of the Indian tribes had any formalized planning documents that, when implemented, would have an impact on the Forest.

Appendix

Other Consultations

Consultations that were conducted outside the general public involvement activities included:

Congressional Delegation

Ongoing contacts by the Forest Supervisor with aides and staff of the U.S. Senators and Representatives have included briefings on the planning process status.

Interest Groups and Non Profit Organizations

Arizona Wildlife Federation - Several meetings to update members and/or representatives on the land management planning progress and answer questions regarding the draft Statement and Plan.

Arizona Desert Bighorn Sheep Society - Discuss proposed plan relative to desert bighorn sheep.

Arizona Wildlife Foundation - Informal contacts regarding land management planning progress.

Maricopa Audubon Society - Informal meetings to discuss their concerns regarding riparian/grazing conflicts, and negotiations and settlements.

Representative of Western Resource Management Incorporated - One meeting to discuss the grazing issue relative to the Proposed Plan.

Local Chapter of the Society of American Foresters - A meeting to discuss land management planning process and progress.

Sierra Club - Numerous formal and informal meetings with representatives to discuss the land management planning progress and answer questions regarding the draft Statement and Plan.

Wilderness Coalition - Several meetings to discuss their position regarding wilderness in Arizona, and to update them on the land management planning process relative to the re-evaluation of roadless areas.

Joint Recreation Professional's Advisory Council - Meeting to discuss land management planning progress.

Superstition Mountain Historical Society - Several meetings regarding the proposed Superstition Mountain Museum.

Burnt Corral Hotboaters - Several informal meetings to discuss hotboating on Apache Lake.

Desert Botanical Garden - Meeting to discuss land management planning progress.

Arizona Archeological Council - Land management planning presentation at a local meeting.

Arizona Archaeological Society - Informal liaison to keep them updated on land management planning progress.

Defenders of Wildlife - Meeting to answer questions regarding the draft Statement and Plan.

Arizona Desert Racing Association and Road and Trail Association - Informal meeting to answer questions regarding the draft Statement and Plan.

Appendix

Industry

Tonto Concessionaires - Three meetings to discuss land management planning progress.

Kaibab and Southwest Forest Industries - Several meetings to discuss timber management and wildlife prescriptions, and to discuss land management planning process and progress.

Other References

Arizona Office of Economic Planning and Development, 1981. Critical Issues in Indian-State Relations. AOEPD, Indian Planning Program, Phoenix, Arizona.

Baker, Malchus B., 1975. Modeling Management of Ponderosa Pine Forest Resource. ASCE Symposium, Logan, Utah. pp. 478 - 493.

Beschta, Robert L., Climatology of the Ponderosa Pine Type in Central Arizona. Agricultural Experiment Station, University of Arizona. Technical Bulletin 228.

Brown, Harry E., Malchus B. Baker, Jr., James J. Rogers, Warren P. Clary, J.L. Kovner, Frederick R. Larson, Charles C. Avery, and Ralph E. Campbell, 1974. Opportunities for increasing water yields and other multiple use values on Ponderosa Pine forest lands. U.S.D.A. Forest Service Research Paper RM-129.

Cass, Hilton K.; Mineral Report for The Tonto National Forest, 1981. Unpublished.

Clary, Warren P., Malchus B. Baker, Paul F. O'Connell, Thomas N. Johnsen, Jr., and Ralph E. Campbell, 1974. Effects of pinyon-juniper removal on natural resource products and uses in Arizona. U.S.D.A. Forest Service Research Paper RM-128.

Cordova, F.J., J.D. Wallace, and R.D. Pieper, 1978. Forage intake by grazing livestock: A review. Journal Range Management 31: 430-438.

Council on Environmental Quality, 1978. National Environmental Policy Act-Implementation of Procedural Provisions: final regulations, 40 CFR 1500.

Edminster, Carleton B., 1978. Computation of Yield Tables for Even-Aged and Two-Storied Stands, Rocky Mountain Forest and Range Experiment Station, Research Paper RM-199.

Fischer, Victor; Boyle, John; Schulman, Mark; Bucuvalas, Michael; A Survey of the Public's Attitudes toward Soil, Water, and Renewable Resources Conservation Policy, 1980. Lowes, Harris, and Associates, Incorporated. Conducted for the U.S. Department of Agriculture.

Ffolliott, Peter F., et al, 1975. Water yield improvement by vegetative management: focus on Arizona. School or Renewable Natural Resources, University of Arizona. PB-246-055.

Forest and Rangeland Renewable Resources Planning Act, 1974. 88 Stat. 476 as amended; 16 USC 1600-1614.

Garcia, Margot; Workshop Manual for Public Participation, 1978. University of Arizona, Tucson, Arizona.

Hibbert, Alden R., 1979. Managing vegetation to increase flow in the Colorado River Basin. U.S.D.A. Forest Service General Technical Report RM-66.

Appendix

Hibbert, Alden R., Edwin A. Davis, and David G. Scholl, 1974. Chaparral conversion potential in Arizona - Part 1: Water response and effects on other resources. U.S.D.A. Forest Service Research Paper RM-26.

Holsti, Ole R.; Content Analysis for the Social Sciences and Humanities, 1969. Addison-Wesley Publishing Company.

Johnson, K.N., et al., 1981. Draft Forest Planning Model (FORPLAN - Direct Entry Option). User's Guide and Operations Manual.

Multiple Use - Sustained Act, 1960. 74 Stat. 215 as amended; 16 U.S.C. 528-531.

Multiple Use Guide, 1975. Tonto National Forest.

National Environmental Policy Act, 1969. 83 Stat. 952 as amended; 42 USC 4321, 4331-4335, 4341-4347.

National Forest Management Act of 1976, 1976. 90 Stat. 2949; USC 472a, 476, 476 (Note), 400, 513-516, 521b, 528 (Note), 576b, 594-2 (Note), 1600 (Note), 1600-1602, 1604, 1606, 1608-1614.

National Park Service Science Center, 1976. The Mohave-Sonoran Natural Region Study.

Oregon State University Extension Service, 1980. Federal Land Use Policy Improving Citizen Participation. Workshop and Handbook, Portland, Oregon.

Rosiere, R.R., J.D. Wallace, and R.D. Pieper. 1980. Forage intake in two-year old cows and heifers grazing blue grama summer range. Journal Range Management 33: 71-73.

Solomon, Rhey M. and Larry J. Schmidt. Water yield opportunities on National Forest Lands in Arizona. U.S.D.A. Forest Sevice, Albuquerque, New Mexico.

U.S.D.A. Forest Service, 1974. The Visual Management System, Chapter 1, Volume 2.

U.S.D.A. Forest Service, 1977. Off-Road Vehicle Management Plan. Tonto National Forest.

U.S.D.A. Forest Service, 1977. Forest Service Inform and Involve Handbook (draft). Washington , D.C.

U.S.D.A. Forest Service, 1978. RARE II Arizona Supplement to Draft Environmental Statement. Roadless Area Review and Evaluation. Washington, D.C.

U.S.D.A. Forest Service, 1979, 1982. National Forest System Land and Resource Management Planning. 36 CFR 219.

U.S.D.A. Forest Service, 1979. Final Environmental Statement. Roadless Area Review and Evaluation. Washington, D.C.

U.S.D.A. Forest Service, 1980. Region 3 Manual, Network Analysis Method for Transportation of Resources.

U.S.D.A. Forest Service, 1980. Terrestrial Ecosystems, Southwestern Region.

U.S.D.A. Forest Service, 1980. Draft Environmental Impact Statements. Wild and Scenic River Studies, Salt and Verde Rivers.

U.S.D.A. Forest Service, 1981. Regional Plan Draft Environmental Impact Statement. Southwestern Region, U.S.D.A. Forest Service, 1980.

U.S.D.A. Forest Service, 1982. SALT: A conceptual overview.

U.S.D.A. Forest Service, 1982. IMPLAN User's Manual, Systems application unit for Land Management Planning.

U.S.D.A. Forest Service, various years. Established Grazing Allotment Management Plans. Tonto National Forest.

U.S.D.I. Bureau of Indian Affairs, 1981. Profiles of Indian Reservations in Arizona, Nevada, and Utah. BIS, Phoenix Area Office, Phoenix, Arizona.

U.S.D.I. Bureau of Indian Affairs, 1981. Recreation Planning Report Stage 11, Central Arizona Water Control Study, pp. 55-89.

U.S.D.I. Bureau of Reclamation, 1984. Central Arizona Water Control Study, Final Environmental Impact Statement.

SELECTED ISSUES, CONCERNS, and OPPORTUNITIES

Following are the final public issues and opportunities addressed in the EIS and proposed Forest Plan. They establish the scope of the EIS [40 CFR 1501.7 and 1508.25].

Issues-Concerns

1. Recreation Diversity and Supply

   Demand for developed recreation opportunity exceeds supply. Quality of dispersed recreation opportunities is declining.

   The extremely heavy demand and use of the Forest for outdoor recreation has created some untenable situations including vandalism, pollution, and deterioration of facilities. Improved recreation facilities are insufficient to handle all of the people that would like to use them. People are forced to use undeveloped areas. This creates additional sanitation and cleanup problems. Occupancy trespass is also a problem in undeveloped areas during the winter months.

2. Wilderness Opportunity and Management

   Heavy use by people, non-compatible resource uses, and nonconforming structures are reducing wilderness values. Use in parts of the Superstition Wilderness periodically exceeds wilderness carrying capacities and management standards.

3. Fuelwood Availability

   Demand for fuelwood exceeds accessible supply. Available fuelwood is not located in areas preferred by the public.

   The Forest lacks a comprehensive fuelwood inventory.

4. Timber Management Intensity

   Current timber harvest levels may be exceeding productive capability of the timber resource. Allocations to other resource emphases may reduce the amount of available timber.

   While the Tonto is not a major producer of wood fiber, the commercial timber land base is important to the dependent industry in Payson and above the Mogollon Rim. Maintaining an economically harvestable sustained timber yield from the Forest is challenging because of the limited timber resource and conflicts with other resource values. Trees on the Tonto are important also for aesthetics, watershed protection, and for shade and shelter for people as well as for a variety of wildlife species.

Appendix

Reforestation efforts in backlog areas, that are either understocked or burned over, has produced little success. Timber harvesting on low productive sites is questionable in light of reforestation problems and needs of other resources.

The demand for fuelwood is expected to exceed the Forest's supply. The current demand is causing enforcement problems, conflicts between personal and commercial cutters, and raising questions as to management of the woodland type primarily for fuelwood production.

5. Forage Production and Use

Existing forage production and management is inadequate to support current livestock and wildlife grazing, resulting in declining site productivity, increased soil loss, and declining wildlife populations.

Balancing permitted numbers of livestock to range capacity and implementing proper methods of management is a major problem. Many of the public think this balance must be done through adjustments in permitted numbers. Ranchers who graze livestock on the Forest think improvement of the range is dependent on coordination between the resource managers and themselves as well as development of structural range improvements and vegetation type conversion to grasslands.

The effects of overgrazing are evident in reduced plant diversity, and the degredation of riparian and desert vegetation. This has a direct relationship to wildlife habitat destruction, and soil loss. There are many conflicting viewpoints on how to bring improvement to soil, wildlife, and vegetative resources.

6. Water Quality and Quantity

Demands for water use on and off the Forest exceed the supply. Limited opportunities exist in the chaparral vegetation type to increase water yield. Some impacts on other resources are anticipated if water yield is increased.

Forest management activities have the potential to significantly alter water quality. Physical, chemical, and biological qualities of water can limit its uses. Currently, isolated pollution problems on and off Forest produce conflicts with water uses.

7. Soil Productivity and Stability

Land use and geologic conditions have created some areas on the Forest that have unacceptable soil erosion and watershed conditions. Soil productivity is being threatened in these areas.

Watershed condition is a measure of the ability of a watershed to provide a sustained and orderly flow of water while maintaining soil productivity. Past research has demonstrated a relationship between watershed condition and the quantity and quality of vegetation and litter cover. Basically, any activity that removes vegetative ground cover has the potential to adversely affect watershed condition. Thus, activities such as off road vehicle use, mining and livestock grazing can have a detrimental effect.

Seventy-five percent of the watersheds on the Tonto are currently in unsatisfactory condition. In terms of water quality, suspended sediment appears to be the greatest problem. Thus, a conflicting relationship can be established between improper land uses and reduced soil productivity, accelerated erosion, and suspended sediment loads.

Opportunities for increasing water yield are greatest in the Chaparral vegetative community which comprises 36% of the Tonto National Forest. A feasible increased water yield would be approximately 1.5 inches of water per year from the Chaparral community.

If present conditions continue, existing problems with deteriorated watersheds will intensify. Demands for water are already exceeding appropriation of available water. Forest Service demands for water rights are very small relative to downstream users, yet they are vitally important to proper management. The demand for more water developments in the Forest will continue to increase as the public demands more commodities and amenities.

8. Transportation System Management

The Forest is not meeting prescribed minimum standards for road and trail maintenance.

There is a continuing conflict between providing user access to Forest resources and minimizing road density.

9. Wildlife Habitat

Existing wildlife habitats are currently inadequate to supply basic food and cover requirements. Present levels of integration of wildlife habitat management prescriptions have failed to provide the basic needs, especially in riparian habitat, where conflicts with other resource needs are amplified.

10. Riparian Habitat

Riparian areas on the Forest are heavily impacted by livestock grazing, and recreationists. Many roads and recreation sites are located in riparian areas. Livestock tend to concentrate in and overuse riparian vegetation. Riparian areas provide essential habitat requirements for a variety of wildlife.

The historic decline in range condition and carrying capacity can be used to reflect long-term fish and wildlife habitat condition trends. Heavy stocking rates and improper use have caused a reduction in high value or preferred forage plants. This forces livestock to eat less palatable species and intensifies the competition between livestock and wildlife. Overstocking and improper use change plant species composition and also reduces ground cover. This causes accelerated soil erosion which affects the long-term ability of the land to produce wildlife food, cover, and water.

Proper stocking and improved management by modern grazing systems keyed to improve riparian habitat condition will produce an upward trend in overall habitat condition. There is a need to design and implement programs that use fire to achieve wildlife and habitat management objectives. As with grazing and fire, there is a need for improved coordination with Timber Management.

11. Off-road Vehicle (ORV) Use

Vehicle use on the land, trails, and primitive roads directly provides, or is integral to needed recreation for some users. ORV use on the Forest continues to increase. ORV use damages the environment in some areas and results in conflicts with other users. In some areas, under the right conditions, the use is compatible and acceptable.

12. Unauthorized-Use

The level of Forest Service law enforcement is generally perceived as inadequate to handle problems associated with burgeoning unauthorized use on the Tonto. The level of enforcement does not meet public expectations. Officials of Gila County think the Forest Service cooperative law enforcement program is inadequate and therefore, the visitors and problems on the Forest belong to the Forest Service. Protection of cultural resources, ORV use, occupancy trespass, fuelwood theft, and vandalism are the major problems identified.

13. Mineral Development

Conflicts exist between proponents of mineral development and other resource considerations which constrain both the opportunity for and method of mineral exploration and development.

Minerals such as copper, silver, and gold occur on the Tonto. Other energy resources are thought to exist, with a large area north and east of Globe, under oil and gas lease. In addition, common variety minerals are removed from Forest land. Removal of minerals and energy resources has the potential to damage the environment and result in conflict with other resource protection and use. On the other hand, decreasing or restricting mineral and energy exploration and development could have adverse impacts on the local economy and on resolution of National minerals and energy demands.

Opportunities

1. Fire Management

There are opportunities to provide innovative strategies in fire management which allow natural fire to play a more significant role in ecosystem management. The use of prescribed fire for vegetative management and fuel/hazard reduction can benefit all resources.

2. Land Ownership Adjustment

Land ownership adjustments within and adjacent to local communities need a continuing emphasis to significantly increase efficiency in resource management and to satisfy the needs of expanding communities.

3. Special Area Designations

Opportunities have been identified to provide areas for scientific study and protection through establishment of research natural areas, botanical areas, or designation as natural areas under the Arizona Parks Board Natural Area Program. Among others, proposals have been presented to provide protection to the Picket Post Mountain area adjacent to the Boyce Thompson Arboretum, to an area of Sonoran desert to be managed cooperatively with the Desert Botanical Garden, and to provide an area for development of a museum and interpretive facility near the Superstition Mountains.

4. Cultural Resources

With the wealth of cultural resources on the Forest, opportunities exist to provide interpretation of prehistoric and historic sites as a developed recreation experience.

5. Recreation Site Design

There is an opportunity to meet the needs of handicapped visitors during construction and reconstruction of recreation sites.

Treatment of Issues, Concerns and Opportunities in Alternatives

Issues and opportunities were treated differently through the range of alternatives. Specific alternatives were developed which emphasized water yield, watershed condition, recreation, range, timber and wildlife resources, production of marketable products, and management of the Forest in a manner which maximized present net value of assigned benefit values. These differing emphases reflected a varying mix of management prescriptions among alternatives. This resulted in varying levels of issue resolution which are displayed in Chapters 2 and 4 of this Environmental Impact Statement.

No issues or opportunities were deferred for resolution outside the planning process.

Appendix

B

INTRODUCTION

Appendix B describes the analysis process used in developing 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 undertook a quantitative analysis incorporating economics into the process.

The purpose of this analysis is three-fold: First, it assures that each alternative contained the most cost-efficient combination of management activities which met the objectives of that alternative. Second, it provided a means to evaluate or compare alternatives for the purpose of choosing among them. Third, it allowed a quantitative starting point from which non-monetary 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 modeling is an analytic technique designed to overcome the complexity of keeping track of the resulting resource outputs, environmental consequences, costs, benefits, and activity schedules applied to the land. This phase of the process is a tool for the manager to use in making a decision. However, based on professional judgement and experience, adjustments in resource distribution are appropriate in order to satisfy implicit social-political implications, or intangible resource considerations which are not inherent in a mathematical model. Judgemental decisions are described in Chapter 2 and the constraints section of this appendix.

Requirements to be fulfilled in the planning process are described in [36 CFR 219.12]. A brief discussion of the steps used on the Tonto National Forest to complete the planning actions is described below.

Identification of Purpose and Need

Public issues, management concerns, and resource use and development opportunities were identified through public participation activities and coordination with other Federal agencies, State and local governments, and Indian tribes. The development of issues, concerns, and opportunities is described in detail in Appendix A.

Planning Criteria

Planning criteria guided the planning process through: 1) identification of the kind and detail of resource inventories needed; 2) the development of benchmark runs for determining minimum and maximum levels of resource production (decision space) responsive to issues, concerns and opportunities; 3) the formulation and evaluation of alternatives responsive to resolving issues, concerns, and opportunities; 4) insuring net public benefits were maximized.

Appendix

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. 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 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. Chapter 2 presents the major environmental impacts in comparative form in a manner which shows the major differences between the Proposed Action and other alternatives to provide a clear basis for decision-making.

Inventory Data

The following discussion presents concepts on how resource data was utilized to delineate capability areas, stratify the Forest into analysis areas based on suitability for management practices, and determine production coefficients. The interrelationship between alternative development and implementation is also discussed.

Capability areas are unique areas of land with respect to slope, landform, vegetation and soils. They form the basic unit for cataloging inventory data.

Analysis areas are aggregations of capability areas, not necessarily contiguous, which are similar with respect to existing vegetation, slope and legal/administrative status. These areas provide the framework for analysis, because individually they respond in a like manner to specific management prescriptions.

Production coefficients reflect the number of units per acre of a given resource that can be produced over a specific period of time. These coefficients were estimated by resource specialists using latest research findings, simulation models, literature reviews, field observations, and professional experience.

The expected value of the coefficient is assumed by the model to be known with certainty. This is required to reduce the complexity and magnitude of the modeling problem to manageable proportions. The variability in the real world is greater than what is shown in the model, but it is difficult to model the range of all variables and the probability of occurrence for each possible value in the range.

Appendix

The development of alternatives is directly related to the ability of the Forest to produce resource outputs based on resource inventories and land capability determination. The mix of specific outputs in an alternative varies with the level of investment and the management emphasis applied to a specific analysis area.

Projected outputs over the planning horizon are based on the best scientific information available. Monitoring the implementation of an alternative is designed to confirm those projections or identify additional inventory needs, or changes in application of scientific principles through management prescriptions.

Data References

Simulation models used to develop yield coefficients for FORPLAN include:

- RMYLD. This model computes yield tables allowing for a wide range of stand densities and management controls.
  RMYLD: Computation of Yield Tables for Even-Aged and Two-Storied Stands, by Carleton B. Edminster. Rocky Mountain Forest and Range Experiment Station, Forest Service, USDA. Research Paper RM-199. February 1978.

- SALT. This model determines total yields across all strata in an analysis area and accounts for volume losses due to defect. It uses RMYLD yield tables as input.
  SALT: A Conceptual Overview and User's Guide. Southwestern Region, Forest Service, USDA. March 1982.

In addition, the IMPLAN model was used to analyze economic impacts based on FORPLAN outputs. For further information see:

- IMPLAN User's Manual. Systems Application Unit for Land Management Planning, Forest Service, USDA. August 1982.

FORPLAN is the Forest Planning Model. Underlying the FORPLAN model is a mathematical technique known as linear programming. For a more detailed understanding of aspects of linear programming and FORPLAN, the reader is referred to:

- Forest Service Land Management Planner's Introduction to Linear Programming by Brian Kent, USDA Forest Service Systems Application Unit for Land Management Planning, Fort Collins, Colorado. U.S. Government Printing Office: 1980-777-792/131, Region No. 8.

- Direct Entry FORPLAN: Draft Executive Summary of the Overview Document by Thomas W. Stuart, USDA Forest Service Systems Application Unit for Land Management Planning, Fort Collins, Colorado. May 6, 1982.

- FORPLAN Version II (DE FORPLAN) User's Guide, by Brad Gilbert, Norm Johnson, and Sarah Crim, USDA Forest Service, Systems Application Unit for Land Management Planning, Fort Collins, Colorado. October 1982.

References used in the planning process are listed in Appendix A. Other sources of data include Forest Service inventories and records, other Federal and State records, and scientific research findings.

Appendix

FOREST PLANNING MODEL (FORPLAN)

Overview and Analysis Process

This section of Appendix B presents the basic concepts used in Forest Planning. Specific details related to management prescriptions, economic efficiency, and development of alternatives are presented in other sections of this appendix.

The interrelationship of resource inventories and land capability and productivity provide the basis for projecting outputs. This is determined prior to analysis through identification of capability and analysis areas. During the identification of analysis areas, estimates were made by resource specialists of naturally occurring outputs that are harvested without direct management actions and associated costs. Outputs of water, minerals, dispersed and wildlife related recreation use, and soil loss were estimated. This established the minimum level of management which provides for protection of soil and water resources, productivity of the land, life, health and safety of incidental users, and prevention of environmental damage to adjoining lands or downstream area. This level of analysis is done outside the computer model and serves to validate management prescriptions prior to computer simulation. It also serves as a base line to compare cost efficiency between benchmarks and alternatives.

The resource allocation model used in developing the Forest Plan is called FORPLAN (Johnson, K.N., et al 1981). FORPLAN is a linear programming model that simultaneously distributes specific land areas to individual management prescriptions, and schedules use and development activities to achieve a specified set of objectives within certain constraints. Variables that are accounted for by the model include resource outputs, costs, and period of implementation. The Tonto National Forest used Test-Direct Entry FORPLAN. The major components of the model are as follows:

Outputs

Outputs are an array of goods and services capable of being produced through management of National Forest lands. Measures of outputs are dependent on the product produced. They may or may not have a market value. The quantity of a specific output is dependent on the management emphasis applied to a given area of land.

Activities

Activities are costs relative to managing the Forest and producing goods and services.

During the building of the FORPLAN model, each output and cost is identified with a computer code name and verbal description. As the end result of the analysis process, costs and outputs are displayed in terms of units of measure, i.e., thousand board feet by year or period. Refer to Economic Efficiency Analysis section of this appendix, Tables 70 and 71, for detailed listing of outputs and activities in the Tonto FORPLAN model.

Analysis Areas

As a part of the planning process, the Forest assesses the current condition of its resources, determines its potential to produce a variety of goods and services, and predicts how the land will respond to a variety of management choices. Because of the complexity of predicting the Forest's widely varying response to different types and intensities of management, the Forest was subdivided into analysis areas based on variations in biological, physical, economic and social conditions.

Appendix

Analysis areas are aggregations of acres - not necessarily contiguous - which are similar with respect to existing vegetation, slope, and legal/administrative status. Fifty-three analysis areas were included in the model. Appendix A of the Forest Plan provides a complete listing of analysis area acreage and vegetative types.

Management Prescriptions

Prescriptions serve as the basis for choice of what can be done in a specific analysis area. A prescription is the set of assigned management practices and a schedule of application to achieve a desired quantity of goods and services, and environmental consequences. Each prescription consists of standards and guidelines directing implementation of the prescription if it is assigned, as well as resource production coefficients, costs, and harvest scheduling options associated with the prescription.

A wide range of prescriptions were developed to meet goals and objectives of benchmarks based on the planning criteria, public issues, management concerns, and opportunities developed early in the planning process. Prescriptions ranged from minimum to maximum production of the various goods and services.

The FORPLAN model distributed prescriptions to specific analysis areas while maximizing present net value based on constraints used to meet goals and objectives of benchmarks or alternatives.

Prescription distributions were verified by determining if the prescription could be implemented in the analysis areas, and if the outputs, costs, environmental effects, and standards and guidelines were realistic for the Forest.

Prescriptions were developed by combining the least-cost management practices needed to achieve the objectives of a prescription. Cost efficiency was considered in developing prescriptions based on professional experience, and review of current literature and research findings by the interdisciplinary team.

Refer to Prescription Development section of this appendix for a description of prescription categories. A detailed listing of prescriptions by analysis areas is on file at the Forest Supervisor's Office.

Planning Horizon

The planning horizon for the analysis is 200 years. Application of a prescription to an analysis area results in outputs and costs calculated in the model from the coefficient for each time period within the planning horizon. The planning horizon is divided into eight time periods. Each one of the first five time periods is ten years in length. The remaining three periods are each fifty years in length.

Constraints

Constraints are quantifiable limits placed on the model to ensure that only reasonable amounts of acres and dollars are used in order to control the mix of outputs to meet objectives of the alternatives.

In linear programming analysis constraints override the objective function. Thus, if a predetermined level of outputs or minimum physical condition is entered as a constraint, it is always achieved or no feasible solution is found. Output levels and other desired effects entered as constraints, therefore, are implicitly assumed to contribute more to public benefits than the sum of the cost of production plus the foregone contribution of public benefits of any outputs replaced in the solution.

Appendix

The following constraints were used during the formulation and evaluation of alternatives:

- Output Constraints - requirements that FORPLAN produce a specified amount of any resource, such as timber, range, or recreation.

- Budget Constraints - limitations on budgets to implement the range of available prescriptions. Budget constraints insure financial feasibility.

- Prescription Constraints - requirements on the specific acreage or land area applied to a specific prescription. This could be a minimum acreage, a maximum acreage, a range of acceptable values or a prespecified acreage.

- Non-declining Timber Yield - requirement that the net merchantable cubic timber volume harvested in each period is greater than or equal to the volume harvested in the preceding time period.

- Ending Inventory - to maintain perpetual timber harvest, the inventory at the end of the planning horizon (net MCF) must be greater than or equal to the average inventory of the regenerated stands in the long run [36 CFR 219.16(a)(1)].

- Long Run Sustained Yield Link - requirement that the net merchantable timber volume harvested (MCF) in the last period is less than or equal to long run sustained yield [36 CFR 219.16(a)(1)]. Regulatory requirements were met by combining non-declining yield with this requirement.

- Culmination Mean Annual Increment - requirement that the total yield from regenerated stands at harvest age is equal to or greater than 95-percent of the volume production corresponding to CMAI, as expressed in cubic measure [36 CFR 219.16(a)(2)(iii)].

  Rotation ages applied in the Rocky Mountain Yield (RMYLD) 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 the RMYLD and Strata Analysis Level and Timing (SALT) models. The CMAI requirements are, therefore, incorporated within FORPLAN yield coefficients and are not achieved through application of specific constraints to the model.

Coefficients

A coefficient is a numerical quantification of the value, cost, or amount of an output or activity at a given point in time. They were developed by resource specialists on the Interdisciplinary Team.

Coefficients fall into one of two categories: Output or economic coefficients. Output coefficients reflect the number of units per acre that can be produced over a specific period of time. These coefficients were based on a simulation model or other data sources. Output coefficients were developed for sawtimber, roundwood, fuelwood, permitted livestock use, grazing capacity, developed recreation, dispersed recreation including wilderness and wildlife use, water yield, and soil loss.

Costs (economic) were estimated using Forest budget data from Fiscal Years 1980, 1981, and 1984. Costs include all resource elements involved in a specific prescription.

Benefits (economic) were assigned based on 1985 Resource Planning Act (RPA) values.

Appendix

Refer to the Coefficients section of this appendix for the calculations and assumptions used to develop coefficients. Detailed listing of coefficients by prescriptions is on file in the Forest Supervisor's Office.

Specific constraints used for each benchmark and alternative are described in the benchmark analysis and alternative sections of this appendix.

Objective Function

Objective functions are mathematical expressions of the criteria by which the model allocates resources to various prescriptions. These can be either economic (e.g., maximize present net value for 200 years) or physical (e.g., maximize developed recreation for 200 years). During the evaluation of alternatives, all runs of the model were made using maximize present net value over 200 years as the objective function. However, certain benchmarks maximized timber, range capacity, water yield, recreation, and wildlife outputs.

PRESCRIPTION DEVELOPMENT

Prescriptions were developed through an interdisciplinary (ID) approach using resource specialists with expertise covering all resource areas on the Forest.

Prescription development was based on all available data sources including field experience, literature reviews, research findings, and simulation models.

Standards and guidelines for all activities or potential activities occurring in each analysis area were developed by resource specialists according to their specific area of knowledge. In order to ensure specific minimum management requirements were met [36 CFR 219.27], standards and guidelines were developed to reflect integration of resources in the development of specific management prescriptions. This was accomplished through interaction between resource specialists and through development and review of management prescriptions by prescription tasks groups consisting of District Rangers and Primary Staff Officers.

Prescription development followed a philosophy of building a broad range of management prescriptions to ensure appropriate consideration of outputs and uses lands are capable of providing, and building management intensity from low to integrated multi-management and unconstrained resource maximums.

Many prescriptions were developed. Some portray current management practices, while others portray practices needed to meet the minimum legal requirements associated with public land management.

Some prescriptions maximize production of individual resources; some are more responsive to specific issues or concerns; and others apply to land requiring specialized management. The process was guided through defining management objectives by analysis area in accordance with specific management emphasis and management intensity level. All prescriptions included implementation timing for each activity.

Each management prescription was assigned associated quantities of production, costs, and benefits by resource. Costs varied by individual resource management practice within each prescription. Resource values (benefits) were assumed to be equal for all prescriptions regardless of where they were applied on the Forest.

The following elements are common to all prescriptions:

A description of the multi-resource activities which will be carried out.

A description of the timing and intensity of the planned activities.

Appendix

A statement of specific policies which apply to the uses and activities covered by the prescription.

Standards and guidelines for resource protection and use.

Mitigation measures and coordinating requirements needed to protect resources and the environment.

The following prescriptions were used in benchmark and alternative analysis, and are on file at the Tonto National Forest Supervisor's Office. Although outputs of individual resources vary by specific objectives of a prescription, all prescriptions provide a variety of renewable resource outputs.

- Low Intensity - this represents the least cost to comply with legal requirements. Minimum management requirements specified in the planning regulations [36 CFR 219] are met at this level. Low intensity standards, activities, costs, and outputs are the minimum to be met or exceeded in all other prescription levels.

- Current - these prescriptions reflect predicted consequences of continuing current management practices, and establish a base for comparing other prescriptions.

- Mogollon Rim Integrated - this level emphasizes a variety of renewable resource outputs with primary emphasis on intensive sustained yield timber management, timber resource protection, and creation of wildlife habitat diversity and recreation opportunity in the vicinity of the Mogollon Rim along the northern portions of the Payson and Pleasant Valley Ranger Districts.

- Constrained Maximum Recreation - this level emphasizes all aspects of recreation Forest-wide. It includes developed, nonwildlife dispersed, and wilderness dispersed recreation. Maximum practical potentials were used to compute outputs.

- Constrained Maximum Wildlife - this level emphasizes wildlife habitat enhancement and diversity, recovery of threatened and endangered species, and recovery of riparian areas.

- Constrained Maximum Watershed Condition - this level emphasizes maximum enhancement of watershed conditions Forest-wide. Special watershed restoration projects are implemented to accelerate recovery of disturbed areas.

- Constrained Maximum Timber - this level emphasizes production of fuelwood in the Pinyon-Juniper vegetative type and sawtimber and roundwood products in the Ponderosa-pine and Mixed Conifer vegetative types. All lands that are capable, suitable, and available are used.

  Timber management intensities also varied with other resource objectives. Refer to Appendix E, Timber Analysis, for specific silvicultural practices applied to prescriptions emphasizing water yield, forage production, recreation, and wildlife in the Ponderosa-pine Mixed Conifer type.

- Constrained Maximum Range - this level emphasizes increased grazing capacity based on current range analysis standards and grazing systems. All suitable lands are used.

- Constrained Maximum Water Yield - this level emphasizes water yield through conversions of chaparral to grass and by reducing the basal area of the Ponderosa-pine Mixed Conifer stands through approved silvicultural practices.

Table 67 displays the range of prescriptions available between analysis levels by analysis area. Complete details on the range of standards and guidelines contained in management prescriptions are on file at the Forest Supervisor's Office.

Table 67

Analysis Level									
Analysis Area	Low Intensity	Current	Mogollon Rim Integrated	Maximum Recreation Emphasis	Maximum Wildlife Emphasis	Maximum Watershed Condition Emphasis	Maximum Timber-Fuelwood Emphasis	Maximum Range Emphasis	Maximum Water Yield Emphasis
1100	x	x		x	x	x		x	
1200	x	x		x	x	x		x	
1201	x	x		x	x	x		x	
1205	x	x		x	x	x			
1206	x	x		x		x			
1300	x	x		x	x	x		x	
1301	x	x		x	x	x		x	
1305	x	x		x	x	x			
1306	x	x		x		x			
1505	x	x		x	x	x		x	
1535	x	x		x	x	x			
1541	x	x		x		x			
3100	x	x		x	x	x			
3200	x	x		x	x	x			
3201	x	x		x	x	x			
3205	x	x		x	x	x			
3206	x	x		x		x			
3600	x	x		x	x	x			
4200	x	x		x	x	x			
4600	x	x		x					
5100	x	x		x	x	x		x	
5200	x	x		x	x	x		x	
5201	x	x		x	x	x		x	
5205	x	x		x	x	x			
5206	x	x		x		x			
5300	x	x		x	x	x	x	x	x
5301	x	x		x	x	x		x	x
5305	x	x		x	x	x			x
5306	x	x		x		x			
5505	x	x		x	x	x	x	x	x
5506	x	x	x	x	x	x	x	x	x

Table 67 (continued)

Analysis Area	Analysis Level: Low Intensity	Current	Mogollon Rim Integrated	Maximum Recreation Emphasis	Maximum Wildlife Emphasis	Maximum Watershed Condition Emphasis	Maximum Timber-Fuelwood Emphasis	Maximum Range Emphasis	Maximum Water Yield Emphasis
5511	x	x		x	x	x	x	x	x
5512	x	x		x	x	x	x	x	x
5529	x	x		x	x	x	x		x
5530	x	x	x	x	x	x	x		x
5535	x	x		x	x	x	x		x
5536	x	x	x	x	x	x	x		x
5541	x	x		x		x			
5542	x	x	x	x		x			
5600	x	x	x		x	x			
6001	x	x		x					
6002	x	x		x					

Appendix

COEFFICIENTS

Water Yield

Water yield (output code X16) was caculated for each analysis area, and expressed as the average acre-feet produced per annum from the total area.

Current Water Yield

In order to establish a baseline to work from, water yield from the entire Forest was calculated using streamflow data. Fortunately, there are eighteen U. S. Geological Survey (USGS) stream gaging stations located on or near the Forest that could be utilized for this purpose. In those few drainages not having streamflow data, water yields were estimated by extrapolating yields from nearby areas having similar vegetation and geologic characteristics. This analysis indicated that the average annual yield from the Forest is currently 349,000 acre-feet.

This water yield was then related to existing Forest vegetation and analysis areas. First, a literature review was conducted to establish the average annual yield that could be expected from various vegetation types. Fortunately, there have been numerous studies of this nature in Arizona. This review resulted in an average annual water yield coefficient for each vegetation type found on the Forest.

These coefficients were then applied to each analysis area on the Forest. As the analysis areas were originally stratified according to vegetation, this was accomlished via FORPLAN. The yield calculated in this manner was very close to the water yield determined using USGS stream gage data. Where necessary, small adjustments were then made to coefficients so that calculated water yields would equal water yields determined from stream gage data.

The final coefficients used to estimate current water yield are as follows:

Vegetation Type	Water Yield Coefficients (Inches Per Year - Average)
Desert (Low elevation)	0.1
Desert (High elevation)	0.2
Pinyon-juniper	1.0
Chaparral	1.4
Ponderosa-pine	4.5
Mixed conifer	5.0
Riparian	2.1

Potential Water Yield Increases

After establishment of current water yield coefficients, the potential increases that could be expected using vegetation management techniques were addressed. Again, the literature was reviewed to determine the average annual increases that could be expected. The results of this literature review are briefly summarized below by vegetation type:

1. Desert (both low and high elevation): Water yields cannot be expected to change significantly as a result of vegetation management. This can be attributed to the relatively low precipitation, high evaporation and sparse vegetation that characterized most desert areas.

2. Pinyon-juniper: Water yields can be expected to increase from 0 to 0.5 inches per year depending on location and type of treatment.

Appendix

3. Chaparral: Assuming an average annual precipitation of 21 inches, water yield increases of approximately 3 inches per year could be expected (Hibbert, 1974). Then assuming 80% shrub removal, the coefficient must be reduced 53% of the potential yield, or to 1.6 inches per year (Hibbert, 1974).

4. Ponderosa-pine and Mixed conifer: For this analysis, these two vegetative types were combined. This was done because of the small acreage of mixed conifer found on the Forest. In addition, the mixed conifer type is usually found intermingled with Ponderosa-pine vegetation (mainly on north slopes and in drainage bottoms).

   In order to estimate water yield increases, a technique presented by Baker (1975) and modified by Solomon and Schmidt (USDA Forest Service) was utilized. This technique relates the basal area in square feet per acre of the timber stands and precipitation to average annual water yield. For most timbered sites on the Tonto, it was assumed that the basal area of the stands would be reduced from present levels of approximately 90 square feet/acre to 40 square feet/acre. It was also assumed that the average annual precipitation was 24 inches. This precipitation value is probably high, as Ponderosa-pine normally receives between 20 and 25 inches of moisture each year (Beschta, Agriculture Experimental Station). It was felt, however, that this high value was warranted in order to account for the larger water yields normally associated with the mixed conifer vegetation. The net result was an estimated water yield increase of 0.75 inches per year.

5. Riparian: Vegetation management to increase water yields in riparian areas would require the removal of trees critically important for recreation and wildlife purposes. As a result, no effort was made to address water yield increases in these areas.

In summary, the potential water yield increases are as follows:

Vegetation Type	Potential Water Yield Increase Coefficients (Inches Per Year - Average)
Desert (Low & High Elevation)	Insignificant
Pinyon-juniper	0.25
Chaparral	1.60
Ponderosa-pine)	
Mixed Conifer)	0.75
Riparian	Not Considered

Application of Results

1. No potential increase was assigned to the pinyon-juniper vegetative type. This is because it is Regional Policy (FSM 1922.24a, R-3 Supp 6) not to manage vegetation to increase water yields where potential increases are less than 0.5 inches/year.

2. In many areas of the Forest, the chaparral and pinyon-juniper vegetation types are interspersed. Thus, some analysis areas contain both types. In these cases, the water yield coefficient for chaparral vegetation was reduced to reflect the inclusion of pinyon-juniper vegetation.

3. Water transmission losses between the treated sites and downstream use points were not considered. In many cases the losses could be substantial.

4. It was assumed that water yield increases would be recoverable in existing reservoirs and/or through groundwater recharge.

5. The different alternatives assume that approximately one-thirtieth of the chaparral that is managed for water yield would be treated each year.

6. It was assumed that maximum water yield increases in the Ponderosa pine-mixed conifer areas could be reached by the end of the first decade.

Recreation

The recreation coefficients (output codes X09, X11, X12, X18, X19, X20, X21, X22, X23) were developed by taking RIM recreation use figures and spreading them out to each analysis area based upon existing use. This use was expressed as average Recreation Visitor Days (RVD)/Acre for dispersed recreation, and developed recreation. These RVD/acre values were used as the base and all projections made from these. Demand was assumed to be constant across all analysis areas.

The Tonto's 1970-1980 Recreation Information Management (RIM) data was used to determine past trends and project future demand for recreation use. Recreation use increased from 1,914.2 MRVD's to 6,564.5 MRVD's or an average increase of $12\frac{1}{2}$ percent per year during the decade.

Projected population growth for Maricopa County, Arizona was also examined. This projection was utilized because most of the recreation use is generated by Phoenix metropolitan area residents.

Projected Percent Increase in Recreation Use

Year	(Public) Dev. Rec.	(Private) Dev. Rec.	Disp. Rec.	Interp. Ser.	Total
1980	- Base	- Year	-		6,052 M
1985	9.0	9.5	9.5	0	6,456 M
1995	8.4	9.1	8.9	8.8	7,303 M
2005	8.5	9.1	9.1	7.3	8,150 M
2015	8.5	9.3	9.0	9.2	9,127 M
2025	9.0	9.6	9.0	8.6	10,080 M

Coefficients were held constant once capacity was achieved to prevent resource damage. Capacity is determined by the Recreation Opportunity Spectrum (ROS) system.

Recreationists participate in activities within available, preferred environmental settings. The ROS system was used to determine the settings and calculate the theoretical maximum capacity (TMC) provided. The TMC was further analyzed to calibrate use coefficients to reflect the Forest's unique patterns of use and length of occupancy. A practical maximum capacity (PMC) was calculated for each type of setting or ROS class. The PMC is the supply of recreation opportunities and was used as a ceiling where projected use approached or was expected to exceed capacity. Management actions were developed to level off use. The coefficients reflect these practices.

Appendix

The PMC for dispersed recreation excluding Wilderness and Wildlife related use has been determined to be 5,294.4 MRVD's, based upon ROS. The estimated potential for Developed Recreation is for 3,200 MRVD's and expected demand is 2,500 MRVD's per year. Wilderness potential is 146.9 MRVD's.

The following assumptions were made regarding changes in Recreation projections and coefficients development:

Recreation use will increase significantly at Bartlett Lake with the paving of the road and proximity to Phoenix. Access will be secured across the Verde River providing an additional trailhead facility.

Increases in dispersed recreation on the Lower Salt River will be less than population increases due to capacity management. Developed recreation sites to operate at nearly full capacity, affected by capacity management of lakes and rivers.

A four-lane highway to the RIM will significantly increase dispersed use.

Increases in dispersed use on Pleasant Valley District will be significantly less than population growth due to isolation and poor roads.

Increases in Roosevelt Lake use will be tied to paving of Highway 88.

Soil Loss

Soil loss (output code 552) was modeled through the planning process for estimating sheet and rill erosion under various management activities for all analysis areas. It is expressed in terms of an average annual tons/acre value for each time period.

Soil loss was calculated for present conditions and modeled for future activities using the Universal Soil Loss Equation (USLE). Universal Soil Loss Equation calculates soil loss based on various environmental conditions. The equation is A = (R)(K)(L S)(P).

Where: "A" is the computed soil loss in tons per acre per year.

"R" is the rainfall factor. It is the sum of the energy intensity for a normal years rainfall. The relationship is:

$$R = 25(P)^{1.5}$$

R = rainfall factor
P = 2 year, 6 hour rain event

"K" is the soil erodability factor which represents the capability of a soil surface to resist erosion. It is a function of the soil physical and chemical properties that effect soil erosion. Significant properties effecting soil erosion include texture, organic matter, structure and permeability. The relationship is:

$$100\,K = 2.1\,M^{1.14}\,(10^{-4})(12-a)+3.25(b-2)+2.5(c-3)$$

M = (% silt + % very fine sand) (% silt + % very fine sand + % sand)
a = % organic matter
b = soil structure factor
c = soil permeability factor

LS is the slope effect factor. The relationship is:

$$LS = (a/72.6)^m (65.41 \sin^2 0 + 4.56 \sin 0 + .065)$$

a = slope length in feet
0 = angle of slope
m = .5 for slopes 5%; .4 for slopes 3.5-4.5%;
.3 for slopes 1.0-3.0; .2 for slopes 1%

"L" is the slope length factor which considers distance from the origin of overland flow to a point where slope decreases, or a point of entry into a channel or where it becomes concentrated.

"S" is the slope gradient factor.

It is the ratio of soil loss from the field gradient to a 9 percent reference slope.

"C" is the cover management factor. It relates the effect of effective ground cover to the computation of erosion. This factor reflects response to management activities.

"P" is the management practice factor. This factor shows the effect of management practices such as contour tillage and strip cropping which would effect runoff. In wild land situations this factor is assumed to be 1.0 unless specific project work will effect this factor in a measurable way. This factor is for project level work and is not suitable for planning.

Universal Soil Loss Equation predicted changes in soil loss through the planning horizon by applying factors to the current soil loss. Coefficients developed for changes in cover factors or soil loss provided estimates of soil loss for a variety of management activities.

The following assumptions were made in modeling soil loss:

Location and timing of future management activities within an analysis area cannot be specified. The impact will be assumed to be uniform over a representative area. Soil loss is calculated as a weighted average based upon soil types present within representative areas for the time period.

The activity is completed within the time period being modeled.

A relationship exists between production of biomass and plant canopy and can be correlated to production of effective cover.

For road construction each vegetation type has one soil type based upon general soil characteristics of the vegetation type.

Protection from wind erosion by flat, small grain stubble can be correlated to grass production.

An electronic spread sheet (computer program) was used as an aid in grouping and calculating USLE values by Terrestrial Ecosystem. Known cover classes and canopy densities were used for this process and were taken from both the Terrestrial Ecosystems Survey and from years of Forest-wide site data.

Appendix

The resulting cover classes and USLE predictions were then grouped by Analysis Area into coefficients, expressed in tons per acre, for Current Soil Loss and Natural (geologic) Soil Loss, as follows:

Table of Sheet and Rill Erosion Coefficients

Analysis Areas:	X100 X600	X200 X204	X201 X205	X206	X300 X304
Average Slope %:	6	25	55	100	20
Average Slope Length	30	50	25	25	25
R Factor:	52.52	52.52	52.52	52.52	70.56
K Factor:	.24	.30	.17	.17	.39
Average Cover %:	60	50	70	80	50
Current Soil Loss:	.39	4.00	8.05	8.43	2.92
Natural Soil Loss	.28	1.64	3.75	7.73	1.01

Analysis Areas:	X301 X305	X306	X505 X506 X529 X530	X511 X512 X535 X536	X541 X542
Average Slope %:	60	100	20	60	80
Average Slope Length	25	25	60	25	25
R Factor:	70.56	70.56	77.02	77.02	77.02
K Factor"	.36	.30	.35	.28	.19
Average Cover %:	70	80	80	80	80
Current Soil Loss:	6.77	5.58	3.41	9.99	3.17
Natural Soil Loss	1.76	2.39	1.79	5.24	1.47

In wilderness areas, where management activities are limited by law, future soil loss was estimated using professional judgment.

Future soil loss for known areas was modeled for each prescription, using the set soil loss tolerances established by Soil Conservation Service in conjunction with the current and natural soil loss coefficients.

Grazing

Grazing capacity (output code X13) was calculated for all capacity and potential capacity range categories. Areas such as recreation sites, sandbar channels, barren ground, lake surfaces, and excessively steep sloped areas were classified as no capacity range. Grazing capacity was expressed as average animal unit months (AUM's) per acre.

The first step in the analysis of estimated capacity was the development of the range forage production information. The R-3 Rangeland Model, Part I, was used to develop these forage production tables.

These tables were constructed to assist in spreading estimated capacities to the capability area level. Primary data requirements included information development for each vegetative type and range condition which covered three separate slope categories (0-15%, 16-40%, and 41-80%). For example, a desert grass vegetative type in moderate range condition required the development of three tables, one for each slope class. If the range condition class was low, three more tables were developed for the same vegetative type.

The end result was a complete set of tables which showed estimated capacity per acre for all vegetative type, range condition, and slope percentage combinations that could possibly occur on the Tonto National Forest.

The following is the RANGELAND formula used to develop the Acre/AUM coefficients for the various tables:

$$\text{ACRES/AUM} = \frac{\text{Lbs./AUM Forage Intake}}{\text{(Forage Production Lbs./Ac)} \times \text{(Allowable Use)} \times \begin{pmatrix}\text{Grazing}\\ \text{Factor}\end{pmatrix} \text{(Intensity)}}$$

Note: An AUM equals one mature cow or equivalent for one month. Forage intake, (Lbs./AUM) equals 600 pounds of forage needed to sustain one AUM (RANGELAND Model).

Forage production in Lbs./Acre equals estimated average pounds of forage produced on one acre of the appropriate vegetation type and range condition. The production coefficients were derived from current production-utilization surveys and range analysis on allotments within each vegetative type.

The allowable use factor is the percentage of the forage production which can be used through grazing and allow for maintenance or needed improvement in range condition. Allowable uses were derived from current representative production-utilization surveys on allotments and R-3 guidelines in Chapter 50, Range Analysis and Management Handbook, FSH 2209.21.

Grazing intensity is a factor that is related to the level of management and the development of range structural improvements. A grazing intensity factor of 1.0 was used for intensive management with optimum range improvements.

The other factor needed to spread capacity to the capability area level is an estimate of the known capacity of each allotment. Each Ranger District developed these estimates.

Grazing capacities for each grazing allotment were developed from the most current data on hand. These capacities reflected high intensity management, current management, and low intensity management. Capacities were developed from representative allotments with proven current management plans and proper stocking. For allotments without current resource data, capacities were developed through analysis of similar vegetative types and comparison of current resource data from neighboring allotments where management plans are perceived to be meeting resource management objectives.

Automatic data processing procedures were used to do the mechanical part of the capacity spread to the capability area level. The computer would read the range resource data (vegetative type, range condition, and range suitability). The resource data was then cross referenced with the forage production tables, the estimated allotment capacity, and the capability area acreage to develop the total AUM coefficients for each capability area. The coefficients for each analysis area were then developed by a summary aggregation of the AUM values using the reporting procedures of the S2K data base management system.

The coefficients developed from the summary aggregation were used to produce a range production yield table in AUM's by planning period for each analysis area and management intensity level.

It must be recognized that for purposes of analysis and projection of outputs, three levels of management were considered (low intensity, current and high intensity). The current level of management is defined as that in existence in 1980. Low and high intensity are hypothetical management levels that infer relative increases or decreases in management intensity from the current level.

Appendix

Outputs associated with the various prescriptions are merely varying applications of management intensities and were dependent on specific prescription objectives. Projected outputs by prescription over time cannot be viewed as absolute in nature, but actually represent the estimated flow of outputs with varying management intensities over time. Actual output coefficients or total AUM outputs will be dependent on actual management intensity applied on an individual grazing allotment basis and actual rate of improvement in range condition and increase in forage production.

Permitted Livestock Use

Current permitted use was determined by summarizing the permitted use on each grazing allotment as of 1980. The Forest objective in range administration is to eventually balance permitted use with the grazing capacity of each allotment. This basic goal is inherent under current management guidelines.

For planning purposes, permitted use is largely a function of grazing capacity. Considering the Forests' rate of progress to date, and animal unit month capacity outputs under the preferred alternative, it is estimated that permitted use could be balanced with capacity in the third planning period. From the point of balancing, permitted use would never be allowed to exceed grazing capacity.

The preferred alternative depicts declining permitted use and balancing with grazing capacity in the third decade. From the estimated balance point (when permitted livestock use is balanced with grazing capacity) moderate levels of livestock increases are exhibited. As time progresses into the final planning period, allotments become more intensively managed and range conditions continue to improve. It must be remembered that this projection is dependent on budget levels in both operation and maintenance and range improvements as indicated. Lesser budget levels would undoubtedly require longer time frames.

Wildlife

The basis for wildlife recreation output coefficients (X10) came from a series of work meetings with planning personnel in Arizona Game and Fish Department. The results of those meetings is described in detail in a document titled "Tonto National Forest Wildlife Outputs for the Forest Land Management Plan and EIS" on file in the Supervisor's Office in Phoenix, Arizona.

A starting point was to assemble current information on game harvest from Arizona Game and Fish Department records. Fortunately, the Tonto National Forest and Arizona Game and Fish Department unit boundaries coincide fairly well. Units 22 and 23 are exclusive to the Tonto. Almost all the wildland in Unit 21 is within the Tonto. About 80% of Unit 24A is within the Tonto. So for the planning exercise it was assumed that the harvest records for the four units reflected wildlife produced on the Tonto National Forest.

The habitat information came from the various Arizona Game and Fish Department strategic plans which show mapped distributions and densities of game species on the Tonto. In order to predict the various outputs as a result of different management schemes, a set of management scenarios was developed for each species.

During a series of meetings with the planning branch of the Arizona Game and Fish Department, a set of conditions and assumptions were developed for each species.

Appendix

Data on distribution, harvest, and hunter or fishermen effort from 1980 was used to determine outputs for the current situation. Other scenarios were Maximize Timber, Maximize Range, and Maximize Wildlife. It was assumed that an option such as Maximize Timber would be implemented in the first decade and carried through the planning horizon. That would result in a habitat condition that would support predicted densities of each species. The change in species populations would result in changes in harvest and effort. The complete set of conditions and assumptions for each scenario and species is contained in the document.

Table 68 shows the annual hunter and fishermen days of output. It is interesting to note that Quail and Cottontail hunting and Warmwater fishing comprise 85% of the current hunting and fishing days and 49% of the RVD's from the Tonto.

The Maximize Wildlife scenario is assumed to represent potential maximum outputs from fish and wildlife. The 1.7 million days from a Maximize Timber option produces 69% of potential and Maximize Range option produces 77% of potential from the Tonto's fish and wildlife resources.

Table 68

Tonto Annual Hunting and Fishing Days by Species and Type Under Various Management Scenarios

	1/ Current	2/ Max. Timber	2/ Max. Range	3/ Max. Wildlife
Elk	406	447	568	5,582
Mule Deer	24,955	26,718	28,040	32,006
Whitetail Deer	9,606	14,106	15,802	23,262
Pronghorn	3	6	6	90
Bighorn Sheep	6	120	120	330
Black Bear	6,613	6,068	3,423	8,246
Mountain Lion	1,296	1,386	1,710	1,692
Turkey	2,833	1,971	4,779	7,612
Javelina	12,311	13,829	13,829	15,337
Dove	16,280	34,188	39,072	48,840
Waterfowl	9,200	9,200	9,920	25,600
Cottontail	116,856	368,983	522,726	614,972
Abert's Squirrel	2,961	4,009	2,405	16,036
Band-Tailed Pigeon	358	250	575	1,074
Quail	111,440	298,135	340,726	425,908
Coldwater Fishing	64,025	90,403	77,214	129,970
Warmwater Fishing	581,357	880,756	880,756	1,180,155
TOTAL:	960,508	1,750,515	1,941,671	2,536,712

1/ From Arizona Game and Fish Department data of 1980.

2/ Predicted to occur by the year 2030.

3/ The Maximize Wildlife Scenario is assumed to represent potential maximum outputs.

In order to get figures comparable to other functions, it was necessary to revise hunting and fishing days to Recreation Visitor Days (RVD's). An RVD is defined as 12 hours at a specific activity. A three day fishing trip may be one fishing RVD and five camping RVD's because only four hours per day was spent fishing.

Appendix

Using Arizona Game and Fish Department data, the hunting and fishing days were converted to RVD's. Table 69 shows the annual wildlife RVD's of outputs under various management scenarios. Non-consumptive wildlife use such as bird watching or enjoying sight of a deer are also included. Non-consumptive use is 67% of consumptive use. Again the maximized wildlife scenario is assumed to represent maximum potential. The timber option produces 1,027,760 RVD's from the fish and wildlife resource and achieves 69% of potential. The range option produces 1,147,434 RVD's and achieves 78% of potential.

Table 69

Tonto Annual Wildlife 1/ RVD's by Species and Type Under Various Management Scenarios used as coefficients in the FORPLAN Model to predict outputs.

	Current 2/	Max. Timber 3/	Max. Range 3/	Max. Wildlife 3/
Elk	272	300	381	3,721
Mule Deer	14,474	15,496	16,163	18,563
Whitetail Deer	5,572	8,181	9,165	13,492
Pronghorn	2	4	4	52
Bighorn Sheep	4	80	80	221
Black Bear	2,778	2,549	1,438	3,463
Mountain Lion	648	693	855	846
Turkey	1,190	828	2,007	3,197
Javelina	7,140	8,021	8,021	8,895
Dove	4,070	8,547	9,768	12,210
Waterfowl	3,036	3,036	3,274	8,448
Cottontail	38,562	121,764	172,500	202,941
Abert's Squirrel	977	1,323	794	5,292
Band-Tailed Pigeon	90	62	143	268
Quail	46,805	125,217	143,105	178,881
Coldwater Fishing	21,342	30,134	25,738	43,323
Warmwater Fishing	193,786	293,586	293,586	393,385
Non-Consumptive 4/	228,282	412,335	460,348	592,992
TOTAL:	569,050	1,032,156	1,147,470	1,490,190

1/ Recreation Visitor Day = 12 hours of actual hunting or fishing.

2/ From Arizona Game and Fish Department data as of 1980.

3/ Predicted to occur by the year 2030.

4/ Non-consumptive use accounts for 67% of consumptive use.

The RVD outputs were then spread and assigned to the various analysis areas based on a species distribution and density as well as opportunities to enhance habitat in those analysis areas to encourage animal population responses. When put into the S2000 data base and divided by the analysis area acreage, an annual RVD per acre coefficient was generated for analysis in the FORPLAN program runs. The RVD outputs included considerations for ecological feasibility as well as current and projected user demand. The RVD outputs were assumed to be increasing in a linear fashion until the year 2030.

Appendix

TIMBER

The following timber output coefficients were tracked in the FORPLAN model.

FORPLAN Output Code	Output Name	Unit of Measure
X07	Fuelwood Sold (green)	Thousand Board Feet (MBF) Per Year
X08	Dead and Down Fuelwood Sold	MBF/Year
X24	Timber Revenue	Thousand Dollars/Period
X25	Topwood Sold	Thousand Dollors/Period
X30	Ending Inventory	Thousand Cubic Feet/Year
02.	Net Merchantable Timber Volume	Thousand Cubic Feet (MCF)Year
03.	Net Merchantable Inventory	MCF/Year
30.	Ending Inventory Coefficient	MCF/Period
04.	Long Run Sustained Yield	MCF/Period
05.	Net Sawtimber	MBF/Year
06.	Net Products	MBF/Year
07.	Topwood	MBF/Year

LTSY

Long run sustained yield (LTSY) is the amount of commercial timber in thousands of cubic feet (MCF) that can be harvested in perpetuity without significant loss in site productivity. This output varies depending on site productivity, scheduling management intensity, age class distribution and amount of selected suitable acres.

Ending Inventory

The ending inventory coefficient represents average inventory of the regenerated stands. The inventory at the end of the planning horizon must be greater than or equal to the average inventory of the regenerated stands in the long run.

Net Merchantable Timber Volume

Net merchantable timber volume represents the volume of merchantable timber in thousand cubic feet which is scheduled for harvest. It includes both sawtimber and roundwood products. When the non-declining yield constraint is applied the level of timber production is equal to or greater than the harvest for the preceding decade.

Appendix

Net Merchantable Inventory

Net merchantable inventory represents total volume of standing merchantable timber in thousand cubic feet.

Fuelwood

The supply of fuelwood consists of four categories: (1) Non-sawlog species such as pinyon-pine, juniper, and Gambel oak; (2) unsalvaged natural mortality; (3) commercial sawlog species of unmerchantable size surplus to growing stock needs; (4) unmerchantable portion of trees harvested for sawlog and roundwood products.

The Forest does not have a fuelwood inventory upon which to develop an annual sustained harvest schedule. Current estimated annual harvest of fuelwood under commercial sales is 1.9 million board feet, while an estimated 1.8 million board feet of dead and downed material is removed as personal use fuelwood. Currently, use of logging debris for fuelwood is limited because of lack of public preference for the material.

Accessibility is the key factor when considering availability of fuelwood for personal use. Accessible fuelwood for personal use is defined as being within 300 feet of a road or travelway open and suitable for use by four-wheel drive vehicles. A key consideration to meeting the increasing demand for fuelwood is providing road access to areas of currently inaccessible suitable fuelwood producing land. The supply of preferred fuelwood species on currently accessible areas would probably be depleted with the first decade of current or slightly increased rate of demand.

Harvest levels of green fuelwood were estimated by the Forest Silviculturist based on emphasis of individual management prescriptions. Harvest levels of unsalvaged natural mortality (dead and down) were based on professional judgement and fuels inventories.

Topwood sold represents wood left on the ground following commercial timber harvest operations. It was computed on the basis of a 10 percent cull factor of merchantable volume removed. It was assumed only 70 percent of the cull material would be accessible.

Net Sawtimber and Products

The FORPLAN yield coefficients for timber were derived from the results of the RMYLD and SALT models.

Refer to Appendix E for a detailed description of timber harvest scheduling.

Timber Revenue

This output was simply for tracking sawtimber and products values.

FACILITIES

There were no direct engineering outputs modeled in FORPLAN.

Engineering outputs were calculated indirectly based on FORPLAN cost (activity) data. Activity costs for each benchmark and alternative resulted from prescription allocations made by the model and FORPLAN cost coefficients. The costs include road construction, reconstruction, and maintenance, FA&O facility construction, reconstruction and maintenance, and property boundary location and maintenance. Trail construction and reconstruction were coordinated with recreation, with recreation making the entries. Although trails will not be addressed here, procedures followed were similar to roads.

Roads

Major corridors were identified by using a technique known as spiderweb analysis. This approach is a straight line technique of drawing lines from existing or potential resource areas to the demand source. The results are checked against existing corridors. From this initial analysis, determination was made that no additional corridors are needed. Reconstruction of State-Federal highways and Forest arterial and collector roads, generally fall within existing rights-of-way on corridors.

Minimum Cost Analysis (MINCST) followed. This is a computer program designed to provide analysis on transportation networks based on economics, time and distance. The program is designed to analyze access routes from the demand source to the resource location and compare various alternatives of road standards and maintenance levels as a result of overall transportation costs (construction/reconstruction, maintenance and user or haul costs). One MINCST computer run was made on the existing system. Local roads are project-oriented and, therefore, were not analyzed in the corridor analysis. Regional and Forest averages for road construction, reconstruction, maintenance and user costs and allowances for varying terrain, construction material and vegetation type resulted in the development of unit costs for construction, reconstruction and maintenance. Unit costs for local roads were developed from previous contracts and Regional averages. Unit costs for road obliteration was developed from estimated costs for work to be done and materials needed.

Actual road mileage and standard needs and subsequent costs by FORPLAN analysis area (AA) were determined based on the analysis above and standards and guidelines for the various resources involved by AA (S&G were developed for all AA's at all prescription levels). These cost coefficients were entered into FORPLAN under FORPLAN activity codes to run the model.

FA&O Facilities

A list of buildings and other facilities was prepared from historical records. Condition surveys were used to establish and analyze what maintenance, reconstruction, construction, obliteration was required. In addition, a long-term facility construction/reconstruction program was made and priorities based on need were established. This program was then incorporated into the Forest planning process. Capital investment analysis was made for the construction and reconstruction of these structures. Cost estimates for construction/reconstruction were based on current construction costs and used for calculating annual cost in FORPLAN. These costs for construction/reconstruction of facilities were entered in the model under Activity Code 501. The costs of upgrading facilities were entered under Activity Code 500 for each of the planning levels.

Facility and radio maintenance was based on near current level for all prescription levels except Low Intensity.

Sanitary and condition surveys were the basis of upgrading or reconstructing the Forest Potable Water systems to meet the existing legislation.

Land Line location

A property boundary location program was developed based on needs and by priority. Approximately 885 miles of property boundary need to be surveyed and posted to standard. This program was planned to be completed by 2020.

A unit cost for property boundary survey was developed from previous contracts and fieldwork.

Appendix

ECONOMIC EFFICIENCY ANALYSIS

Present Net Value

Present net value (PNV) is the measure of economic efficiency used to maximize benefits realized from management of the Forest. It is defined as the discounted difference between the dollar value of all priced outputs and the dollar value of all expenditures for management and investment. The greater the PNV, the greater the net economic return.

Priced outputs that are included in PNV are all recreation visitor days (RVD), permitted livestock use in animal unit months (AUM), timber in thousands of board feet (MBF), roundwood products (MBF), fuelwood (MBF), and water yield (acre-feet). It does not include nonpriced benefits such as threatened and endangered species habitat maintenance or enhancement, reduction in soil loss, natural and scientific areas, historical sites, or visual quality in excess of full service-day standards. These nonpriced benefits together with the sum of PNV yield net public benefit, which is a more inclusive measure of total social welfare.

In the FORPLAN model priced outputs are made up of assigned as well as market values. Assigned values are necessary for outputs where no well-defined market exists. Outputs with assigned values are: Water yield, and dispersed, wilderness and wildlife recreation. Market prices and outputs include developed recreation, sawtimber, roundwood products, fuelwood and permitted use AUM's. All dollar values displayed are based on a four-percent discount rate as established by the Chief of the Forest Service.

The dollar values used in calculating PNV are defined as the "willingness-to-pay price," whether or not that price is actually collected by the Forest. PNV is, therefore, not synonymous with cash flow. The willingness-to-pay values represent potential dollar returns to the taxpayers. Thus, they are one measure of the benefits associated with the production of priced outputs. Another kind of effect includes net cash return and annual budget requirements. A third effect includes the implications to employment, income and social changes in communities affected by the management of the Forest. A fourth effect includes the physical and environmental consequences both on and off the Forest. It is only when all effects have been evaluated that a judgement of net public benefits or costs is possible.

Cost efficiency is a driving force in planning. Assumptions were necessary in determining projected future use levels and prices and costs to develop cost efficient prescriptions. Current use and supply levels were assumed to be at or near equilibrium. Anticipated levels of future use were developed for the Analysis of the Management Situation. Projected future use was derived from historical use, industry projections and input from Forest and Regional Office specialists. Standards and guidelines were developed to satisfy current and future use while still maintaining resource objectives.

PNV is a measure of the cost-efficient use of the Forest resources. However, resource management must be based on sound biological, physical, and social principles as well. Because it is not possible to assign dollar values to all resources, the final decision is the quantifiable PNV plus consideration of the non-quantifiable Forest resources.

A comparison of cumulative benefits, costs, and present net value between benchmarks is displayed in Table 74 of this appendix. Economic efficiency between alternatives in relationship to the max PNV assigned value benchmark displayed in Table 10, Chapter 2.

Appendix

Benefit Values

Outputs and benefit values displayed in Table 70 were tracked in FORPLAN. Benefit values were developed from the 1985 RPA Program. All values are in terms of 1980, 4th quarter dollars.

Wildlife recreation benefits were calculated as a weighted average of big game use, other game use, nongame use, and warm water fishing use.

Non-wildlife and wilderness dispersed recreation benefits were calculated as a weighted average use figure for urban, rural, roaded natural, semi-primitive motorized, semi-primitive non-motorized, and primitive ROS classes. These were further categorized according to the ratio of full service and reduced service levels for low intensity, current, and maximum recreation emphasis prescriptions. The assumption was made that in prescriptions which emphasized other resource outputs current recreation emphasis would be maintained.

Wilderness dispersed recreation use benefits were calculated as a weighted average use figure for semi-primitive motorized, semi-primitive, and primitive ROS classes. These were further categorized according to the ratio of full service and reduced service levels for low intensity, current, and maximum recreation emphasis prescriptions.

Developed recreation benefits were calculated as a weighted average use figure for urban, rural, and roaded natural, ROS classes. These were further categorized according to the ratio of full service and reduced service levels for low intensity, current, and maximum recreation emphasis prescriptions. The assumption was made that in prescriptions that emphasized other resource outputs current recreation emphasis would be maintained.

All benefit values remained constant throughout the planning horizon and are realized on site where they occur.

Sawtimber benefit values on a weighted average of all species harvested. Values used for cable logging are reduced to reflect the higher cost for cable operations compared to conventional tractor logging. Topwood sold represents fuelwood in the form of cull material left on the ground following commercial timber harvest operations.

Soil loss was modeled as a negative benefit (cost) of $4.55 per thousand tons. Significant differences in PNV did not occur from valuing soil loss.

Minerals values were calculated outside the model for energy related leases, locatable minerals, and mineral materials. The benefit value used for energy related leases was $1.82 per acre. The benefit value used for locatable minerals was five-percent of market value. Market values for locatable minerals were computed on the basis of actual production and the "willingness-to-pay concept" for maintaining staked mining claims. The benefit value used for minerals materials was $2.82 per ton.

PNV for minerals was computed using the following discount factors:

FORPLAN Period	Length (years)	Mid-point Year Discount Factor at 4%
1	10	.8219
2	10	.5553
3	10	.3751
4	10	.2534
5	10	.1712
6	50	.0528
7	50	.00743
8	50	.00105

The assumption was made that mineral outputs would remain constant between alternatives.

Appendix

Table 70

FORPLAN Outputs and Benefit Values

FORPLAN Output Code	Output Name	Unit of Measure	Benefit Value (1980, 4th Quarter Dollars)
X07	Fuelwood Sold (green)	Thousand Board Feet (MBF)/ Year	7.06/MBF
X08	Dead and Down Fuelwood Sold	MBF/Year	7.06/MBF
X09	Dispersed Recreation, low intensity, non-wildlife and wilderness	Thousand Recreation Visitor Days (MRVD)/Year	5.11/RVD
X10	Wildlife Dispersed Recreation	Recreation Visitor Days (RVD)/Year	14.57/Wildlife-Fish User Day
X11	Wilderness Dispersed Recreation, low intensity	MRVD/Year	6.64/RVD
X12	Developed Recreation, low intensity	MRVD/Year	4.91/RVD
X13	Grazing Capacity	Animal Unit Months (AUM)/Year	No benefit value assigned
X14	Permitted Use	AUM/Year	8.16/AUM
X16	Water Yield	Thousand Acre Feet/Year	39.60 Acre Foot
X18	Developed Recreation, current management	MRVD/Year	7.08/RVD
X19	Developed Recreation maximum intensity management	MRVD/Year	9.25/RVD
X20	Dispersed Recreation, current, non-wilderness and wildlife	MRVD/Year	7.38/RVD
X21	Dispersed Recreation, maximum intensity management, non-wilderness and wildlife	MRVD/Year	9.64/RVD
X22	Wilderness Dispersed Recreation, current management	MRVD/Year	10.02/RVD
X23	Wilderness Dispersed Recreation, maximum intensity management	MRVD/Year	12.52/RVD
X24	Timber Revenue	Thousand Dollars/Period	See Output 05. and 06.
X25	Topwood Sold	Thousand Dollars/Period	See Output 07.
X30	Ending Inventory	Thousand Cubic Feet/Year	No benefit value assigned

Table 70 (continued)

FORPLAN Outputs and Benefit Values

FORPLAN Output Code	Output Name	Unit of Measure	Benefit Value (1980, 4th Quarter Dollars)
02.	Net Merchantable Timber Volume	Thousand Cubic Feet (MCF)/Year	No benefit value assigned
03.	Net Merchantable Inventory	MCF/Year	No benefit value assigned
30.	Ending Inventory	MCF/Period	No benefit value assigned
04.	Long Run Sustained Yield	MCF/Period	No benefit value assigned
05.	Net Sawtimber	MBF/Year	148.83/MBF Tractor logging 108.83/MBF Cable logging
06.	Net Products	MBF/Year	8.19/MBF
07.	Topwood	MBF/Year	7.06/MBF

Appendix

Costs

The Tonto National Forest model includes costs for all activities. Costs were based on Forest budget data for Fiscal Years 1980, 1981, and 1984. Most costs varied with the prescription applied; because, the types of investment, level of operations and maintenance, personnel staffing, and other activities depend upon the management practices and intensities prescribed. Those costs, which do not depend on the analysis area or prescription (e.g., law enforcement administration), were incorporated into Forest-wide prescriptions; these costs varied some by alternative.

Some costs, such as operation and maintenance, occur annually. Other costs, such as reconstruction, occur periodically. Capital investment costs may occur at irregular intervals. Investment and periodic costs were incorporated within the decade in which they occurred, so that they could be added to annual costs. The resulting annual value was assumed to remain constant for that decade.

All costs are valued as 4th quarter 1980 dollars. It was assumed that costs remain constant throughout the planning horizon.

Activities tracked in FORPLAN are displayed in Table 71.

Appendix

Table 71

FORPLAN Activities (Costs)

FORPLAN Activity Code	Activity	Unit of Measure	Activity Description
10 A	Developed Recreation-Operation & Maintenance	Thousand Dollars (M$)/Year	Includes expenditures for the management, operation, and maintenance of developed recreation and visitor information recreation facilities. Includes planning and inventory, administration, operation, maintenance, visual resource management, resource treatment, administration of recreation special use permits, and collection of recreation area use revenues.
10 +	Developed Recreation Construction-Reconstruction	M$/Year	Includes capital investments necessary to complete proposed developments under a high level of recreation emphasis in analysis areas 3200, 3201, 5200, 5300, 5306, 5506, and 6001.
10 B	Dispersed Recreation	M$/Year	Includes expenditures for the management, operation, and maintenance of dispersed recreation and visitor information recreation facilities. Includes planning, inventory, administration, operation, maintenance, visual resources management, resource treatment, administration of special use permits.
10 C	Cultural Resource Management	M$/Year	Includes expenditures for the management, protection, and enhancement of cultural sites for public and scientific use. Includes planning, inventories, evaluation, protection, and enhancement.
10 D	Trail Maintenance (Non-wilderness)	M$/Year	Includes expenditures for maintenance of trails and trail bridges that are included in the Forest development trail system.
10 E	Trail Construction-Reconstruction	M$/year	Includes expenditures for construction and reconstruction of trails. Includes bridges, retaining walls, rights-of-way, trailhead facilities, and similar structures necessary for visitor use, safety, and resource protection. Includes preconstruction, construction, and construction engineering.
10 F	Interpretative Service	M$/Year	Includes expenditures for the management, operation, maintenance and planning of interpretative services facilities.
10 G	Dispersed Recreation-Construction	M$/Year	Includes capital investments necessary to encourage dispersed use away from heavily used areas and to provide site protection in heavily used dispersed areas.

Appendix

Table 71 (continued)

FORPLAN Activities (Costs)

FORPLAN Activity Code	Activity	Unit of Measure	Activity Description
50 A	Wilderness Management	M$/Year	Includes expenditures for management, operation, and maintenance of the wilderness resource and related facilities. Includes planning, inventory, administration, operations, and maintenance. Does not include expenditures for the management, operation, and maintenance of other resources and related facilities within the wilderness area.
50 B	Wilderness Trail Maintenance	M$/Year	See Activity Code 10 D.
50 C	Wilderness Trail Construction-Reconstruction	M$/Year	See Activity Code 10 E.
080	Wildlife Operation and Maintenance	M$/Year	Includes expenditures for planning, management, administration, and maintenance of wildlife and fish habitat improvements.
100	Fish Habitat Improvement	M$/Year	Includes expenditures for structural and nonstructural improvements that benefit fisheries other than Threatened and Endangered species. Includes special fish cultural measures as authorized under the Knutson-Vanderberg Act of June 9, 1930 as amended.
110	Wildlife Habitat Improvement Current Level	M$/Year	Includes expenditures for structural and nonstructural improvements that benefit wildlife other than Threatened and Endangered species. Includes special wildlife cultural measures as authorized under the Knutson-Vandenberg (K-V) Act of June 9, 1930 as amended.
111	Wildlife Habitat Improvement High Level	M$/Year	See Activity Code 110 above.
120	Threatened and Endangered Species Operation and Maintenance	M$/Year	Includes expenditures for surveys, planning, and management of Threatened and Endangered animals, fish, and plants.
121	Threatened and Endangered Species Habitat Improvement	M$/Year	Includes expenditures for structural and nonstructural improvements that benefit Threatened and Endangered animals, fish, and plants. Includes special endangered species cultural resources as authorized under the Knutson-Vandenberg Act of June 9, 1930 as amended.
140	Range Operation & Maintenance	M$/Year	Includes expenditures for managing the forage resource used by domestic livestock, including maintenance of range structural improvements, allotment management, range analysis, planning and administration.

Table 71 (continued)

FORPLAN Activities (Costs)			
FORPLAN Activity Code	Activity	Unit of Measure	Activity Description
150	Range Improvements	M$/Year	Includes expenditures for construction of improvements for range management purposes, including fences, water development, and other range structures, revegetation of lands to establish forage cover, including re-establishing forage cover by natural revegetation, forage maintenance, and temporary protective fence construction and maintenance until area is open to grazing.
151	Range Permittee Costs	M$/Year	Includes permittee expenditures for structural and non-structural range improvements.
160	Fuelwood Survey	M$/Year	Includes expenditures to complete a fuelwood inventory during the first planning period.
161	Reforestation	M$/Period	Includes expenditures for treatments and activities for tree stand establishment. This includes field planting, field seeding, site preparation, animal control, planting stock purchase, survival examinations, and other work to facilitate reforestation.
162	Timber Stand Improvement	M$/Period	Includes expenditures for non-commercial, intermediate cuttings, and other treatments to improve the composition, constitution, condition, and increment of a timber stand.
164	Insect and Disease	M$/Year	Includes expenditures for planning, directing, and coordinating the Insect and Disease Management Program. Includes detection and evaluation surveys.
166	Timber Management	M$/Period	Includes expenditures for timber sale preparation, timber sale administration, timber management plans, silvicultural examinations, timber purchaser road reconstruction, and road construction engineering.
220	Soil/Water Management	M$/Year	Includes expenditures for soil and water resource planning, evaluation monitoring, administration, inspection and maintenance of soil and water improvements, including dams. Includes developing and administering plans for soil and water resource improvement, special studies, and monitoring the effects of land use on the soil and water resource.
230	Soil/Water Improvements	M$/Year	Includes expenditures for restoring and improving soil and water resources on Forest Service administered lands. Includes measures to improve or restore the quality of productivity of the soil, reduce erosion, and improve the quantity or timing of waterflow.

Appendix

Table 71 (continued)

FORPLAN Activities (Costs)			
FORPLAN Activity Code	Activity	Unit of Measure	Activity Description
231	Road Closure Projects	M$/Year	Includes expenditures for reducing erosion and restoring productivity of the soil.
270	Energy Minerals Management	M$/Year	Includes expenditures for oil and gas, coal, geothermal, and uranium minerals. Includes administration of permits and leases.
271	Energy Mine Rehabilitation	M$/Year	Includes expenditures for land reclamation of abandoned claims.
280	Non-Energy Minerals Management	M$/Year	Includes expenditures for non-energy minerals, minerals materials, and administration of permits and leases. Also includes, mining law compliance and administration.
281	Non-Energy Mine Rehabilitation	M$/Year	Includes expenditures for land reclamation of abandoned mines and claims.
350	Forest Fire Protection	M$/Year	Includes expenditures for fire prevention, detection, maintenance of fire equipment and inital attack forces, and supporting fire aviation operations for inital attack.
351	Emergency Forest Fire Funds	M$/year	Includes all expenditures for suppressing fires on or endangering Forest Service administered lands. Includes false alarms, purchasing, reconditioning, and replacement of equipment and supplies expended or necessary for actual suppression.
360	Fuel Treatments	M$/Year	Includes expenditures to dispose, reduce, manipulate and/or modify forest fuels and for fire management.
380	Forest Law Enforcement	M$/Year	Includes expenditures for the enforcement of laws governing the management of National Forest lands.
381	Coop Law Enforcement	M$/Year	Includes expenditures for the enforcement of State and local law on National Forest System lands as provided for by agreements with States or political subdivisions thereof.
410	Land Management Planning	M$/Year	Includes planning for the Land Management Plan, compliance with the National Environmental Policy Act, and implementation of the Land Management Plan.
420	Land Ownership Management	M$/Year	Includes expenditures for processing, approval and administration of permits. Includes leases, easements, admendments, rights-of way grants, and Federal Energy Regulatory Commission license and permits. Also includes, expenditures for land status maintenance, land ownership planning and exchange proposals.

Table 71 (continued)

FORPLAN Activities (Costs)

FORPLAN Activity Code	Activity	Unit of Measure	Activity Description
421	Land Line location	M$/year	Includes expenditures necessary to identify legal boundaries of National Forest lands. Specific items include corner search, boundary location, and related maintenance.
470	Existing Road Operation and Maintenance	M$/Year	Includes expenditures for system inventory, transportation system planning, and maintenance of roads included on the National Forest.
471	Existing Road Closures	M$/Year	Includes expenditures to implement Level 1 management of roads Forest-wide.
480	Road Construction-Reconstruction.	M$/Year	Includes expenditures for construction and reconstruction of system roads primarily for recreation purposes.
501	Facilities-Capital Investments	M$/Period	Includes expenditures for the construction of offices, dwellings, warehouses, and other related facilities.
520	Facilities Maintenance	M$/Year	Includes expenditures for the maintenance of structural improvements used for fire and general administrative purposes such as offices, dwellings, lookout towers, warehouses, fences, water systems, telephone systems, and other related facilities.
550	General Administration	M$/Year	
552	On Site Soil Loss	M$/Year	

Appendix

ANALYSIS
PRIOR TO
FORMULATION
OF ALTERNATIVES

Overview

Minimum Management Requirements

The regulations for the National Forest Systems Land and Resource Management Planning [36 CFR 219] specifies: 1) The minimum legal management requirements to be met for accomplishing the goals and objectives of the National Forest System [36 CFR 219.17]; 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 Forest complied with [36 CFR 219.27] primarily within the specific standards and guidelines associated with the individual resource management practices developed for prescription levels. No constraints were used in the analysis model to achieve MMR's.

The Low intensity prescription level contains the standards and guidelines for mitigation measures required to be present in all prescriptions. The Low intensity level is the least management activity and cost to meet legal requirements. Therefore, Low intensity level standards, activities, costs and outputs are the minimum to be met 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 minimum resource integration requirements specified in [36 CFR 219.14 through 219.26] were achieved through the Forest's planning process and in prescription standards and guidelines.

Social Impact Analysis

Social Impact Analysis is defined in FSM 1973 as "the determination of how Forest Service policies and actions affect the quality of people's lives or social well-being. The primary goal is to enable managers to take into account important social concerns in making decisions. Social 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."

The objectives of social impact assessment are to:

- Determine in a systematic manner the social effects of Forest Service planning and decision-making.
- Provide the decision-maker with an assessment of social effects which can be considered along with the assessments of economic, physical, and biological effects in order to make a balanced decision which promotes the goal of attaining "productive and enjoyable harmony between man and his environment."

- Satisfy the requirements of the law (NEPA, NFMA, CEQ) and of Forest Service policy (FSM 1973).

The following steps are used in the social analysis:

- Delineate geographic zones of influence that will be used to assess the effects of National Forest management on social variables. The first zone is the primary zone which is made up of the multi-county area (used in IMPLAN) and the sub-areas, a breakdown of local areas having a strong dependence on the National Forest.

- The secondary zone of influence comes from outside the primary zone, consisting of non-local and generally amenity uses.

- The third zone is the Native American and consists of the Indian tribes or groups using the Forest.

- Eight social variables affected by National Forest management are evaluated for each alternative. The variables are:

  Employment
  Income
  Population
  Community Lifestyle
  Social Oraganization
  Relationship to Minority Groups
  Land Use Patterns
  Attitudes, Beliefs, Values

Alternatives will be measured against the current situation baseline for each variable.

Economic Impact Analysis

The IMPLAN model is used to respond to the [36 CFR 219] Planning Requirements for Economic Impact Analysis. It has been designed to provide the planning analyst with the capability to construct a regional input-output model for any applicable area, and perform evaluations of potential economic effects in support of the planning process.

The outputs for each alternative (FORPLAN results) are entered into the IMPLAN model. The resulting figures for employment, income and population are evaluated against the current situation baseline for effects on the sub-areas.

The inputs used by the IMPLAN model are:

  Timber, Sawtimber (MMBF)
  Timber, Products (MMBF)
  Fuelwood, Commercial (MMBF)
  Fuelwood, Personal (MMBF)
  Picnicking-Resident (MRVD)
  Picnicking-Non Resident (MRVD)
  Camping-Resident (MRVD)
  Camping-Non Resident (MRVD)
  Skiing Downhill-Resident (MRVD)
  Skiing Downhill-Non Resident (MRVD)
  Disp, Non-Motor Rec-Resident (MRVD)
  Disp, Non-Motor Rec-Non Resident (MRVD)
  Disp, Motor Rec-Resident (MRVD)
  Disp, Motor Rec-Non Resident (MRVD)
  Snowmobiling (MRVD)

Appendix

Hunting, Big Game-Resident (MRVD)
Hunting, Big Game-Non Resident (MRVD)
Hunting, Small Game (MRVD)
Wildlife, Non-Game (MRVD)
Fishing-Resident (MRVD)
Fishing-Non Resident (MRVD)
Livestock, Cow/Calf (MAUM)
Livestock, Yearling (MAUM)
Livestock, Sheep (MAUM)

The outputs are changes in employment and income (Forest Service generated) by sector. Eighty-nine sectors are impacted in the Forest Service program. The most significantly impacted sectors are shown in tables in Chapters 3 and 4. They are:

Logging and Sawmills,
Wholesale Trade,
Retail Trade,
Lodging,
Restaurants and Bars,
Amusement and Recreation,
Livestock, and
Oil and Gas Development

The social analysis is conducted in accordance with "Guidelines for Social Impact Assessment", Region 3.

The economic analysis is based on the "IMPLAN User's Manual", August 1982 and IMPLAN, the Forest Service Model to assess economic impacts required by NEPA, NFMA, and to help assess demand. The analysis is conducted in accordance with "Guidelines for Social Impact Assessment", Region 3.

A social impact assessment panel was formed to assess the social impacts on: Lifestyle, social organization, land use patterns, and attitudes, beliefs and values. The panel met originally to review the draft of the current situation (Chapter 3) and then later to review the affects of the management alternatives The panel was given employment and income data, a draft report and some additional information from the ID team. Under their guidance, an analysis was written and reviewed. Refer to Chapter 4 of the Environmental Impact Statement.

Benchmark Analysis

Early in the planning process an analysis of the management situation was completed to determine the ability of the planning area to supply goods and services [36 CFR 219.5 (e)]. The purpose of the analysis was to evaluate all potentials for multiple use in formulating a resonable range of alternatives. Eighteen benchmarks representing a broad range of feasible options were generated through the FORPLAN model to identify opportunities for resolution of issues, concerns, and opportunities; and, to delineate the limits of the decision space in which feasible alternatives for resource mixes could be considered, given physical, biological, and legal criteria.

This analysis projected maximum economic physical and biological resource uses and development opportunities; and current and low intensity management emphasis. Maximum benchmark analysis falls into two categories. The first, monetary benchmarks, projected maximum present net value of those resources having an established market value or an assigned value. Biological and physical benchmarks, maximized outputs of timber, recreation, wildlife, range, watershed condition and water yield. The benchmark analyses do not reflect the Arizona Wilderness Act. Roadless areas were allowed to be chosen for various management emphases and not restricted to wilderness.

Appendix

Table 72 provides a description of each benchmark developed. Each description includes an objective function. When the objective function specifies assigned values it includes resources having either an established market value or an assigned value. When the objective function specifies market values it includes only those resources having an established market value.

Table 73 displays benchmark outputs in decreasing order of present net value. The percent difference in the first period output from the maximum present net value (assigned values) benchmark is also shown.

Table 74 displays present net value, present value cost, and present value benefits in decreasing order of present net value and compares benchmarks to the maximum present net value (assigned values) benchmark. The percent difference in present net value from the maximum present net value benchmark is also shown.

Table 75 compares the market and non-market outputs of the maximum present net value (market values) and the maximum present net value (assigned values) benchmark.

Table 76 displays the number of acres applied by management emphasis.

Table 72

Benchmark Descriptions

Purpose	Objective Function	Constraint	Discussion
Maximize Level Benchmark			
Defines the least cost program for keeping the Forest in public ownership.	None - This level was determined outside the FORPLAN model. Management prescriptions were not developed. PNV was hand calculated for comparison with other benchmarks and alternatives.	None	This benchmark provides for protecting life, health, and safety of incidental users, prevention of environmental damage to adjoining land or downstream areas, and administration of established special uses and minerals. This benchmark identifies naturally occurring outputs that are harvested without direct management actions and any associated costs. Outputs of water, minerals, dispersed and wildlife related recreation use, and soil loss were estimated. Costs of administering the land at minimum levels was estimated. All estimates were made by the Interdisciplinary Team.

Table 72 (continued)

Benchmark Descriptions			
Purpose	Objective Function	Constraint	Discussion
Maximize Period 1 Timber (Benchmark 3)			
To maximize net merchantable timber in thousand cubic feet in Period 1.	Maximize net merchantable timber in thousand cubic feet in Period 1. Then a Max PNV rollover run was done. This locks in the output level of the objective function on the preceding run, and develops a new solution that maximizes PNV with assigned values.	Timber Non-declining yield; culmination of mean annual increment; long-term sustained yield-link; ending inventory.	This benchmark was used for timber analysis purpose. Refer to Appendix E.
Max PNV Assigned Values (Benchmark 5)			
To project future resource uses, outputs and costs which will maximize Present Net Value (PNV) based on those resources having an established market value or an assigned value.	Maximum Present Net Value (assigned values) for 8 periods.	Timber Non-declining yield, culmination of mean annual increment; long run sustained yield-link; ending inventory.	This is a monetary benchmark. The PNV produced in this run is used as the reference point to evaluate the impact on PNV resulting from constraints applied in other runs. This run represents the most cost-efficient manner of managing the Forest based on resources having an established market or assigned value, and the associated costs of producing those resource outputs. This benchmark favorably addresses concerns about recreation, water yield, timber, fuelwood, wildlife habitat, and riparian habitat.
Evaluation of Non-declining Yield (Benchmark 6)			
To determine the opportunity cost of maintaining base sale schedule of timber harvest equal to, or greater than, the planned sale for the preceding decade.	Maximum Present Net Value (assigned values) for 8 periods.	Timber Culmination of mean annual increment and ending inventory.	This run is compared with the MAX PNV assigned value benchmark to determine the opportunity cost of the non-declining yield constraint.

Table 72 (continued)

Benchmark Descriptions			
Purpose	Objective Function	Constraint	Discussion
Max PNV Market Values (Benchmark 7)			
To project future resource uses, outputs, and costs which will maximize Present Net Value of those outputs which have an established market value. Market prices are assigned to sawtimber and roundwood products, fuelwood, permitted use, and developed recreation use.	Maximize Present Net Value (market values) for 8 periods.	Timber Non-declining yield, culmination of mean annual increment; long-run sustained yield; ending inventory.	This is a monetary benchmark. this run represents the most cost efficient method of managing the Forest based on resources having established market values, and the associated costs of producing those resource outputs. It serves as a basis for comparing quantities of market outputs with those in the maximum Present Net Value (assigned value) Benchmark. This benchmark provides a limited level of issue resolution in timber and recreation.
Low Budget (Benchmark 8)			
To define the lower end of the feasible legal decision space.	Maximize Present Net Value (assigned values) for 8 time periods.	Timber Non-declining yield, culmination of mean annual increment long-term sustained yield, ending inventory. Budget Less than or equal to 75 percent of current direction benchmark for the first 5 time periods. Prescriptions Only low intensity prescriptions were allowed into solution.	This benchmark meets only minimum management standards required by regulation. It establishes the base level for all resource outputs. All other alternatives meet or exceed these levels. This benchmark does not respond to issues and concerns.

Table 72 (continued)

Benchmark Descriptions			
Purpose	Objective Function	Constraint	Discussion
Current Direction (Benchmark 9)			
To evaluate the consequences of continuing with the current management program.	Maximize Present Net Value (assigned values) 8 time periods.	Timber Non-declining yield, culmination of mean annual increment, long-term sustained yield, ending inventory. Net merchantable timber volume harvested in thousand cubic feet in the first two decades constrained to be no greater than the quantity specified in the current timber management plan. Budget Average annual budget for the first two time periods constrained to current budget, 7.3 million dollars. Prescription Only current management prescriptions were allowed into solution.	This is the No Action alternative. It establishes a base line from which to measure changes in current management emphasis.
Max Timber Minimize Cost (Benchmark 11)			
To produce the maximum level of net merchantable timber volume in thousand cubic feet at least cost without maintaining non-declining yield.	The model was first run with the objective function of maximizing timber production over the planning horizon. Then the model was constrained to meet the levels of timber production achieved with the timber objective while minimizing discounted costs over the planning horizon.	Timber Culmination of mean annual increment, ending inventory.	This benchmark provides a basis for determining opportunity costs associated with producing high levels of timber harvest at least cost. The least cost objective is significant on the Tonto when only 3 percent of the land base is classified as suitable for commercial timber production. This level of management does not respond to issues and concerns, or provide an integrated mix of resource outputs.

Table 72 (continued)

Benchmark Descriptions			
Purpose	Objective Function	Constraint	Discussion
Max Timber-Max PNV (Benchmark 12)			
To maximize Present Net Value while maintaining high levels of merchantable timber volume in thousand cubic feet without maintaining non-declining yield. No limits are placed on demand. Supply is limited to the biological capability of the ecosystem to produce on available and suitable lands.	Maximize timber production for 8 time periods. Then do a Max PNV rollover.	Timber Culmination of mean annual increment, ending inventory.	This benchmark represents the most cost efficient method of managing the Forest under an objective of maximizing the biological potential of the timber resource. It also gives a basis for determining the opportunity costs associated with this objective. This benchmark favorably addresses concerns about recreation, water yield, fuelwood, wildlife habitat, and riparian habitat.
Max Long Run Sustained Yield (LRSY) (Benchmark 14)			
To maximize Present Net Value while maintaining a high level of long run sustained yield.	Maximize LRSY. Then do a Max PNV rollover.	Timber Culmination of mean annual increment, ending inventory.	This benchmark was used for timber analysis purposes. Refer to Appendix E.
Max Grazing Capacity (Benchmark 15)			
To project the maximum potential of the Forest to produce grazing capacity in animal unit months. No limits are placed on demand. Supply is limited to the biological capability of the ecosystem to produce on suitable lands.	Maximum grazing capacity for 8 time periods.	Timber Culmination of mean annual increment, ending inventory. On suitable forest lands under 40 percent slope only timber scenario 1 allowed into solution. Refer to Appendix E, Financial Analysis for detailed discussion of timber management intensities.	This is a biological benchmark. It establishes the high level of grazing capacity to be used for emphasizing grazing outputs on the Forest while integrating other resource outputs in a cost effective manner.

Table 72 (continued)

Benchmark Descriptions

Purpose	Objective Function	Constraint	Discussion
Max Grazing Capacity-Max PNV (Benchmark 16)			
To maximize Present Net Value while maintaining a high level of grazing capacity.	Maximize Present Net Value (assigned values) for 8 time periods.	Timber Same as the max grazing capacity benchmark. Range Floor on grazing capacity in thousand animal unit months equal to or greater than 98% of the biological potential over 8 time periods established in the max grazing capacity benchmark. Period 1/ 1 2 3 4 5 6 7 8 256 257 266 284 301 301 301 301	This benchmark represents the most cost efficient method of managing the Forest under an objective of maximizing the biological potential of the range resources. It also provides a basis for determining the opportunity costs associated with this objective. This benchmark is highly responsive to concerns expressed about grazing.
Max Wildlife (Benchmark 17) To protect the maximum potential of the Forest to produce wildlife and fish user days. Supply is based on habitat condition and management intensity. Arizona Game and Fish comprehensive plans provide the base line to judge if the Forest can meet demand.	Maximum wildlife and fish user days for 8 time periods.	Timber Culmination of mean annual increment, ending inventory. On suitable forest lands only timber scenario's 2 and 3 allowed into solution. Scenario 3 was assigned a lower bound of 19,000 acres and an upper bound of 20,000 acres. Refer to Appendix E, Financial Analysis for detailed discussion of timber management intensities.	This is a biological benchmark. It establishes the high level of wildlife and fish user days to be used for emphasizing wildlife outputs on the Forest.

1/ Periods 1 through 5 are each 10 years in length. Periods 6, 7, and 8 are each 50 years in length. Floor on grazing represents average annual values.

Table 72 (continued)

Benchmark Description			
Purpose	Objective Function	Constraint	Discussion
Max Wildlife-Max PNV (Benchmark 18)			
To maximize Present Net Value while maintaining a high level of emphasis on wildlife resources.	Maximize Present Net Value (assigned values) for 8 time periods.	Timber Same as the max wildlife benchmark. Wildlife Floor on wildlife and fish user days in thousand days equal to or greater than 98% of the biological potential over 8 time periods established in the max wildlife benchmark.	This benchmark represents the most cost efficient method of managing the Forest under an objective of maximizing the biological potential of wildlife. It also provides a basis for determining the opportunity costs associated with this objective. This benchmark specifically addresses issues regarding wildlife and riparian habitat.

Period 1/							
1	2	3	4	5	6	7	8
743	853	964	1075	1185	1185	1185	1185

1/ Periods 1 through 5 are each 10 years in length. Periods 6, 7, and 8 are each 50 years in length. Floor on wildlife and fish user days represents annual average values.

Table 72 (continued)

Benchmark Description			
Purpose	Objective Function	Constraint	Discussion
Max Watershed Condition-Max PNV (Benchmark 20)			
To maximize Present Net Value while emphasizing watershed condition Forest-wide.	Maximize Present Net Value (assigned values) for 8 time periods.	Timber Culmination of mean annual increment, ending inventory. On suitable forest lands only timber scenario 2 allowed into solution. Refer to Appendix E, Financial Analysis for detailed discussion of timber management intensities. Prescription Controls The model was constrained to consider those prescriptions that emphasize watershed condition.	This benchmark represents the most cost efficient method of managing the Forest under an objective of emphasizing management prescriptions which accelerate soil stabilization and incorporate special watershed restoration projects. It also provides a basis for determining opportunity costs associated with this emphasis. This benchmark is highly responsive to concerns expressed about water quality and soil productivity and stability.
Max Water Yield (Benchmark 21)			
To project the maximum potential of the Forest to produce water. No limit is placed on demand. Supply is limited to the biological capability of the ecosystem to produce on suitable lands.	Maximize water yield in acre feet for 8 time periods.	Timber Culmination of mean annual increment, ending inventory. On suitable forest lands only timber scenario 1 allowed into solution. Refer to Appendix C, Financial Analysis, for a detailed discussion of timber management intensities.	This is a physical benchmark. It establishes the high level of water yield to be used for emphasizing water yield on the Forest.

Table 72 (continued)

Benchmark Description			
Purpose	Objective Function	Constraint	Discussion
Max Water Yield-Max PNV (Benchmark 22)			
To maximize Present Net Value while maintaining a high level of potential water yield.	Maximize Present Net Value (assigned values) for 8 time periods.	Timber Same as max water yield benchmark. Water Yield Floor on water yield in thousand acre feet equal to or greater than 98% of the physical potential over 8 time periods established in the max water yield benchmark. Period 1/ 1 2 3 4 5 6 7 8 373 397 419 419 419 419 419 419	This benchmark represents the most cost efficient method of managing the Forest under an objective of increased water yield. It also provides a basis for determining the opportunity costs associated with this objective. This benchmark is highly responsive to concerns regarding increased water yield from the Forest.
Max Recreation (Benchmark 23)			
To project the maximum potential of the Forest to produce non-wildlife related recreation. Demand is a function of population trends in the Phoenix metropolitan area. Supply is limited by (1) capability of the ecosystem to withstand recreational activities, (2) budgets necessary to construct and maintain facilities, and (3) areas classified as wilderness through Congressional legislation.	Maximize recreation visitor days for developed, non-wilderness dispersed, and wilderness dispersed activities.	Timber Culmination of mean annual increment, ending inventory. On suitable forest lands only timber scenario 2 allowed into solution. Refer to Appendix E, Financial Analysis for detailed discussion of timber management intensities.	This is a physical benchmark. It establishes the base level of non-wildlife related recreation to be used for emphasizing recreation opportunities.

1/ Periods 1 through 5 are each 10 years in length. Periods 6, 7, and 8 are each 50 years in length. Floor on water yield represents average annual values.

Table 72 (continued)

Benchmark Descriptions

Purpose	Objective Function	Constraint	Discussion
Max Recreation-Max PNV (Benchmark 24)			
To maximize Present Net Value while maintaining a high level of potential non-wildlife related recreation visitor days.	Maximize Present Net Value (assigned values) for 8 time periods.	Timber Same as the max recreation benchmark. Recreation Floor on thousand recreation visitor days set equal to or greater than 98% of the physical potential over 8 time periods established in the max recreation benchmark. It was necessary to relax this initial constraint to 94% to achieve a solution.	This benchmark represents the most cost efficient method of managing the Forest under an objective of producing high levels of non-wildlife related recreation opportunity. It also provides a basis for determining the opportunity costs associated with this objective. This benchmark addresses concerns regarding recreation opportunity and experience diversity.

Period (Developed) 1/

1	2	3	4	5	6	7	8
1563	1787	2026	2325	2537	2537	2537	2537

Period (Non-Wilderness Dispersed) 1/

1	2	3	4	5	6	7	8
5998	6688	7372	8118	9515	9515	9515	9515

Period (Wilderness Dispersed) 1/

1	2	3	4	5	6	7	8
533	597	667	733	800	800	800	800

1/ Periods 1 through 5 are each 10 years in length. Periods 6, 7, and 8 are each 50 years in length. Floor on recreation visitor days represents average annual values.

Appendix

Table 73

Average Annual Output by Benchmark with Percent Change in First Period Compared to MAX PNV Assigned

Benchmarks in Decreasing Order of Cumulative PNV Over the Planning Horizon	Percent Change in First Period Outputs	Period 1	2	3	4	5	6	7	8
Output: Net Merchantable Timber Volume (Sawtimber and Product MCF)*									
Max PNV Assg.		4,799	4,803	4,809	4,805	4,806	4,808	4,812	4,815
Max LRSY	+ 73	8,285	4,025	1,046	2,683	4,125	3,424	5,307	5,693
Max Water Yield-PNV	+ 71	8,185	4,063	4,594	2,966	6,036	4,748	4,328	3,360
Max Timber-PNV	- 63	1,781	5,000	2,917	3,668	3,646	6,256	3,703	7,550
Max Wildlife-PNV	+ 21	5,819	4,285	3,929	4,463	6,474	5,070	4,046	4,168
Max Recreation-PNV	+ 15	5,518	3,682	4,835	4,348	6,659	5,539	3,641	3,843
Max Grazing-PNV	+ 68	8,058	4,051	4,507	3,131	6,045	4,742	4,264	3,435
Max Watershed-PNV	+ 15	5,518	3,682	4,835	4,348	6,659	5,539	3,641	3,843
Current	- 55	2,148	2,147	3,007	3,008	3,007	3,009	3,009	3,790
Max PNV Mkt.	0	4,799	4,803	4,809	4,805	4,806	4,808	4,812	4,815
Low Budget	+108	9,962	2,757	3,468	2,534	6,487	3,961	3,672	4,422
Max Timber-Min. Cost	- 60	1,919	2,069	3,775	2,486	2,118	7,031	3,268	8,024
Minimum Level	-	0	0	0	0	0	0	0	0
Output: Net Sawtimber Volume (MBF)									
Max PNV Assg.		16,404	17,192	17,082	18,753	17,565	16,020	11,571	15,508
Max LRSY	+ 74	28,526	14,770	4,032	10,185	13,122	11,568	17,295	16,280
Max Water Yield-PNV	+ 63	26,796	13,902	15,632	12,417	16,447	16,745	8,118	12,873
Max Timber-PNV	- 58	6,921	18,065	10,859	13,396	12,495	23,809	6,366	27,143
Max Wildlife-PNV	+ 25	20,453	14,762	13,390	17,505	20,029	17,556	9,187	11,472
Max Recreation-PNV	+ 18	19,427	12,521	16,701	17,228	20,659	19,268	6,891	10,641
Max Grazing-PNV	+ 61	26,484	14,185	15,345	13,202	17,086	16,863	8,055	12,990
Max Watershed-PNV	+ 18	19,427	12,521	16,701	17,228	20,659	19,268	6,891	10,641
Current	- 56	7,498	7,487	11,651	11,935	9,088	10,896	7,426	9,751
Max PNV Mkt.	0	16,404	17,192	17,082	18,753	17,565	16,020	11,571	15,568
Low Budget	+110	34,625	10,059	11,856	11,188	17,515	14,663	8,054	13,701
Max Timber-Min. Cost	- 54	7,519	7,528	14,853	8,846	7,259	26,958	4,324	28,416
Minimum Level	-	0	0	0	0	0	0	0	0
Output: Net Products Volume (MBF)									
Max PNV Assg.		1,622	244	586	569	1,188	2,251	5,015	3,100
Max LRSY	- 69	506	342	40	456	2,347	1,601	3,008	4,441
Max Water Yield-PNV	+108	3,377	918	1,602	363	4,458	1,556	5,880	1,358
Max Timber-PNV	-	0	551	565	868	1,206	862	5,490	2,646
Max Wildlife-PNV	+ 7	1,733	326	1,477	421	3,619	1,682	4,571	3,954
Max Recreation-PNV	+ 23	1,995	232	1,752	409	3,736	1,739	4,919	3,789
Max Grazing-PNV	+101	3,258	865	1,633	347	4,314	1,582	5,852	1,541
Max Watershed-PNV	+ 23	1,995	232	1,752	409	3,736	1,739	4,919	3,789
Current	- 60	684	0	376	541	2,246	628	3,162	3,912
Max PNV Mkt.	0	1,622	244	586	569	1,188	2,251	5,015	3,100
Low Budget	+ 60	2,595	87	1,242	87	5,372	1,058	4,678	3,159
Max Timber-Min. Cost	-	0	164	172	484	729	766	5,608	3,174
Minimum Level		0	0	0	0	0	0	0	0

* Nonpriced output.

Table 73 (continued)

Average-Annual Output by Benchmark with Percent Change in First Period Compared to MAX PNV Assigned

Benchmarks in Decreasing Order of Cumulative PNV Over the Planning Horizon	Percent Change in First Period Outputs	Period 1	2	3	4	5	6	7	8
Output: Fuelwood Sold (MBF) (Includes green, dead & down and topwood)									
Max PNV Assg.		13,638	13,695	13,695	13,724	13,723	13,613	13,296	13,293
Max LRSY	+ 5	14,488	13,525	12,760	13,199	13,412	13,296	13,704	13,630
Max Water Yield-PNV	+ 5	14,375	13,469	13,582	13,369	13,638	13,664	13,055	13,386
Max Timber-PNV	- 6	12,959	13,766	13,242	13,246	13,369	14,165	12,927	14,552
Max Wildlife-PNV	+ 2	13,919	13,525	13,426	13,709	13,908	13,721	13,126	13,290
Max Recreation-PNV	- 4	13,147	12,669	12,949	12,991	13,232	13,138	12,260	12,527
Max Grazing-PNV	- 2	13,348	12,484	12,565	12,413	12,696	12,673	12,047	12,399
Max Watershed-PNV	- 24	10,363	9,881	10,165	10,207	10,448	10,354	9,476	9,743
Current	- 48	7,147	7,147	7,459	7,473	7,260	7,396	7,150	7,314
Max PNV Mkt.	- 30	9,598	9,655	9,655	9,754	9,683	9,573	9,256	9,533
Low Budget	- 51	7,087	7,087	7,087	7,087	7,254	7,135	7,135	7,135
Max Timber-Min. Cost	- 40	8,975	8,975	9,499	9,069	8,961	10,346	8,743	10,448
Minimum Level	-	0	0	0	0	0	0	0	0
Output: Non-wildlife and Wilderness Dispersed Recreation (MRVD) 1/									
Max PNV Assg.		7,925	8,831	9,728	10,718	11,916	11,916	11,916	11,916
Max LRSY	0	7,925	8,831	9,728	10,718	11,916	11,916	11,916	11,916
Max Water Yield-PNV	- 3	7,920	8,824	9,722	10,710	11,908	11,908	11,908	11,908
Max Timber-PNV	0	7,925	8,831	9,728	10,718	11,916	11,916	11,916	11,916
Max Wildlife-PNV	- 3	7,699	8,580	9,453	10,416	11,578	11,578	11,578	11,578
Max Recreation-PNV	0	7,290	8,122	8,949	9,859	10,963	10,963	10,963	10,963
Max Grazing-PNV	- 1	7,882	8,783	9,676	10,661	12,118	12,118	12,118	12,118
Max Watershed-PNV	- 13	6,869	7,670	8,465	9,329	10,366	10,366	10,366	10,366
Current	- 23	6,131	6,832	7,527	8,291	9,221	9,221	9,221	9,221
Max PNV Mkt.	- 4	7,643	8,517	9,382	10,337	11,489	11,489	11,489	11,489
Low Budget	- 1	7,905	8,809	9,703	10,690	11,886	11,886	11,886	11,886
Max Timber-Min. Cost	- 15	6,768	7,543	8,310	9,153	10,178	10,178	10,178	10,178
Minimum Level	- 69	2,449	2,730	3,008	3,313	3,683	3,683	3,683	3,683
Output: Wildlife Dispersed Recreation (MRVD)									
Max PNV Assg.		735	832	929	1,025	1,122	1,122	1,122	1,122
Max LRSY	0	735	832	929	1,025	1,122	1,122	1,122	1,122
Max Water Yield-PNV	0	736	834	932	1,029	1,127	1,127	1,127	1,127
Max Timber-PNV	0	735	832	929	1,025	1,122	1,122	1,122	1,122
Max Wildlife-PNV	+ 3	756	863	970	1,078	1,185	1,185	1,185	1,185
Max Recreation-PNV	- 1	726	814	902	991	1,078	1,079	1,079	1,079
Max Grazing-PNV	- 9	670	776	852	929	1,005	1,005	1,005	1,005
Max Watershed-PNV	- 20	587	588	590	591	593	593	593	593
Current	- 27	535	535	535	535	535	535	535	535
Max PNV Mkt.	- 38	455	456	456	456	456	456	456	456
Low Budget	- 37	465	465	465	465	465	465	465	465
Max Timber-Min. Cost	- 37	461	461	462	462	462	462	462	462
Minimum level	- 73	199	199	200	200	200	200	200	200

1/ Includes highway use.

Appendix

Table 73 (continued)

Average Annual Output by Benchmark with Percent Change in First Period Compared to MAX PNV Assigned

Benchmarks In Decreasing Order of Cumulative PNV Over the Planning Horizon	Percent Change In First Period Outputs	Period 1	2	3	4	5	6	7	8
Output: Wilderness Dispersed Recreation (MRVD)									
Max PNV Assg.		218	253	288	315	342	342	342	342
Max LRSY	0	218	253	288	315	342	342	342	342
Max Water Yield-PNV	0	218	253	288	315	342	342	342	342
Max Timber-PNV	0	218	253	288	315	342	342	342	342
Max Wildlife-PNV	+ 14	248	287	324	353	385	385	385	385
Max Recreation-PNV	+144	533	612	688	758	829	829	829	829
Max Grazing-PNV	0	218	253	288	315	342	342	342	342
Max Watershed-PNV	- 44	139	163	184	196	211	211	211	211
Current	+260	785	897	1,007	1,111	1,218	1,218	1,218	1,218
Max PNV Mkt.	- 26	162	183	202	215	229	229	229	229
Low Budget	+ 16	255	290	324	351	378	378	378	378
Max Timber-Min. Cost	+ 84	401	454	505	548	593	594	594	594
Minimum Level	-	0	0	0	0	0	0	0	0
Output: Developed Recreation (MRVD)									
Max PNV Assg.		1,580	1,674	1,770	1,897	1,981	1,981	1,981	1,981
Max LRSY	0	1,580	1,674	1,770	1,897	1,981	1,981	1,981	1,981
Max Water Yield-PNV	- 2	1,546	1,572	1,593	1,630	1,648	1,648	1,648	1,648
Max Timber-PNV	0	1,580	1,674	1,770	1,897	1,981	1,981	1,981	1,981
Max Wildlife-PNV	- 3	1,537	1,544	1,549	1,561	1,564	1,564	1,564	1,564
Max Recreation-PNV	+ 4	1,641	1,849	2,062	2,344	2,537	2,537	2,537	2,537
Max Grazing-PNV	- 3	1,537	1,543	1,543	1,555	1,555	1,555	1,555	1,555
Max Watershed-PNV	- 3	1,537	1,537	1,537	1,537	1,537	1,537	1,537	1,537
Current	- 3	1,537	1,537	1,537	1,537	1,537	1,537	1,537	1,537
Max PNV Mkt.	- 3	1,537	1,537	1,537	1,537	1,537	1,537	1,537	1,537
Low Budget	- 34	1,048	1,048	1,048	1,048	1,048	1,048	1,048	1,048
Max Timber-Min. Cost	- 34	1,048	1,048	1,048	1,048	1,048	1,048	1,048	1,048
Minimum Level	-	0	0	0	0	0	0	0	0
Output: Permitted Livestock Use (MAUM)									
Max PNV Assg.		412	325	288	230	200	200	200	200
Max LRSY	0	412	325	288	230	200	200	200	200
Max Water Yield-PNV	0	410	323	288	231	203	203	203	203
Max Timber-PNV	0	412	325	288	230	200	200	200	200
Max Wildlife-PNV	- 13	360	280	254	200	179	179	179	179
Max Recreation-PNV	- 1	409	322	285	228	199	199	199	199
Max Grazing-PNV	- 2	403	324	267	284	301	301	301	301
Max Watershed-PNV	- 3	400	315	281	224	194	194	194	194
Current	- 2	404	347	338	268	278	278	278	278
Max PNV Mkt.	+ 1	418	352	293	232	200	200	200	200
Low Budget	0	414	349	290	230	198	198	198	198
Max Timber-Min. Cost	- 2	402	339	283	226	195	195	195	195
Minimum level	-	0	0	0	0	0	0	0	0

Table 73 (continued)

Average Annual Output by Benchmark with Percent Change in First Period Compared to MAX PNV Assigned

Benchmarks in Decreasing Order of Cumulative PNV Over the Planning Horizon	Percent Change in First Period Outputs	Period 1	2	3	4	5	6	7	8
Output: Grazing Capacity (MAUM)									
Max PNV Assg.		252	229	205	195	200	200	200	200
Max LRSY	0	252	229	205	195	200	200	200	200
Max Water Yield-PNV	0	252	230	207	198	203	203	203	203
Max Timber-PNV	0	252	229	205	195	200	200	200	200
Max Wildlife-PNV	0	251	229	207	201	206	206	206	206
Max Recreation-PNV	- 1	250	227	203	194	199	199	199	199
Max Grazing-PNV	+ 3	259	260	267	284	301	301	301	301
Max Watershed-PNV	- 2	247	224	200	189	194	194	194	194
Current	- 3	245	252	261	268	278	278	278	278
Max PNV Mkt.	+ 1	254	230	205	195	200	200	200	200
Low Budget	0	252	228	204	193	198	198	198	198
Max Timber-Min. Cost	- 2	247	224	200	190	195	195	195	195
Minimum Level	- 1	250	226	202	192	198	198	198	198
Output: Water Yield (MCFT)									
Max PNV Assg.		362	386	407	407	407	407	407	407
Max LRSY	0	362	386	407	407	407	407	407	407
Max Water Yield-PNV	+ 3	373	398	420	420	420	420	420	420
Max Timber-PNV	0	362	386	407	407	407	407	407	407
Max Wildlife-PNV	- 2	353	367	383	383	383	383	383	383
Max Recreation-PNV	- 1	360	377	395	395	395	395	395	395
Max Grazing-PNV	+ 2	371	394	416	416	416	416	416	416
Max Watershed-PNV	- 8	332	332	332	332	332	332	332	332
Current	- 8	332	332	332	332	332	332	332	332
Max PNV Mkt.	- 7	335	335	335	335	335	335	335	335
Low Budget	- 9	332	332	332	332	332	332	332	332
Max Timber-Min. Cost	- 7	335	335	335	335	335	335	335	335
Minimum Level	- 9	331	331	331	331	331	331	331	331

Appendix

Table 74

Comparison of Cumulative Benefits, Costs, and Present Net Value of Benchmarks to Maximum PNV Assigned Benchmark over the 20 Year Planning Horizon (millions of 1980 dollars discounted at four-percent).

Benchmarks	Present Value Benefits	Present Value Costs	Present Net Value	Percent Difference in PNV from Max PNV Assign.
Max PNV Assg.	3681.0	314.3	3366.7	
Max LRSY	3668.6	314.2	3354.4	- 1
Max Water Yield-PNV	3598.6	263.6	3335.0	- 1
Max Timber-PNV	3640.8	311.5	3329.3	- 1
Max Wildlife-PNV	3533.5	258.3	3275.2	- 3
Max Recreation-PNV	3648.7	527.0	3121.7	- 7
Max Grazing-PNV	3319.5	258.8	3060.7	- 9
Max Watershed-PNV	2739.5	225.5	2514.0	- 25
Current	2613.8	237.3	2376.5	- 31
Max PNV Mkt.	2267.7	179.3	2088.4	- 38
Low Budget	2054.7	113.8	1940.9	- 42
Max Timber-Min. Cost	1936.5	116.7	1819.8	- 46

Appendix

Table 75

Comparison of Average Annual Outputs for Max PNV Market and Max PNV Assigned Benchmarks

Outputs	Period 1	2	3	4	5	6	7	8
MARKET VALUES								
Net Sawtimber (MBF)								
PNV Mkt.	16,404	17,192	17,082	18,753	17,565	16,020	11,571	15,508
PNV Assg.	16,404	17,192	17,082	18,753	17,565	16,020	11,571	15,508
% Change	0	0	0	0	0	0	0	0
Net Products (MBF)								
PNV Mkt.	1,622	244	586	569	1,188	2,251	5,015	3,100
PNV Assg.	1,622	244	586	569	1,188	2,251	5,015	3,100
% Change	0	0	0	0	0	0	0	0
*Fuelwood (MBF)								
PNV Mkt.	9,598	9,655	9,655	9,754	9,683	9,573	9,256	9,533
PNV Assg.	13,638	13,695	13,695	13,794	13,723	13,613	13,296	13,293
% Change	+42	+42	+42	+41	+42	+42	+44	+39
Permitted Use (MAUM)								
PNV Mkt.	418	352	293	232	200	200	200	200
PNV Assgn.	412	325	288	230	200	200	200	200
% Change	-1	-8	-2	-1	0	0	0	0
Developed Recreation (MRVD)								
PNV Mkt.	1,537	1,537	1,537	1,537	1,537	1,537	1,537	1,537
PNV Assg.	1,580	1,674	1,770	1,897	1,981	1,981	1,981	1,981
% Change	+3	+9	+15	+23	+29	+29	+29	+29
ASSIGNED VALUES								
Non-wildlife and Wilderness Dispersed Recreation (MRVD)								
PNV Mkt.	7,643	8,517	9,382	10,337	11,489	11,489	11,489	11,489
PNV Assg.	7,925	8,831	9,728	10,718	11,916	11,916	11,916	11,916
% Change	+4	+4	+4	+4	+4	+4	+4	+4
Wildlife Dispersed Recreation (MRVD)								
PNV Mkt.	455	456	456	456	456	456	456	456
PNV Assg.	735	832	929	1,025	1,122	1,122	1,122	1,122
% Change	+62	+83	+104	+125	+146	+146	+146	+146
Wilderness Dispersed Recreation (MRVD)								
PNV Mkt.	162	183	202	215	229	229	229	229
PNV Assg.	218	253	288	315	342	342	342	342
% Change	+35	+38	+43	+47	+49	+49	+49	+49
Water Yield (MACFT)								
PNV Mkt.	335	335	335	335	335	335	335	335
PNV Assg.	362	386	407	407	407	407	407	407
% Change	+8	+15	+21	+21	+21	+21	+21	+21

* Includes green, dead and down, and topwood.

Appendix

The section on Economic Efficiency Analysis explained the difference between market and assigned values for priced outputs. The benchmarks displayed in Table 75 were developed to examine the significant effects, if any, that market versus assigned values have on output levels. The Max PNV Assigned 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.

At present, it is National policy to provide most Forest outputs either at no charge to consumers, as is the case of water, or at a charge less than the willingness to pay price, as is the case of developed recreation. Based on the comparison of marked values and assigned values, it is apparent the Tonto National Forest ranks high in resource outputs which the public would be willing to pay for, even though benefit dollars are not actually collected by the Forest for these outputs. They include all forms of dispersed recreation and water yield. When considering only market values, the most cost effective approach to management on the Tonto is through low intensity prescriptions Forest-wide with exception of maximum recreation emphasis on existing developed recreation sites and maximum timber emphasis on suitable timber producing lands. However, when considering all priced outputs a larger PNV results which indicates that taxpayers, as owners of the National Forests, can realize a much larger net return on their investment.

It is also apparent that the Max PNV Assigned Benchmark yields a higher PNV without negative tradeoffs of most market value outputs. Sawtimber and product outputs remain unchanged. Developed recreation increases because prescriptions yielding higher levels of recreation facility capital investments come into solution. increased fuelwood, water yield, and wildlife dispersed outputs are interrelated because management practices tailored for creation or enhancement of wildlife habitat result in increased water yield and fuelwood.

Table 76

Acreage Applied by Management Emphasis for Each Benchmark (M Acres)

Management Emphasis	Max PNV Assig.	Max LRSY	Max Water Yield PNV	Max Timber PNV	Max Wild-life PNV	Max Rec. PNV	Max Grazing PNV	Max Water-shed PNV	Current	Max PNV Mkt.	Low Budget	Max Timber Min. Cost
Low Intensity. Minimum Outputs and Costs to Meet Local Requirements.	157.9	157.9	157.9	157.9	154.1	157.9	157.9			2284.8	2761.6	2285.5
Current. Continuation of Present Outputs Within Existing Budgets.							270.9 2/		2761.6 3/			
Recreation 1/ Emphasis	650.0	650.0	545.9	650.0	592.2	456.9	520.7	18.1		.8		
Wilderness Low Intensity Management Emphasis	16.9	16.9	16.9	16.9			15.2	16.9		350.2		350.2
Wilderness High Intensity Management Emphasis	343.4	343.4	343.4	343.4	360.3	594.3	190.8	333.3				
Range Emphasis	54.0	54.0		54.0	3.2		1284.5					
Wildlife Emphasis	1404.2	1404.1	1404.1	1404.1	1632.1	1282.4	84.0	33.5		60.9		60.9

1/ Includes non-wildlife and non-wilderness dispersed, wilderness dispersed, and developed recreation.

2/ Includes 154,303 acres of wilderness.

3/ Includes 350,200 acres of existing wilderness.

Table 76 (continued)

Acreage Applied by Management Emphasis for Each Benchmark (M Acres)

Management Emphasis	Max PNV Assig.	Max LRSY	Max Water Yield PNV	Max Timber PNV	Max Wild-life PNV	Max Rec. PNV	Max Grazing PNV	Max Water-shed PNV	Current	Max PNV Mkt.	Low Budget	Max Timber Min. Cost
Water Yield Emphasis	115.5	115.5	273.7	115.5		250.4	217.9			45.2		45.2
Watershed Condition Emphasis								2340.1				
Low Timber Emphasis											102.9	
Current Timber Emphasis	1.7	22.8		17.1			3.4		102.9	1.7		16.6
Maximum Timber Emphasis intergrated with Recreation and Watershed Condition	45.7	31.8		56.2	102.6	122.6	4.0	122.6		45.7		75.8
Maximum Timber Emphasis intergrated with Wildlife Habitat	36.0	68.1		43.2	20.0					36.0		22.1
Maximum Timber Emphasis intergrated with Increased Water Yield	39.2		122.6	6.2			115.2			39.2		8.1

Appendix

FORMULATION of ALTERNATIVES

The formulation of alternatives is the culmination of planning actions specified in [36 CFR 219.12(a) through 219.12(f)]. The requirements of [36 CFR 219.12(f)] for formulation of alternative are discussed in Chapter 2. The National Forest Interdisciplinary Team used a four step process to formulate a range of alternatives which would provide a basis for identifying an alternative maximizing net public benefits, consistent with resource integration and management requirements of [36 CFR 219.13 through 219.27]. That process is described below.

1) Forest issues were identified through public involvement efforts. Management concerns were also identified through an internal analysis. Issues and management concerns were then consolidated into issue and concern statements which would be specifically addressed in development of alternatives and the subsequent recommendation of a Proposed Action.

   Public involvement efforts and issue and concern statements are described in detail in Appendix A.

2) Individual resource inventories were completed to identify site specific areas having common environmental characteristics. Data were collected and stored in the Forest resource data base. An Analysis of the Management Situation (AMS) was written to describe the existing condition of the Forest. Chapter 2 summarizes the AMS.

3) Primary objectives were developed for an array of alternatives that were responsive to issues and concerns. The objectives were tailored to provide a wide range of Forest management alternatives. Alternative emphasis included improved water yield, balancing permitted numbers with range capacity, timber production, recreation management, watershed condition improvement, wildlife management and riparian habitat improvement. Nine alternative scenarios were developed with varying degrees of issue and concern resolution. Chapter 2 provides a detailed discussion of alternatives eliminated from detailed study and those alternatives considered in detail.

4) This step involved an evaluation of all benchmark runs presented in the preceding section of this appendix. Each benchmark first had to meet the test of maximizing present net value. These runs were then assessed for their ability to conform to the alternative scenarios previously developed.

   Seven benchmark runs were adopted for use as alternatives, with only slight modification. These are identified in Chapter 2.

The purpose; criteria and assumptions; the relationships to issues, concerns, and opportunities; and relationship to the benchmarks are described in Chapter 2.

In accordance with [36 CFR 219.16(3)], departures from base sale schedules were considered. None of the criteria requiring a departure were met (refer to Appendix E). However, a departure run was made for the Proposed Action to determine if there were other reasons for departing from nondeclining yield. It was concluded that there were no reasons to consider the departure in detail.

The constraints used in the Tonto's model for alternatives considered in detail are shown in Table 77. The objective function for all alternatives was to maximize present net value.

Constraints common to all alternatives were nondeclining yield (NDY), culmination of mean annual increment (CMAI), long-term sustained yield link (LTSY-L), and ending inventory (EI).

Appendix

In the analysis constraints were placed on the alternatives as a set-of-constraints to achieve the objectives of each alternative. Constraints were not applied incrementally. The effects of individual constraints cannot be specified because individual constraints within a set of constraints are interdependent. Discussions of effects of constraints deal with the effects of the set-of-constraints as a whole. The changes in PNV, PVC, and PVB between the alternatives are a result of applying different sets of constraints to the maximum PNV benchmark and are displayed in Chapter 2.

The sets-of-constraints were developed by the Interdisciplinary Team. Based on the collective experience and expertise of the team the least cost constraints were selected to achieve the objectives of the alternative. The set-of-constraints applied was therefore, the most cost effective means of achieving the objectives of the alternative.

Table 77

Alternative 1

LTSY-L, NDY, CMAI, EI 1/	Type of Constraint: Prescription	Output	Budget	Discussion
Yes	On suitable Forest lands only Scenario 1 prescriptions were allowed into solution; this required timber harvests to have low basal areas to maximize water yield. Refer to Appendix E Financial Analysis for detailed discussion of timber management intensities.	Water Yield Floor on water yield in thousand acre feet set equal to the floor established in the max water yield max PNV benchmark. Period 2/ 1 2 3 4 5 6 7 8 373 397 419 419 419 419 419 419 Timber Timber harvest in the first period constrained to current level due to budget constraint. Second period sawtimber harvest constrained to an average annual output of 13.4 MM to allow organizational adjustments necessary to handle higher levels of output.	First period constrained to 7.6 million dollars to reflect anticipated levels of funding. This constraint insures financial feasibility.	This alternative was analyzed in detail because it is highly responsive to the issue of increasing water yield on the Forest. Increased water yields are attained through maintaining low growing stock levels on commercial Forest lands, and conversion of chapparal to grass.

1/ NDY - Nondeclining yield.
CMAI - Culmination of mean annual increment.
EI - Ending inventory.
LTSY-L - Long-term sustained yield link.

2/ Periods 1 through 5 are each 10 years in length. Periods 6, 7, and 8 are each 50 years in length. Floor on water yield represents average annual values.

Table 77 (continued)

Alternative 2				
	Type of Constraint			
LTSY-L, NDY, CMAI, EI	Prescription	Output	Budget	Discussion
Yes	Requirement that the model pick prescriptions which maximize watershed condition; on suitable timber land this requirement included Scenario 2 prescriptions, only. Scenario 2 provided denser vegetative cover through basal areas of 60 through 80.	Timber Timber harvest in the first period constrained to current level due to budget constraint. Second period sawtimber harvest constrained to an average annual output of 13.4 MM to allow organizational adjustments necessary to handle higher levels of output.	First period constrained to 7.6 million dollars to reflect anticipated levels of funding. This constraint insures financial feasibility.	This alternative was analyzed in detail because it is highly responsive to the issue of soil productivity and stability, and water quality through increased emphasis on soil restoration.

Table 77 (continued)

Alternative 3

LTSY-L, NDY, CMAI, EI	Prescription	Type of Constraint: Output	Budget	Discussion
Yes	None	Grazing Floor on grazing capacity in thousand animal unit months set to achieve Tonto's share of Region 3 target by the fifth time period. Period 1/ 1: 226 2: 210 3: 219 4: 215 5: 225 6: 225 7: 225 8: 225	Unconstrained in order to see if the Forest can attain resource objectives displayed in the Regional Guide.	This alternative incorporates the RPA program tentative resource objectives displayed in the Regional Guide [36 CFR 219.12(f)(6)]. It favorably addresses issues identified during the scoping process while providing a balanced integration of resource uses. However, funding levels exceed those which can reasonably be expected. Analysis shows that the RPA objective for developed recreation greatly exceeds both projected demand and the ability of the Forest to provide developed recreation opportunity.

1/ Periods 1 through 5 are each 10 years in length.
Periods 6, 7, and 8 are each 50 years in length.
Floor on grazing capacity represents average annual values.

Table 77 (continued)

Alternative 4				
	Type of Constraint			
LTSY-L, NDY, CMAI, EI	Prescription	Output	Budget	Discussion
Yes	Only current management prescriptions allowed into solution. On suitable timber land the current emphasis is Scenario 2.	Timber Net merchantable timber volume harvested (MCF) in the first two decades constrained to be no greater than the quantity specified in the current timber management plan.	First two periods constrained to current funding level (7.3 million dollars). This constraint insures financial feasibility.	This alternative is the same as the current benchmark and is used to evaluate the consequences of continuing with the current management program [36 CFR 219.12(f)(7)].

Table 77 (continued)

Alternative 5				
		Type of Constraint		
LTSY-L, NDY, CMAI, EI	Prescription	Output	Budget	Discussion
Yes	None	Timber Timber harvest in the first period constrained to current levels due to budget constraint. Second period sawtimber harvest constrained to an average annual output of 13.4 MM to allow organizational adjustments necessary to handle higher levels of output.	First period constrained to 7.6 million dollars to reflect anticipated funding levels. This constraint insures financial feasibility.	This alternative was analyzed in detail to determine the opportunity costs of emphasizing production of commodities with market value (developed recreation, permitted grazing use, wood products) in the most cost effective manner. This alternative is responsive to low funding levels and the issue regarding timber management intensity.

Table 77 (continued)

Alternative 6

LTSY-L, NDY, CMAI, EI	Type of Constraint: Prescription	Output	Budget	Discussion
Yes	Only low intensity management prescriptions allowed into solution with exception of analysis area 6001-developed recreation sites. On suitable timber lands the low intensity emphasis is Scenario 4; no cable harvesting is allowed.	Timber Timber harvest constrained to 75% of current for first five periods in order to meet the budget constraint.	First period constrained to 7.6 million dollars to insure financial feasibility; see the Chief's letter to the Regional Forester (October 1981).	This alternative was analyzed in detail to determine the opportunity costs of managing the Forest at a low investment low intensity level with exception of rehabilitating existing developed recreation sites. This alternative is responsive to low funding levels and the issue of deteriorating developed recreation sites Forest-wide.

Table 77 (continued)

Alternative 7

LTSY-L, NDY, CMAI, EI	Prescription	Type of Constraint: Output	Budget	Discussion
Yes	On suitable Forest lands only timber Scenario 2 allowed into solution. Refer to Appendix E, Financial Analysis for detailed discussion of timber management intensities. Scenario 2 growing stock levels are most aesthetically appealing to recreationists (based on professional judgement). In river recreation areas prescription controls were used to lock out wildlife emphasis prescriptions which didn't resolve the recreation	Timber Timber harvest in the first period constrained to current level, second period sawtimber harvest constrained to an average annual output of 13.4 MM to allow organizational adjustments necessary to handle higher levels of output. Recreation Floor on thousand recreation visitor days set equal to the floor established for the Max Recreation-Max PNV benchmark. Period (Developed) 1/ 1 2 3 4 5 6 7 8 1563 1787 2026 2325 2537 2537 2537 2537 Period (Non-wilderness Dispersed) 1/ 1 2 3 4 5 6 7 8 5998 6688 7372 8118 9515 9515 9515 9515 Period (Wilderness Dispersed Use) 1/ 1 2 3 4 4 6 7 8 533 597 667 733 800 800 800 800	Budget was unconstrained in order to evaluate the cost to fully resolve the recreation issue on the Tonto.	This alternative was analyzed in detail because it is highly responsive to the issue of providing high quality developed and dispersed recreation opportunities, and wilderness experience. The demand for developed recreation opportunity is met through rehabilitation of existing sites Forest-wide and capital investments in recreation facilities primarily in the river recreation areas.

Table 77 (continued)

Alternative 7 (cont.)				
		Type of Constraint		
LTSY-L, NDY, CMAI, EI	Prescription	Output	Budget	Discussion
	Issues; this allowed recreation emphasis prescriptions to come into solution.			

1/ Periods 1 through 5 are each 10 years in length.
Periods 6, 7, and 8 are each 50 years in length.
Floor on recreation visitor days represents average annual values.

Table 77 (continued)

Alternative 8

LTSY-L, NDY, CMAI, EI	Prescription	Type of Constraint: Output	Budget	Discussion
Yes	On suitable Forest lands only timber scenario 2 and 3 allowed into solution. Scenario 3, an old growth and vertical diversity prescription was assigned a lower bound of 18,000 acres and an upper bound of 21,500 acres. Scenario 2 and 3 result in a multiple use emphasis. Refer to Appendix E, Financial Analysis for detailed discussion of timber management intensities.	Timber Timber harvest in the first period constrained to current level due to budget constraint. Second period sawtimber harvest constrained to an average annual output of 13.4 MM to allow organizational adjustments necessary to handle higher levels of output. Wildlife Floor on thousand wildlife visitor days set at 90% of the floor established for the Max Wildlife-Max PNV benchmark.	First period constrained to 7.6 million dollars to reflect anticipated funding levels. This constraint insures financial feasibility	This alternative was analyzed in detail because it is highly responsive to the issue of wildlife and riparian habitat protection and needs.

Period 1/	1	2	3	4	5	6	7	8
	678	786	894	1004	1083	1083	1083	1083

1/ Periods 1 through 5 are each 10 years in length.
Periods 6, 7, and 8 are each 50 years in length.
Floor on wildlife visitor days represents average annual values.

Table 77 (continued)

Alternative 9				
		Type of Constraint		
LTSY-L, NDY, CMAI, EI	Prescription	Output	Budget	Discussion
Yes	None	Timber Timber harvest in the first period constrained to current levels due to budget constraint. Second period sawtimber harvest constrained to an average annual output of 13.4 MM to allow organizational adjustments necessary to handle higher levels of output.	First period constrained to 7.6 million dollars to reflect anticipated funding levels. This constraint insures financial feasibility.	This alternative was analyzed in detail to determine the opportunity costs of production of commodities with market value (developed recreation, permitted grazing use, wood products) in the most cost effective manner. This alternative is responsive to low funding levels and the issue regarding timber management intensity. This alternative was compared to Alternative 5 for analysis purposes.

Table 77 (continued)

Proposed Action

LTSY-L, NDY, CMAI, EI	Prescription	Type of Constraint: Output	Budget	Discussion
Yes	Prescriptions generated to maintain management objective, of 80% full service level in wilderness areas. This constraint became necessary when constraining the model to meet current management direction for balancing grazing capacity with permitted use.	Timber Timber harvest in the first period constrained to current level due to budget constraint. Second period sawtimber harvest constrained to an average annual output of 13.4 MM to allow organizational adjustments necessary to handle higher levels of output. Range Floor on thousand animal unit months grazing capacity established to meet objectives of current management direction.	First period constrained to 7.3 million dollars to reflect anticipated funding levels. Periods 2 through 8 constrained to 9.3 million dollars. These constraints insure financial feasibility.	This alternative is highly responsive to concerns identified during the scoping process while being consistent with multiple use considerations. However, substantial recreation capital investments are delayed until the second time period due to funding limitations. The primary emphasis on any one area is appropriate with its individual capability to be managed for that emphasis.

Period 1/

1	2	3	4	5	6	7	8
243	241	243	256	276	276	276	276

Table 77 (continued)

Proposed Action (cont.)				
		Type of Constraint		
LTSY-L, NDY, CMAI, EI	Prescription	Output	Budget	Discussion
Yes	On suitable Forest lands only timber Scenarios 2 and 3 allowed into solution. Scenarios 2 and 3 result in a multiple use emphasis. Scenario 3 was assigned a lower bound of 19,000 acres and an upper bound of 20,000 acres. Refer to Appendix E, Financial Analysis for detailed discussion of Timber Management Intensities.			

1/ Periods 1 through 5 are each 10 years in length.
Periods 6, 7, and 8 are each 50 years in length.
Floor on grazing capacity represents average annual values.

Appendix

ESTIMATING EFFECTS of BENCHMARKS, CONTRAINTS and ALTERNATIVES

As described in preceding sections, benchmarks and alternatives were developed to achieve different sets of goals and objectives responding to the ICO's in different degrees. Sets-of-constraints were applied to achieve the goals and objectives of each benchmark and alternative. The most cost effective set-of-constraints were used to develop the benchmarks and alternatives.

Use of sets-of-constraints to achieve the goals and objectives in a benchmark or alternative causes a reduction in PNV from the max PNV benchmark because costs are increased and/or benefits are reduced in order to satisfy the constraint. The reduction in PNV is called the opportunity cost (trade-off) of the set-of-constraints. The trade-offs associated with the sets-of-constraints are shown in Tables 9 and 10 for the alternatives, and Table 74 for the benchmarks. Changes in outputs are shown in Table 6 for the alternatives, and Table 73 for the benchmarks.

The constraints having the greatest impact on PNV were:

1) Nondeclining yield which spreads timber harvest over future periods rather than allowing substantial harvests in the early periods with subsequent declines in subsequent periods, thereby reducing PVB by significant amounts.

2) Budget constraints to hold alternative costs within reasonable budget expectations. These constraints held down PVC but also limited the amount of investment work and also significantly reduced PVB.

3) Timber harvest constraints during the first period to correspond with current level budget constraints. These constraints limited PVC and the amount of investment work which significantly reduced PVB.

4) Suitable acres available for timber harvest in Alternatives 2, 4, 6, 7, 8, and the Proposed Action. This limited PVC and the amount of investment work which significantly reduced PVB.

5) Floor on grazing capacity for Alternatives 3 and the Proposed Action, increases PVC due to increased investments in structural and nonstructural improvements, and staffing requirements to implement and monitor intensive grazing systems. This also results in reduced PVB because of the trade-off between range and recreation outputs.

Appendix

C

Table 78

Federal and State Listed Species

Mammals	Federal 1/ Classification	Arizona 2/ Classification
River Otter	-	Group 2
Spotted Bat	Candidate	-
Birds		
Bald Eagle	Endangered	Group 2
Peregrine Falcon	Endangered	Group 3
Yuma Clapper Rail	Endangered	Group 3
Osprey	-	Group 3
Black Hawk	-	Group 3
Black-Crowned Night Heron	-	Group 4
Spotted Owl	Candidate	Group 4
White-Faced Ibis	Candidate	-
Swainson's Hawk	Candidate	-
Fereginous Hawk	Candidate	-
Western Yellow-Billed Cuckoo	Candidate	-
Fishes		
Bonytail Chub	Endangered	Group 2
Gila Topminnow	Endangered	Group 3
Razorback Sucker	Candidate	Group 3
Colorado River Squawfish	Endangered	Group 1
Woundfin	Endangered	Group 2
Gila Chub	Candidate	Group 3
Spikedace	Candidate	Group 3
Colorado River Roundtail Chub	-	Group 3
Loach Minnow	Candidate	Group 3
Desert Pupfish	-	Group 1
Reptiles		
Desert Tortoise	Candidate	Group 3
Narrow-Headed Garter Snake	-	Group 3

1/ Endangered - A species which is in danger of extinction throughout all or a significant portion of its range.

Threatened - Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Category 1 - Species in this category are those the Fish and Wildlife Service has substantial information on their biological vulnerability to support the appropriateness of proposing to list as Endangered or Threatened.

Category 2 - Species with data that are inadequate to propose for listing at this time.

2/ Group 1 - Species or subspecies extirpated from Arizona that may possibly be re-established.
Group 2 - Species or subspecies in danger of being eliminated from Arizona.
Group 3 - Species or subspecies whose status in Arizona may be in jeopardy in the foreseeable future.
Group 4 - Species or subspecies of special interest because of limited distribution in Arizona.

Appendix

Table 78 (continued)

Threatened and Endangered Plants - Tonto National Forest

	Federal 1/ Classification
Plants	
Echinocereus triglochidiatus var. arizonicus	Endangered
Agave arizonica	Endangered
Cimicifuga arizonica	Category 1
Rumex orthoneurus	Category 1
Cheilanthes pringlei	Category 2
Erigeron lemmonii	Category 2
Erigeron pringlei	Category 2
Eriogonum capillare	Category 2
Eriogonum ripleyi	Category 2
Cowania subintegra	Category 2

1/ Endangered - A species which is in danger of extinction throughout all or a significant portion of its range.

Threatened - Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Category 1 - Species in this category are those the Fish and Wildlife Service has substantial information on their biological vulnerability to support the appropriateness of proposing to list as endangered or threatened

Category 2 - Species with data that are inadequate to propose for listing at this time.

Appendix

D

Management Indicator Species

Management Indicator Species were selected to adequately monitor the effects of implementation of the Proposed Action on wildlife habitat and species diversity. The following is a listing of Management Indicator Species and what they are intended to monitor:

Ponderosa Pine/Mixed Conifer Vegetative Types

Elk - General forest conditions
Turkey - Vertical diversity - general forest mix
Pygmy Nuthatch - Old growth Ponderosa pine
Violet-Green Swallow - Cavity nesting habitat
Western Bluebird - Forest openings
Hairy Woodpecker - Snags
Goshawk - Vertical diversity
Abert's Squirrel - Successional stages of Ponderosa pine

Pinyon-Juniper (Woodland) Vegetative Type

Ash-throated Flycatcher - Ground cover
Gray Vireo - Tree density
Townsends Solitaire - Juniper berry production
Plain Titmouse - General woodland conditions
Common Flicker - Snags
Rufous-sided Towhee - Successional Stages of Pinyon-Juniper

Chaparral Vegetative Type

Rufous-sided Towhee - Shrub density
Black-chinned Sparrow - Shrub diversity

Desert-Grassland Vegetative Type

Savannah Sparrow - Grass species diversity
Horned Lark - Vegetative aspect

Desertscrub Vegetative Type

Black-Throated Sparrow - Shrub diversity
Brown Towhee - Ground cover

Riparian - Low Elevation (1500-3500 feet)

Bald Eagle - General riparian
Bell's Vireo - Well developed understory
Summer Tanager - Tall mature trees
Hooded Oriole - Medium sized trees

Riparian - High Elevation (3000 feet plus)

Hairy Woodpecker - Snags, cavities
Arizona Gray Squirrel - General riparian
Warbling Vireo - Tall overstory
Western Wood Pewee - Medium overstory
Black Hawk - Riparian streamside

Aquatic

Macro Invertebrates - Water quality and fisheries habitat

Appendix

The comprehensive package of documentation regarding the rationale and process of selection of Management Indicator Species (MIS) is on file in the Forest Supervisor's Office in Phoenix, Arizona. A brief excerpt of that package is given here. Over 25 persons representing many agencies and groups including the Arizona Game and Fish Department have been involved in the selection process. Species considered for selection included:

1. Endangered and Threatened animal species identified on Federal and State lists.

2. Species with special habitat needs that may be influenced significantly by planned management activities.

3. Species commonly hunted, fished, or trapped.

4. Animal species selected because their population changes are believed to indicate effects of management activities on other species of a major biological community, or on water quality.

Other considerations in the selection process are: 1) How easy the species is to census, 2) what would the presence or absence of the species mean in terms of habitat condition, and 3) can relative amounts of one species to another be used to indicate habitat quality.

In addition to the selection of MIS, the planning regulations call for a description of the Desired Future Condition of Fish and Wildlife Habitats. It was assumed that MIS and Desired Future Condition are conceptually related. Desired Future Condition is the management objective, and Management Indicator Species will indicate progress in terms of achieving the Desired Future Condition.

Using the Brown and Lowe vegetative type map of the Forest, it has been determined that there are 13 major plant communities on the Tonto. Using the RUNWILD animal species listing by vegetation types, an initial pick of MIS was made for each plant community.

After several meetings, reviews, and discussions, the Desired Future Condition has been described and candidate MIS was finalized. Using the Desired Future Condition descriptions, the final selection of MIS was made.

Elk and turkey have been included on the MIS list. Other commonly hunted species - mule deer, white tail deer, javelina, quail, and dove - are not included. They were considered and eliminated because their habitat needs are better represented by the requirements and population changes of other game and non-game species. These other species appearing on the MIS list provide better indications of effects of management activities on habitat conditions.

Appendix

E

INTRODUCTION

Forest Service Manual (2410) and the Code of Federal Regulations [36 CFR 219], as established and directed by the National Forest Management Act of 1976, require that a detailed timber analysis occur in the process of timber management planning to assure (1) coordination with other resource uses, and (2) that timber is harvested on a sustained yield basis. The NFMA, in the "National Forest System Resource Planning" section states:

"(e) In developing, maintaining, and revising Plans for units of the National Forest System pursuant to this section, the Secretary shall assure that such Plans -

(1) provide for multiple use and sustained yield of the products and services obtained therefrom in accordance with the Multiple-Use Sustained Yield Act of 1960, and, in particular, include coordination of outdoor recreation, range, timber, watershed, wildlife and fish, and wilderness; and

(2) determine Forest management systems, harvesting levels, and procedures in the light of all of the uses set forth in subsection (c) (1), the definition of the terms "multiple use" and "sustained yield" as provided in the Multiple-Use Sustained Yield Act of 1960, and the availability of lands and their suitability for resource management."

A detailed analysis of the timber resource is a necessity, if these requirements, as set down by law (NFMA) and reiterated by regulation [36 CFR 219] and Forest Service direction (FSM 2410), are to be met.

There are no Forests in Region 3 that have been designated by the Chief as significant timber forests.

INVENTORY DATA

Utilization Standards

The Tonto National Forest Inventory Plan requires utilization of sawtimber, 12.1 inches DBH and larger, to a 6-inch top, D.I.B. Pulpwood utilization includes trees 6.0 inches DBH, which have three 5-foot pieces, up to 12.0 inches DBH, all to a 4-inch top, D.I.B.

Volume Equations

Volume equations used by the Tonto National Forest are the standard Regional volume tables, which come from the USDA Forest Service Research Paper INT-210, "Comprehensive Tree Volume Equations for Major Species of New Mexico and Arizona: Tables for Unforked Trees" by David W. Hann and B. Bruce Bare.

TIMBER STANDS

The 1981 Tonto National Forest Timber Inventory, provided averages for six (6) strata, or stand condition classes to be used in development of RMYLD growth simulation computer runs. However, these six strata were broken down into a total of ten (10) strata to account for dwarf-mistletoe infections to allow separate management prescription development for the infected portions of the involved strata. Table 79 lists each strata used in the RMYLD development:

Appendix

Table 79

Strata	Stand Condition Class	Acres	Stocking Arrangement	Avg. TPA	Avg. DBH	Avg. Hgt.	Avg. Age	Avg. DMR
06	Sparse Poles (Uninfected))	7,877	Seedlings	66				0.00
			Saplings	99	2.7	17		0.00
			Poles	62	8.9	41	59	0.00
			S/T	17	16.6	62	111	0.00
26	Sparse Poles (DM infected)	5,454	Seedlings	241				0.00
			Saplings	129	2.4	14		0.42
			Poles	60	9.0	43	60	1.02
			S/T	19	16.5	62	93	1.37
07	Sparse S/T	5,005	Seedlings	107				0.00
			Saplings	120	2.6	15		0.04
			Poles	53	8.6	39	63	0.26
			S/T	15	18.8	68	127	0.21
11	Mature S/T	2,635	Seedlings	286				0.00
			Saplings	95	2.7	22		0.18
			Poles	110	8.5	43	61	0.39
			S/T	36	17.1	67	90	0.36
12	Immature Poles (Uninfected)	27,858	Seedlings	192				0.00
			Saplings	182	2.7	18		0.00
			Poles	90	8.7	44	64	0.00
			S/T	21	17.4	68	107	0.00
22	Immature Poles (DM infected)	27,858	Seedlings	303				0.00
			Saplings	246	2.5	16		0.39
			Poles	103	8.7	43	59	0.72
			S/T	27	16.0	65	96	0.71
13	Immature S/T (Uninfected)	5,409	Seedlings	223				0.00
			Saplings	113	2.7	16		0.00
			Poles	99	8.9	47	63	0.00
			S/T	20	16.4	74	97	0.00
23	Immature S/T (DM infected)	11,591	Seedlings	206				0.00
			Saplings	112	2.7	17		0.49
			Poles	86	8.7	43	53	0.28
			S/T	29	17.5	69	103	0.40
14	Seedling/Saplings (Uninfected)	5,532	Seedlings	366				0.00
			Saplings	484	2.3	15		0.04
			Poles	90	8.7	42	66	0.00
			S/T	20	15.9	60	98	0.11
24	Seedling/Saplings (DM infected)	10,273	Seedlings	310				0.00
			Saplings	217	2.2	13		0.26
			Poles	79	8.4	39	62	0.73
			S/T	17	16.9	65	118	1.04

Splitting the original strata into sub-strata to separate the infected from the uninfected strata was done by analyzing the original inventory printouts of the average stand data and selecting those sample points that showed an average dwarf-mistletoe rating (DMR). The number of points infected in each strata were then used to proportionately estimate the infected and uninfected acreage in each strata. It should be noted that not all of the original six strata (06, 07, 11, 12, 13, 14) were broken into sub-strata based in DMR. Strata 07 and 11 both have dwarf-mistletoe, but were not divided into acreage infected and uninfected. The reason for not breaking these two strata down was because the timber inventory program could only accomodate 10 total strata. Therefore,

strata 07 and 11 were chosen not to be subdivided because of the relatively small acreage involved with each of these two strata. The strata that were subdivided were selected for such based upon their respective size (acreage) and DMR, figuring that the higher the average DMR and the larger the acreage involved, the more critical it was that these be separated and managed separately as infected stands.

YIELD PROJECTIONS

The stand averages (Section IV.) were incorporated onto data entry forms for development of RMYLD runs to simulate growth. The basic timing options utilized for management were: (1) Delay of initial harvest from zero (no delay) to twenty (20) years; (2) extending the rotation age from 120 up to 170 years for some stands; (3) harvest interval of 20 years. These timing options used singularly and in combination provided numerous management alternatives for each strata.

No adjustments were made to yield data.

Input information used for development of FORPLAN runs are available in computer printout form, by accessing the following files at Fort Collins Computer Center:

File Name	Description
1. NFPTON*SC1A through SC1Y	RMYLD for Scenario 1
2. NFPTON*SC2A through SC2L and SC24	RMYLD for Scenario 2
3. NFPTON*SC3A through SC3B	RMYLD for Scenario 3
4. NFPTON*SC4A through SC4L	RMYLD for Scenario 4
5. SLT*1A through 1Y	"PPP" phase of SALT for Scenario 1
6. SLT*2A through 2L and 24	"PPP" phase of SALT for Scenario 2
7 SLT*3A through 3B	"PPP" phase of SALT for Scenario 3
8. SLT*4A through 4L and 24	"PPP" phase of SALT for Scenario 4
9. SLT*PPPSC1A through PPPSC1Y	"Extract" phase of SALT for Scenario 1
10. SLT*PPPSC2A through PPPSC2L and PPPSC24	"Extract" phase of SALT for Scenario 2
11. SLT*PPPSC3A through PPPSC3B	"Extract" phase of SALT for Scenario 3
12. SLT*PPPSC4A through PPPSC4L and PPPSC24	"Extract" phase of SALT for Scenario 4
13. SLT*INPUT1	
14. SLT*INPUT2	
15. SLT*INPUT3	
16. SLT*INPUT4	
17. SLT*SALTOUTPUT1	"RxCALC" phase of SALT for Scenario 1
18. SLT*SALTOUTPUT2	"RxCALC" phase of SALT for Scenario 2
19. SLT*SALTOUTPUT3	"RxCALC" phase of SALT for Scenario 3
20. SLT*SALTOUTPUT4	"RxCALC" phase of SALT for Scenario 4
21. NFPTON*SALTFORPLAN	

Timing options to be used by FORPLAN were developed by combining the various management alternatives listed in IV. A. By combining the option to delay initial entry form zero to twenty years with the option of using a rotation age of 120 to 170 and a harvest interval of 20 years, a wide array of management timing options was made available to FORPLAN. The various stocking level options available in Scenarios 1, 2, 3, and 4, when combined with the timing options, increased considerably the total available management possibilities for review of FORPLAN. (Refer to Financial Analysis Section for explanation of the four scenarios used with their corresponding prescriptions). It should be noted that a defect factor in the SALT program allowed for timber defect in calculating net timber volumes.

Appendix

AREA CONSTRAINTS and VEGETATION MANAGEMENT PRACTICES

With exception of salvage harvests, timber harvest on the Tonto is restricted to shelterwood management. In other words, when a timber stand is regenerated an overstory of seed trees remains until the area has been adequately restocked with seedlings. This silvicultural system is based on scientific research and practical experience in the Ponderosa-pine type on the Tonto. Shelterwood management meets management requirements specified in the planning regulations [36 CFR 219.27(b)] and conforms with the Southwestern Regional Guide.

In all prescriptions timber harvest on slopes in excess of 40% is restricted to cable logging to insure protection of soil and water resources.

Varying levels of basal area were analyzed to evaluate the effect on multiple-use goals.

Viable populations of native wildlife species are insured in the preferred alternative through maintenance of horizontal and vertical diversity, distribution of age classes throughout 5,000 acre management units, and basal area constraints.

Fisheries are protected in all prescriptions through maintenance of perennial stream cover.

LAND CLASSIFICATION

The following table displays the timber suitability classification for each benchmark and alternative and the previous timber management plan.

Table 80

Timber Suitability Classification

Land Classification	Alt. 1, 3, 5, 9 Benchmark, 5, 6, 7, 11, 12, 14 15, 16, 17, 18, 19, 20, 21, 22 23, 24	1/ Alt. 6, 4 Benchmark 8, 9	2/ Alt. 2, 7, 10	3/ Alt. 8	Previous Timber Plan
Non-Forest Land	996,880	996,880	996,880	996,880	2,648,300
Forest Land (F.L.)	1,876,412	1,876,412	1,876,412	1,876,412	22,045
F.L. withdrawn from timber production	375,921	375,921	375,921	375,921	15,500
F.L. not capable of prod. crops of industrial wood	1,343,217	1,343,217	1,343,217	1,343,217	31,100
F.L. physically unsuitable (not restockable in 5 yrs., etc.)	18,641	18,641	18,641	18,641	7,600
Forest Land - Inadequate Info.	N/A	N/A	N/A	N/A	NA
Tentatively Suitable F.L.	138,633	138,633	138,633	138,633	167,945
Not appropriate Forest Land because of:					
- Nontimber Values	N/A	N/A	N/A	N/A	NA
- Mgmt. requirements	13,770	13,770	13,770	13,770	30,981
- Cost Inefficiency	4,066	22,001	15,371	4,066	32,246
Unsuitable Forest Land	1,753,800	1,773,550	1,766,920	1,755,615	117,327
Total Suitable Forest Land	122,612	102,862	109,492	120,797	104,718
Total National Forest Land	2,873,292	2,873,292	2,873,292	2,873,292	2,870,345

1/ Excludes Sierra Ancha Experimental Forest, Pinal Mountains and slopes over 40%.
2/ Excludes Sierra Ancha Experimental Forest and Pinal Mountains.
3/ Excludes Sierra Ancha Experimental Forest.

Appendix

TIMBER PRODUCTIVITY CLASSIFICATION

The following information was tabulated from site indexes from the timber inventory. Corresponding acreages were obtained from the strata acreages used for our RMYIELD runs in the timber management plan. The 1981 timber inventory did not include productivity classification for suitable lands in the Pinal Mountains and Sierra Ancha Experimental Forest. Therefore, acreages in these units are not displayed in the following table.

Table 81

Timber Productivity Classification

Potential Growth (Cubic Feet/Acre/Year)	Suitable Lands (Acres)
Less than 20	
20-49	104,083
50-84	5,409
85-119	
120-164	
165-224	
225 +	
TOTAL:	109,492

FINANCIAL ANALYSIS

Management Intensities

The various management intensities for which input was prepared for simulation using the RMYLD growth model were broken down into four (4) categories or scenarios for the Forest. There were nine (9) prescriptions for the Forest, which were used as guides for grouping into the four scenarios, based upon the similiarity of the silvicultural management guides written in each of the prescriptions. The four scenarios with their corresponding management prescriptions are as follows:

(1) Scenario 1 incorporates the prescriptions for "Constrained Maximum Water Yield" and "Constrained Maximum Range Production," each of which called for silvicultural manipulation of the stands to a 30 to 50 growing stock level; providing for a seed cut under the shelterwood system; pre-commercial thinning using one entry for healthy stands and two entries for dwarf-mistletoe infested stands; and allowing for reforestation, if necessary, with natural regeneration preferred. A growing stock level (GSL) of 40 was used.

(2) Scenario 2 included prescriptions for "Constrained Maximum Watershed Condition", "Constrained Maximum Timber Production" and "Constrained Maximum Recreation." Each of these prescriptions called for managing the timber stands at a GSL of 60, 70, or 80; providing seed cuts under

the shelterwood system; precommercial thinning with one entry in healthy stands and two entries for dwarf-mistletoe infected stands; and reforestation, if necessary, with natural reproduction preferred. Each of the various timing options available was incorporated in an RMYLD run utilizing each of the three growing stock levels (GSL 60, 70, and 80).

(3) Scenario 3 included the "Constrained Maximum Wildlife" and the "Mongollon Rim-Integrated" prescriptions. These are the only two prescriptions incorporating detailed criteria for wildlife habitat needs and management. These two prescriptions used a GSL 100 for providing the dense pole stands needed for squirrel habitat plus it called for retaining 12-14 of the seed trees after regeneration and carrying them on an extended rotation to age 180-240 to provide vertical diversity needed by wildlife. These prescriptions also allowed precommercial thinning and reforestation, the same as Scenarios 1 and 2. Scenario 3 was designed to be applied to a certain number of acres (20,000) in the strata selected and the remaining operable-suitable timber acres would be managed the same as Scenario 2. This would provide wildlife habitat on the percentage of forested acres prescribed in the Plan and allow more intensive timber management on the remainder.

(4) Scenario 4 included the "Low Intensity" prescription and the "Current" prescription, which provide for management identical to Scenario 2, except for providing only one precommercial thinning entry regardless of the presence or absence of dwarf-mistletoe.

Refer to Table 79 for a tabular display of the Forest stratification in analysis categories (strata).

Timber Benefits

Output categories and dollar values were taken from the 1985 RPA Program.

Output Name	Tractor Logging Value/MBF	Cable Logging Value/MBF
Ponderosa-pine	148.83	108.83

An optional report to estimate fuelwood yields was generated assuming a ten-percent cull factor.

Cable logging values were reduced by $40 to reflect additional logging costs based on actual experience in Region 3.

Timber Costs

Timber costs were developed using the 1984 Tonto timber program and discounting 1984 dollars to 4th quarter 1980 dollars. Costs include timber management plans and silvicultural examinations, timber sale preparation, timber sale administration, timber purchaser road reconstruction, road construction engineering, timber stand improvement and reforestation. These costs represent the minimum staffing level necessary to meet minimum management requirements and other multiple use considerations at current harvest levels.

Costs for harvest levels above current were adjusted to reflect increased timber purchaser road construction, archaeological surveys, and modified staffing and service contracts necessary to handle higher levels of output.

Costs for low intensity management were reduced 29 percent below current and represent costs necessary to meet minimum legal requirements.

Cable preparation costs were increased 35 percent based on Regional experience.

Appendix

Discounted Benefits and Costs

Information concerning the discounted timber costs, the discounted timber benefits, the timber PNV, and the management intensity which maximizes PNV for each analysis area can be found on file in the Forest Supervisor's Office, Tonto National Forest. The run ID is TONR5S and the file name in which the benefits, costs, and PNV can be found is FORTONR5S*MATRX-COLS.

ALLOWABLE SALE QUANTITY and TIMBER SALE PROGRAM QUANTITY

The following tables display allowable sale quantity timber sale program quantity, present net worth and timber resource benefits for benchmarks and alternatives:

Table 82	Sawtimber and Product MCF
Table 83	Sawtimber MBF
Table 84	Product MBF
Table B5	Charge Fuelwood
Table 86	Long Range Sustained Yield (MCF)
Table 87	Present Net Worth (Timber)
Table 88	Timber Resource Benefits
Table 89-98	First Period Harvest Method and Allowable Sale Quantity

Although Alternative 5 is displayed in the report, it was dropped from detailed study in the Environmental Impact Statement because Forest-wide outputs and present net value of this alternative was not significantly different than Alternative 10. Refer to Chapter 2 of the Environmental Impact Statement for specific details.

Table 82

Allowable Sale Quantity And Timber Sale Program Quantity

Sawtimber and Product by MCF Per Period

(Net Merchant Timber Volume)

Benchmark 1/	Period 1 (10 yrs.)	Period 2 (10 yrs.)	Period 3 (10 yrs.)	Period 4 (10 yrs.)	Period 5 (10 yrs.)	Period 6 (50 yrs.)	Period 7 (50 yrs.)	Period 8 (50 yrs.)
3	48,670	48,720	48,680	48,770	48,940	244,000	243,550	243,950
5	47,990	48,030	48,090	48,050	48,060	240,400	240,600	240,750
6	99,620	27,570	34,680	25,340	64,870	198,050	183,600	221,100
7	47,990	48,030	48,090	48,050	48,060	240,400	240,600	240,750
8	13,050	13,350	13,250	13,380	14,920	97,100	96,800	111,450
9	21,480	21,470	30,070	30,080	30,070	150,450	150,450	189,500
11	19,190	20,690	37,550	24,860	21,180	351,550	163,400	401,200
12	17,810	50,000	29,170	36,680	36,460	312,800	185,150	377,500
14	82,850	40,250	10,460	26,830	41,250	171,200	265,350	284,650
15	80,580	40,510	45,070	31,310	60,450	237,100	213,200	171,750
16	80,580	40,510	45,070	31,310	60,450	237,100	213,200	171,750
17	58,190	42,850	39,290	44,630	64,740	253,500	202,300	208,400
18	58,190	42,850	39,290	44,630	64,740	253,500	202,300	208,400
19	55,180	36,820	48,350	43,480	66,590	276,950	182,050	192,150
20	55,180	36,820	48,350	43,480	66,590	276,950	182,050	192,150
21	81,850	40,630	45,940	29,960	60,360	237,400	216,400	168,000
22	81,850	40,630	45,940	29,960	60,360	237,400	216,400	168,000
23	55,180	36,820	48,350	43,480	66,590	276,950	182,050	192,150
24	55,180	36,820	48,350	43,480	66,590	276,950	182,050	192,150

1/ Benchmark numbers correspond to numbers in Table 72, Appendix B.

Table 82 (continued)

Allowable Sale Quantity And Timber Sale Program Quantity

Sawtimber and Product by MCF Per Period

(Net Merchant Timber Volume)

Alternative	Period 1 (10 yrs.)	Period 2 (10 yrs.)	Period 3 (10 yrs.)	Period 4 (10 yrs.)	Period 5 (10 yrs.)	Period 6 (50 yrs.)	Period 7 (50 yrs.)	Period 8 (50 yrs.)
1	21,470	29,410	29,250	29,360	29,260	146,850	146,750	146,750
2	22,200	34,590	36,960	37,010	36,880	185,100	184,950	212,400
3	47,990	48,030	48,090	48,050	48,060	240,400	240,600	240,750
4	21,480	21,470	30,070	30,080	30,070	150,450	150,450	189,500
5	21,010	39,190	50,050	50,000	50,090	250,250	250,050	250,150
6	13,050	13,350	13,250	13,380	14,920	97,100	96,800	111,450
7	22,200	34,590	36,960	37,010	36,880	185,100	184,950	212,400
8	21,950	37,540	46,740	46,570	46,820	232,650	233,200	274,000
9	21,010	39,190	50,050	50,000	50,090	250,250	250,050	250,750
Proposed Action	21,650	38,610	41,820	41,870	41,670	209,100	209,150	250,750
Departure Run (Proposed Action)	22,010	30,840	43,240	60,640	44,690	206,300	186,050	260,550

Table 83 1/

Allowable Sale Quantity And Timber Sale Program Quantity

Sawtimber by MBF Per Period

(Net Sawtimber)

Benchmark	Period 1 (10 yrs.)	Period 2 (10 yrs.)	Period 3 (10 yrs.)	Period 4 (10 yrs.)	Period 5 (10 yrs.)	Period 6 (50 yrs.)	Period 7 (50 yrs.)	Period 8 (50 yrs.)
3	161,680	170,550	169,680	185,980	168,800	770,550	582,100	795,050
5	164,040	171,920	170,820	187,530	175,650	801,000	578,550	775,400
6	346,250	100,590	118,560	111,880	175,150	733,150	402,700	685,050
7	164,040	171,920	170,820	187,530	175,650	801,000	578,550	775,400
8	47,240	46,870	46,480	46,990	46,820	358,050	272,850	273,300
9	74,980	74,870	116,510	119,350	90,880	544,800	371,300	487,550
11	75,190	75,280	148,530	88,460	72,590	1,347,900	216,200	1,420,800
12	69,210	180,650	108,590	133,960	124,950	1,190,450	318,300	1,357,150
14	285,260	147,700	40,320	101,850	131,220	578,400	864,750	814,000
15	264,880	141,850	153,450	132,020	170,860	843,150	402,750	649,500
16	264,800	141,850	153,450	132,020	170,860	843,150	402,750	649,500
17	204,530	147,620	133,900	175,050	200,290	877,800	459,350	573,600
18	204,530	147,620	133,900	175,050	200,290	877,800	459,350	573,600
19	194,270	125,210	167,010	172,280	206,590	963,400	344,550	532,050
20	194,270	125,210	167,010	172,280	206,590	963,400	344,550	532,050
21	267,960	139,020	156,320	124,170	164,470	837,250	405,900	643,650
22	267,960	139,020	156,320	124,170	164,470	837,250	405,900	643,650
23	194,270	125,210	167,010	172,280	206,590	963,400	344,550	532,050
24	194,270	125,210	167,010	172,280	206,590	963,400	344,550	532,050

1/ Benchmark numbers correspond to numbers in Table 72, Appendix B.

Table 83 (continued)

Allowable Sale Quantity And Timber Sale Program Quantity

Sawtimber by MBF Per Period

(Net Sawtimber)

Alternative	Period 1 (10 yrs.)	Period 2 (10 yrs.)	Period 3 (10 yrs.)	Period 4 (10 yrs.)	Period 5 (10 yrs.)	Period 6 (50 yrs.)	Period 7 (50 yrs.)	Period 8 (50 yrs.)
1	74,930	96,800	86,190	121,230	100,780	567,000	286,050	503,350
2	75,060	121,290	147,710	152,170	96,850	637,200	433,850	606,350
3	164,040	171,920	170,820	187,530	175,650	801,000	578,550	775,400
4	74,980	74,870	116,510	119,350	90,880	544,800	371,300	487,550
5	75,160	134,150	191,260	202,940	196,890	883,600	560,100	814,800
6	47,240	46,870	46,480	46,990	46,820	358,050	272,850	273,300
7	75,060	121,290	147,710	152,170	96,850	637,200	433,850	606,350
8	74,830	133,920	181,610	186,790	173,790	784,650	554,550	835,100
9	75,160	134,150	191,260	202,940	196,890	883,600	560,100	814,800
Proposed Action	74,880	133,890	163,910	164,300	160,010	684,850	508,150	752,200
Departure Run (Proposed Action)	74,840	109,900	166,890	243,820	158,440	682,500	379,750	813,150

Table 84

Allowable Sale Quantity And Timber Sale Program Quantity

Product MBF by Period

(Net Products)

Benchmark 1/	Period 1 (10 yrs.)	Period 2 (10 yrs.)	Period 3 (10 yrs.)	Period 4 (10 yrs.)	Period 5 (10 yrs.)	Period 6 (50 yrs.)	Period 7 (50 yrs.)	Period 8 (50 yrs.)
3	13,110	2,600	13,180	6,290	15,840	128,600	249,500	149,200
5	16,220	2,440	5,860	5,690	11,880	112,550	250,750	155,000
6	25,980	870	12,420	870	53,720	52,900	233,900	157,950
7	16,220	2,440	5,860	5,690	11,880	112,550	250,750	155,000
8	2,800		4,580	5,700	10,760	25,750	84,050	121,750
9	6,840		3,760	5,410	22,460	31,400	158,100	195,600
11		1,640	1,720	4,840	7,290	38,300	280,400	158,700
12		5,510	5,650	8,680	12,060	43,100	274,500	132,300
14	5,060	3,420	400	4,560	23,470	80,050	150,400	222,050
15	32,580	8,650	16,330	3,470	43,140	79,100	292,600	77,050
16	32,580	8,650	16,330	3,470	43,140	79,100	292,600	77,050
17	17,330	3,260	14,770	4,210	36,190	84,100	228,550	197,700
18	17,330	3,260	14,770	4,210	36,190	84,100	228,550	197,700
19	19,950	2,320	17,520	4,090	37,360	86,950	245,950	189,450
20	19,950	2,320	17,520	4,090	37,360	86,950	245,950	189,450
21	33,770	9,180	16,020	3,630	44,580	77,800	294,000	67,900
22	33,770	9,180	16,020	3,630	44,580	77,800	294,000	67,900
23	19,950	2,320	17,520	4,090	37,360	86,950	245,950	189,450
24	19,950	2,320	17,520	4,090	37,360	86,950	245,950	189,450

1/ Benchmark numbers correspond to numbers in Table 72, Appendix B.

Table 84 (Continued)

Allowable Sale Quantity And Timber Sale Program Quantity

	Product MBF by Period (Net Products)							
Alternative	Period 1 (10 yrs.)	Period 2 (10 yrs.)	Period 3 (10 yrs.)	Period 4 (10 yrs.)	Period 5 (10 yrs.)	Period 6 (50 yrs.)	Period 7 (50 yrs.)	Period 8 (50 yrs.)
1	2,310	12,150	18,700	5,170	8,320	26,100	208,550	96,550
2	11,780	2,060	2,040		33,690	54,050	201,850	184,900
3	16,220	2,440	5,860	5,690	11,880	112,550	250,750	155,000
4	6,840		3,760	5,410	22,460	31,400	158,100	195,600
5	4,690	3,570	5,650	4,300	5,580	78,000	291,850	168,150
6	280		458	570	1,076	515	1,681	2,435
7	11,780	2,060	2,040		33,690	54,050	201,850	184,900
8	3,240	2,240	1,560	4,470	8,630	87,750	253,000	207,950
9	4,690	3,570	5,650	4,300	5,580	78,000	291,850	168,150
Proposed Action	3,720	3,510	1,060	4,030	7,090	89,100	218,450	194,150
Departure Run (Proposed Action)	4,380	1,120	3,110	1,900	16,410	75,600	238,400	179,550

Table 85

Allowable Sale Quantity And Timber Sale Program Quantity

Charge Fuelwood MBF by Period

(MBF/Period)

Benchmark 1/	Period 1 (10 yrs.)	Period 2 (10 yrs.)	Period 3 (10 yrs.)	Period 4 (10 yrs.)	Period 5 (10 yrs.)	Period 6 (50 yrs.)	Period 7 (50 yrs.)	Period 8 (50 yrs.)
11	89,752	89,752	94,993	90,693	89,611	517,317	437,147	522,417
12	129,586	137,660	132,419	134,260	133,694	708,269	646,371	726,116
14	144,883	135,252	127,603	131,994	134,118	664,785	685,181	681,499
Alternative								
1	132,792	134,209	133,501	135,909	134,492	677,135	657,305	672,602
2	96,311	99,569	101,410	101,977	97,869	500,534	485,945	498,268
3	139,025	139,591	139,591	140,583	139,875	693,849	677,985	677,843
4	71,471	71,471	74,587	74,729	72,604	369,819	357,496	365,711
5	93,472	97,580	101,688	102,538	101,971	502,915	480,110	493,425
6	69,629	69,629	69,629	69,629	69,629	356,504	350,555	350,555
7	127,081	130,339	132,180	132,747	128,639	654,384	639,795	652,118
8	128,871	132,978	136,520	136,803	135,953	673,816	657,527	677,357
9	83,992	88,100	92,208	93,058	92,491	455,515	432,710	446,025
Proposed Action	95,201	99,450	101,575	101,575	101,291	498,384	485,777	503,058

1/ Benchmark numbers correspond to Table 72, Appendix B.

NOTE: Above fuelwood volumes are a sum total of fuelwood sold, dead-down, and top-wood sold.

Appendix

Table 86

Long Range Sustained Yield by MCF

Benchmark 1/	LRSY	Alternative	LRSY
3	57,202	1	29,337
5	58,311	2	42,517
6	50,266	3	58,311
7	58,311	4	37,893
8	22,285	5	50,902
9	37,893	6	22,285
11	57,729	7	42,517
12	63,131	8	54,787
14	72,626	9	50,902
15	41,477	Proposed Action	50,617
16	41,477	Departure Run	50,363
17	54,665	(Proposed Action)	
18	54,665		
19	48,515		
20	48,515		
21	40,959		
22	40,959		
23	48,515		
24	48,515		

1/ Benchmark numbers correspond to numbers in Table 72, Appendix B.

Table 87

Allowable Sale Quantity And Timber Sale Program Quantity

Timber Present Net Worth by Period (Cumulative)

(M Dollars)

Benchmark 1/	Period 1 (10 yrs.)	Period 2 (10 yrs.)	Period 3 (10 yrs.)	Period 4 (10 yrs.)	Period 5 (10 yrs.)	Period 6 (50 yrs.)	Period 7 (50 yrs.)	Period 8 (50 yrs.)
11	9.7	16.2	24.6	28.0	30.0	40.6	40.9	41.1
12	9.1	10.9	17.1	22.4	25.7	35.2	35.6	35.8
14	35.7	48.2	50.7	54.6	58.1	62.8	63.8	63.9
Alternative								
1	10.0	18.5	23.7	28.5	31.2	35.9	36.3	36.4
2	9.8	20.2	28.7	34.6	37.2	42.3	42.8	42.9
3	20.9	35.5	45.2	52.3	56.5	63.0	63.7	63.9
4	9.6	16.1	22.8	27.4	29.8	34.2	34.6	34.7
5	9.7	21.1	31.9	39.3	44.4	51.4	52.1	52.2
6	6.2	10.3	13.1	15.0	16.3	19.3	19.6	19.7
7	10.0	20.5	29.1	35.1	37.7	42.9	43.4	43.5
8	9.9	21.5	31.8	39.0	43.6	49.9	50.6	50.7
9	9.7	21.0	31.8	39.5	44.6	51.6	52.2	52.3
Proposed Action	9.7	21.1	30.4	36.7	40.9	46.4	47.0	47.1

1/ Benchmark numbers correspond to numbers in Table 72, Appendix B.

Table 88

Allowable Sale Quantity And Timber Sale Program Quantity

Timber Resource Benefits by Period

(Net Revenue/Period M Dollars)

Benchmark 1/	Period 1 (10 yrs.)	Period 2 (10 yrs.)	Period 3 (10 yrs.)	Period 4 (10 yrs.)	Period 5 (10 yrs.)	Period 6 (50 yrs.)	Period 7 (50 yrs.)	Period 8 (50 yrs.)
5	25,458	26,318	25,938	28,126	24,432	122,121	91,503	118,496
6	52,138	15,427	18,391	17,024	27,051	112,211	65,581	105,994
7	25,128	25,988	25,608	27,796	24,102	120,471	89,853	116,945
11	11,746	11,630	22,341	13,482	11,378	200,890	36,882	212,451
12	11,100	3,202	16,517	20,773	19,495	179,190	53,517	204,672
14	43,159	22,446	6,730	15,451	20,162	89,063	134,065	125,640
Alternative								
1	12,108	15,341	13,925	18,948	16,018	88,864	48,624	80,139
2	11,929	18,696	22,651	23,349	15,220	97,113	68,651	94,923
3	25,488	26,348	25,968	28,156	24,462	122,271	91,653	118,646
4	11,722	11,650	17,900	18,337	14,225	83,966	59,090	76,758
5	11,853	20,493	28,838	30,570	29,763	132,297	87,701	124,223
6	7,548	7,470	7,448	7,534	7,550	56,028	43,781	44,162
7	12,149	18,916	22,871	23,569	15,440	98,213	69,751	96,073
8	12,032	20,812	27,547	28,564	26,658	119,355	87,881	129,129
9	11,783	20,423	28,768	30,500	29,693	131,947	87,351	123,873
Proposed Action	11,817	20,600	24,715	24,991	24,353	103,641	79,682	115,449

1/ Benchmark numbers correspond to numbers in Table 72, Appendix B.

Table 89

Allowable Sale Quantity and Timber Sale Program Quantity

(Annual Average for First Period)

ALTERNATIVE 1:		Allowable Sale Quantity			
		Sawtimber		Other Products	
Harvest Method	Acres	(MMCF)	(MMBF)	(MMCF)	(MMBF)
Regeneration Harvest:					
Clearcut					
Shelterwood & Seed Tree - Preparatory Cut - Seed Cut - Removal Cut	1,910	0.8	3.2	0.0	0.0
Selection					
Intermediate Harvest:					
Commercial Thinning	1,520	1.2	4.3	0.1	0.2
Salvage/Sanitation					
TOTAL:	3,430	2.0	7.5	0.1	0.2

	Additional Sales			
	Sawtimber		Other Products	
	(MMCF)	(MMBF)	(MMCF)	(MMBF)
Total for all Harvest Methods:	0.0	0.0	5.3	13.3 *

Allowable Sale Quantity 2.1 (MMCF) 7.7 (MMBF)

Timber Sale Program Quantity 7.4 (MMCF) 21.0 (MMBF

Acres Precommercial TSI 11,500

Acres Reforestation:

Natural 0

Artificial 0

* The "Additional Sales - Other Products" volume is a sum total of fuelwood sold, dead-down, and topwood sold.

Appendix

Table 90

Allowable Sale Quantity and Timber Sale Program Quantity

(Annual Average for First Period)

ALTERNATIVE 2:

Harvest Method	Acres	Allowable Sale Quantity: Sawtimber (MMCF)	Sawtimber (MMBF)	Other Products (MMCF)	Other Products (MMBF)
Regeneration Harvest:					
Clearcut					
Shelterwood & Seed Tree					
- Preparatory Cut					
- Seed Cut					
- Removal Cut	2,570	0.2	0.6	0.0	0.0
Selection					
Intermediate Harvest:					
Commercial Thinning	3,500	1.6	6.9	0.5	1.2
Salvage/Sanitation					
TOTAL:	6,070	1.8	7.5	0.5	1.2

	Additional Sales: Sawtimber (MMCF)	Sawtimber (MMBF)	Other Products (MMCF)	Other Products (MMBF)
	0.0	0.0	3.9	9.6 *

Total for all Harvest Methods:

Allowable Sale Quantity 2.3 (MMCF) 8.7 (MMBF)

Timber Sale Program Quantity 6.2 (MMCF) 18.3 (MMBF

Acres Precommercial TSI 0

Acres Reforestation:

Natural: 0

Artificial: 0

* The "Additional Sales - Other Products" volume is a sum total of fuelwood sold, dead-down, and topwood sold.

Appendix

Table 91

Allowable Sale Quantity and Timber Sale Program Quantity

(Annual Average for First Period)

ALTERNATIVE 3:		Allowable Sale Quantity			
Harvest Method	Acres	Sawtimber (MMCF)	Sawtimber (MMBF)	Other Products (MMCF)	Other Products (MMBF)
Regeneration Harvest:					
Clearcut					
Shelterwood & Seed Tree - Preparatory Cut - Seed Cut - Removal Cut	940	0.4	1.1	0.0	0.0
Selection					
Intermediate Harvest:					
Commercial Thinning	2,900	1.9	6.1	0.3	0.7
Salvage/Sanitation					
TOTAL:	3,840	2.3	7.2	0.3	0.7

	Additional Sales			
	Sawtimber (MMCF)	Sawtimber (MMBF)	Other Products (MMCF)	Other Products (MMBF)
Total for all Harvest Methods:	0.0	0.0	5.6	13.9 *

Allowable Sale Quantity 2.6 (MMCF) 7.9 (MMBF)

Timber Sale Program Quantity 8.2 (MMCF) 21.8 (MMBF

* The "Additional Sales - Other Products" volume is a sum total of fuelwood sold, dead-down, and topwood sold.

Appendix

Table 92

Allowable Sale Quantity and Timber Sale Program Quantity

(Annual Average for First Period)

ALTERNATIVE 4: Harvest Method	Acres	Allowable Sale Quantity Sawtimber (MMCF)	Sawtimber (MMBF)	Other Products (MMCF)	Other Products (MMBF)
Regeneration Harvest:					
Clearcut					
Shelterwood & Seed Tree					
- Preparatory Cut	1,440	0.8	3.6	0.3	0.7
- Seed Cut					
- Removal Cut	2,620	0.8	2.9	0.0	0.0
Selection					
Intermediate Harvest:					
Commercial Thinning	960	0.3	1.0	0.0	0.0
Salvage/Sanitation					
TOTAL:	5,020	1.9	7.5	0.3	0.7

	Additional Sales Sawtimber (MMCF)	Sawtimber (MMBF)	Other Products (MMCF)	Other Products (MMBF)
	0.0	0.0	2.9	7.1 *

Total for all Harvest Methods:

Allowable Sale Quantity 2.2 (MMCF) 8.2 (MMBF)

Timber Sale Program Quantity 5.1 (MMCF) 15.3 (MMBF

Acres Precommercial TSI 0

Acres Reforestation:

Natural: 0

Artificial: 0

* The "Additional Sales - Other Products" volume is a sum total of fuelwood sold, dead-down, and topwood sold.

Table 93

Allowable Sale Quantity and Timber Sale Program Quantity

(Annual Average for First Period)

ALTERNATIVE 5:

Harvest Method	Acres	Allowable Sale Quantity: Sawtimber (MMCF)	Sawtimber (MMBF)	Other Products (MMCF)	Other Products (MMBF)
Regeneration Harvest:					
Clearcut					
Shelterwood & Seed Tree - Preparatory Cut - Seed Cut - Removal Cut	2,690	0.7	2.8	0.0	0.0
Selection					
Intermediate Harvest:					
Commercial Thinning	2,300	1.2	4.8	0.2	0.7
Salvage/Sanitation					
TOTAL:	4,990	1.9	7.6	0.2	0.7

	Additional Sales: Sawtimber (MMCF)	Sawtimber (MMBF)	Other Products (MMCF)	Other Products (MMBF)
	0.0	0.0	3.7	9.3 *

Total for all Harvest Methods:

Allowable Sale Quantity 2.1 (MMCF) 8.3 (MMBF)

Timber Sale Program Quantity 5.8 (MMCF) 17.6 (MMBF

Acres Precommercial TSI 0

Acres Reforestation:

Natural: 0

Artificial: 0

* The "Additional Sales - Other Products" volume is a sum total of fuelwood sold, dead-down, and topwood sold.

Appendix

Table 94

Allowable Sale Quantity and Timber Sale Program Quantity

(Annual Average for First Period)

ALTERNATIVE 6: Harvest Method	Acres	Allowable Sale Quantity: Sawtimber (MMCF)	Sawtimber (MMBF)	Other Products (MMCF)	Other Products (MMBF)
Regeneration Harvest:					
Clearcut					
Shelterwood & Seed Tree - Preparatory Cut - Seed Cut - Removal Cut	1,460	0.9	3.3	0.0	0.0
Selection					
Intermediate Harvest:					
Commercial Thinning	590	0.3	1.5	0.1	0.3
Salvage/Sanitation					
TOTAL:	2,050	1.2	4.8	0.1	1.3

Additional Sales: Sawtimber (MMCF)	Sawtimber (MMBF)	Other Products (MMCF)	Other Products (MMBF)
0.0	0.0	2.8	7.0 *

Total for all Harvest Methods:

Allowable Sale Quantity 1.3 (MMCF) 5.1 (MMBF)

Timber Sale Program Quantity 4.1 (MMCF) 12.1 (MMBF

Acres Precommercial TSI 0

Acres Reforestation:

Natural: 0

Artificial: 0

* The "Additional Sales - Other Products" volume is a sum total of fuelwood sold, dead-down, and topwood sold.

Table 95

Allowable Sale Quantity and Timber Sale Program Quantity

(Annual Average for First Period)

ALTERNATIVE 7:

Harvest Method	Acres	Allowable Sale Quantity: Sawtimber (MMCF)	Sawtimber (MMBF)	Other Products (MMCF)	Other Products (MMBF)
Regeneration Harvest:					
Clearcut					
Shelterwood & Seed Tree - Preparatory Cut - Seed Cut - Removal Cut	2,570	0.2	0.6	0.0	0.0
Selection					
Intermediate Harvest:					
Commercial Thinning	3,500	1.6	6.9	0.5	1.2
Salvage/Sanitation					
TOTAL:	6,070	1.8	7.5	0.5	1.2

Additional Sales: Sawtimber (MMCF)	Sawtimber (MMBF)	Other Products (MMCF)	Other Products (MMBF)
0.0	0.0	5.1	12.7 *

Total for all Harvest Methods:

Allowable Sale Quantity 2.3 (MMCF) 8.7 (MMBF)

Timber Sale Program Quantity 7.4 (MMCF) 21.4 (MMBF

Acres Precommercial TSI 0

Acres Reforestation:

Natural: 0

Artificial: 0

* The "Additional Sales - Other Products" volume is a sum total of fuelwood sold, dead-down, and topwood sold.

Appendix

Table 96

Allowable Sale Quantity and Timber Sale Program Quantity

(Annual Average for First Period)

ALTERNATIVE 8: Harvest Method	Acres	Allowable Sale Quantity Sawtimber (MMCF)	Sawtimber (MMBF)	Other Products (MMCF)	Other Products (MMBF)
Regeneration Harvest:					
Clearcut					
Shelterwood & Seed Tree - Preparatory Cut - Seed Cut - Removal Cut	3,490	1.4	4.8	0.0	0.0
Selection					
Intermediate Harvest:					
Commercial Thinning	1,270	0.7	2.7	0.1	0.3
Salvage/Sanitation					
TOTAL:	4,760	2.1	7.5	0.1	0.3

Additional Sales Sawtimber (MMCF)	Sawtimber (MMBF)	Other Products (MMCF)	Other Products (MMBF)
0.0	0.0	5.2	12.9 *

Total for all Harvest Methods:

Allowable Sale Quantity 2.2 (MMCF) 7.8 (MMBF)

Timber Sale Program Quantity 7.7 (MMCF) 20.7 (MMBF

Acres Precommercial TSI 0

Acres Reforestation:

Natural: 0

Artificial: 0

* The "Additional Sales - Other Products" volume is a sum total of fuelwood sold, dead-down, and topwood sold.

Table 97

Allowable Sale Quantity and Timber Sale Program Quantity

(Annual Average for First Period)

ALTERNATIVE 9:

Harvest Method	Acres	Allowable Sale Quantity: Sawtimber (MMCF)	Sawtimber (MMBF)	Other Products (MMCF)	Other Products (MMBF)
Regeneration Harvest:					
Clearcut					
Shelterwood & Seed Tree - Preparatory Cut - Seed Cut - Removal Cut	2,690	0.7	2.8	0.0	0.0
Selection					
Intermediate Harvest:					
Commercial Thinning	2,300	1.2	4.8	0.2	0.7
Salvage/Sanitation					
TOTAL:	4,990	1.9	7.6	0.2	0.7

Additional Sales: Sawtimber (MMCF)	Sawtimber (MMBF)	Other Products (MMCF)	Other Products (MMBF)
0.0	0.0	3.7	9.3 *

Total for all Harvest Methods:

Allowable Sale Quantity 2.1 (MMCF) 8.3 (MMBF)

Timber Sale Program Quantity 5.8 (MMCF) 17.6 (MMBF

Acres Precommercial TSI 0

Acres Reforestation:

Natural: 0

Artificial: 0

* The "Additional Sales - Other Products" volume is a sum total of fuelwood sold, dead-down, and topwood sold.

Appendix

Table 98

Allowable Sale Quantity and Timber Sale Program Quantity

(Annual Average for First Period)

PROPOSED ACTION:		Allowable Sale Quantity			
Harvest Method	Acres	Sawtimber (MMCF)	Sawtimber (MMBF)	Other Products (MMCF)	Other Products (MMBF)
Regeneration Harvest:					
Clearcut					
Shelterwood & Seed Tree - Preparatory Cut - Seed Cut - Removal Cut	3,450	1.5	5.3	0.0	0.0
Selection					
Intermediate Harvest:					
Commercial Thinning	2,140	0.6	2.2	0.1	0.3
Salvage/Sanitation					
TOTAL:	5,590	2.1	7.5	0.1	0.4

	Additional Sales			
	Sawtimber (MMCF)	Sawtimber (MMBF)	Other Products (MMCF)	Other Products (MMBF)
	0.0	0.0	3.8	9.5 *

Total for all Harvest Methods:

Allowable Sale Quantity 2.2 (MMCF) 7.9 (MMBF)

Timber Sale Program Quantity 6.0 (MMCF) 17.3 (MMBF

Acres Precommercial TSI 400

Acres Reforestation:

Natural: 0

Artificial: 0

* The "Additional Sales - Other Products" volume is a sum total of fuelwood sold, dead-down, and topwood sold.

No regeneration (seed) cuts were prescribed during the first period for any alternative because of the stand condition classes, and their respective age classes, that exist on the Forest. The timber inventory indicated a three story condition in almost every stand condition class on the Forest. In most instances, the lower two stories were either utilized in combination, or one of them separately, to create an adequately stocked understory. The age classes of each of these respective stories did not vary significantly from one stand condition class (strata) to another. Because of the existence of a stocked understory and the age classes represented, there was no need to prescribe for regeneration cuts during the first decade.

It should be noted that the "Other Products MMCF" and the "Sawtimber MMCF" figures in the tables above were determined from the FORPLAN runs as follows:

1. If the "Net Product" line for the first decade showed no volume, the "Net Merchant Timber Volume" represented the entire MMCF volume for sawtimber.

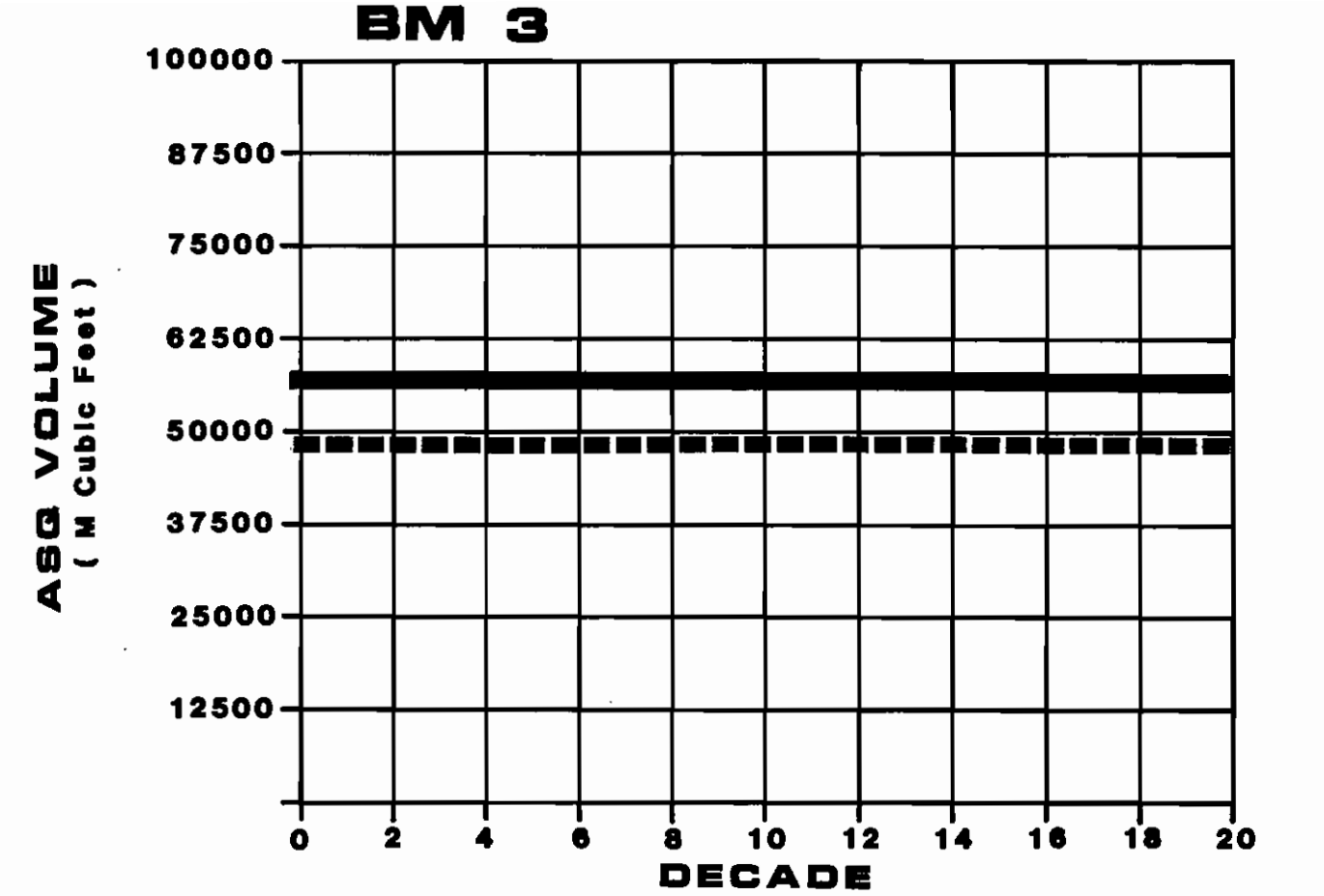
2. If the "Net Product" line did show a volume for the first decade, then that volume (MBF) was divided by 2.5 to give the MMCF volume for "Other Products" in the tables. This volume was then subtracted from the "Net Merchant Timber Volume (MCF)" to give the MMCF volume for sawtimber in the tables.

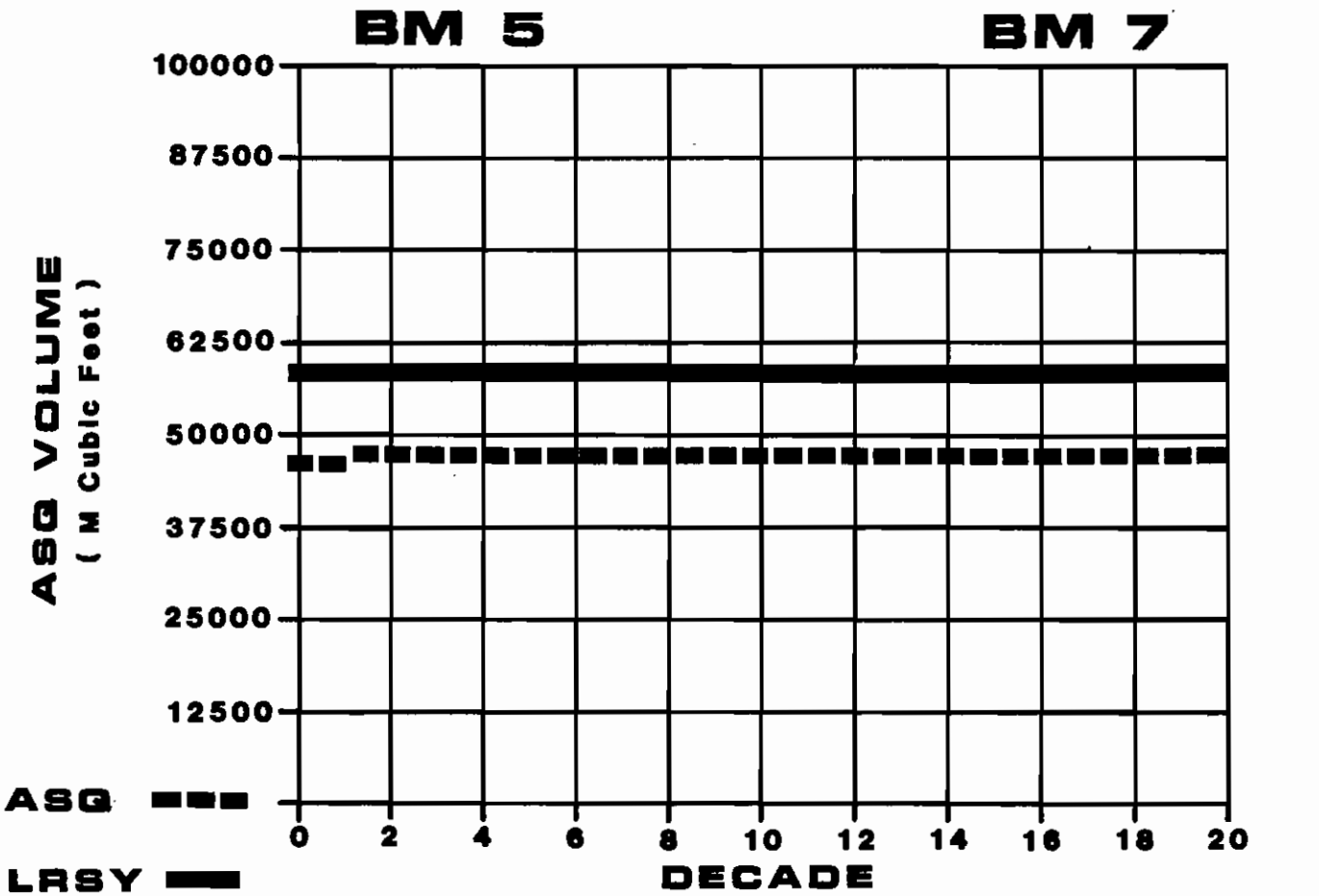
These calculations were necessary because the "Net Merchant Timber Volume" line of the FORPLAN runs represented both "sawtimber" and "other products" combined, unless there was no volume shown in the "net products" line.

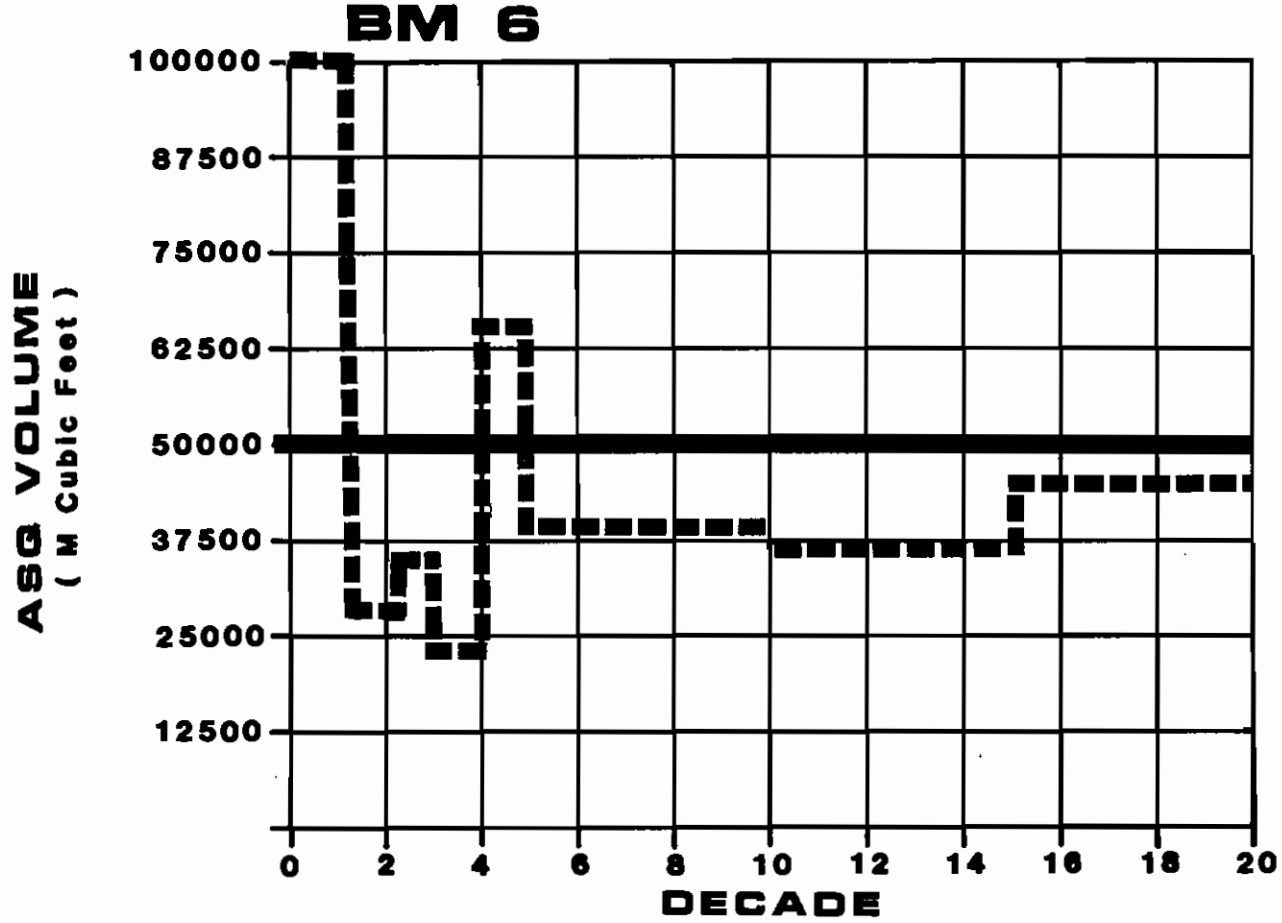
Appendix

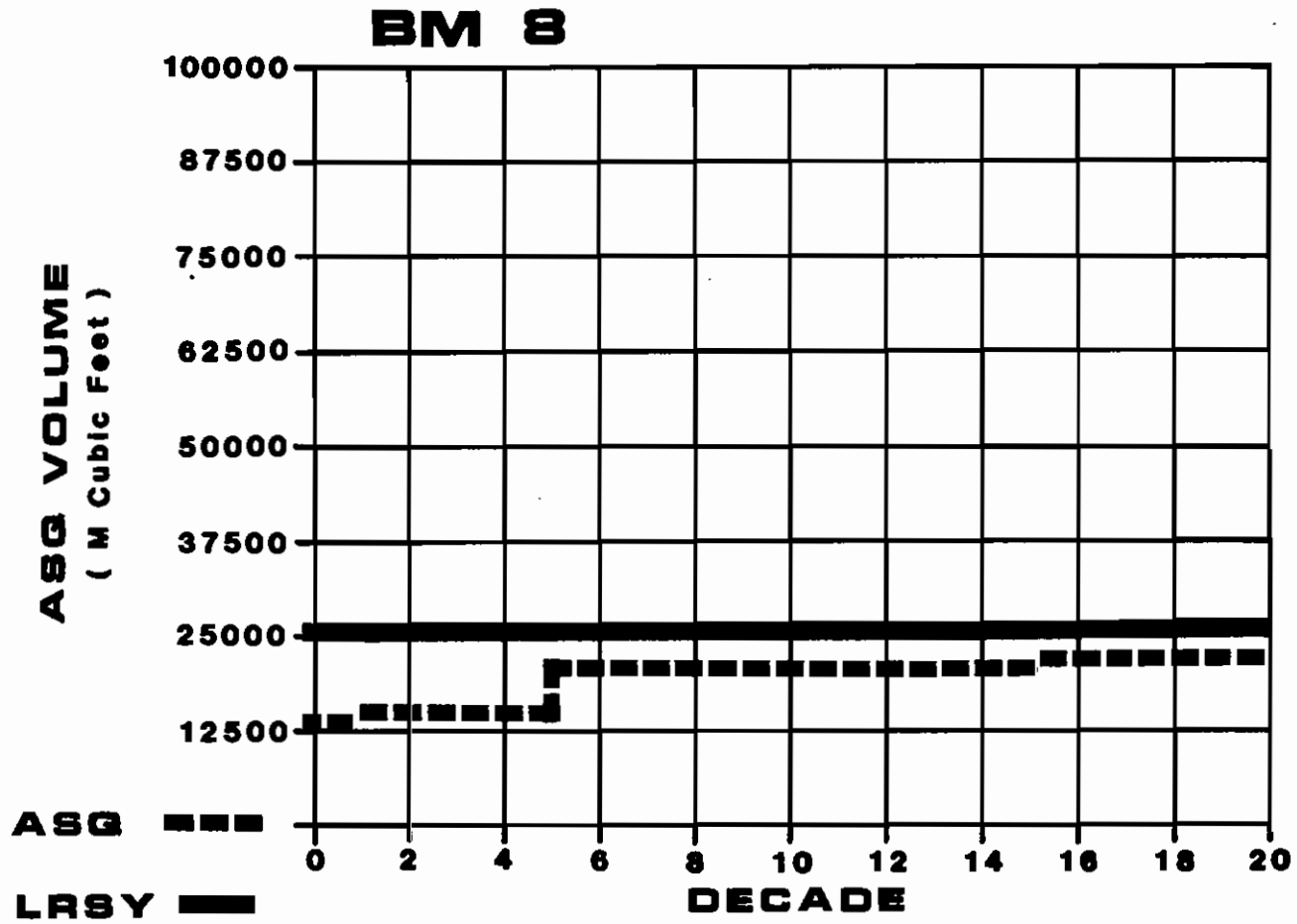
ALLOWABLE SALE QUANTITY and LONG-TERM SUSTAINED YIELD CAPACITY

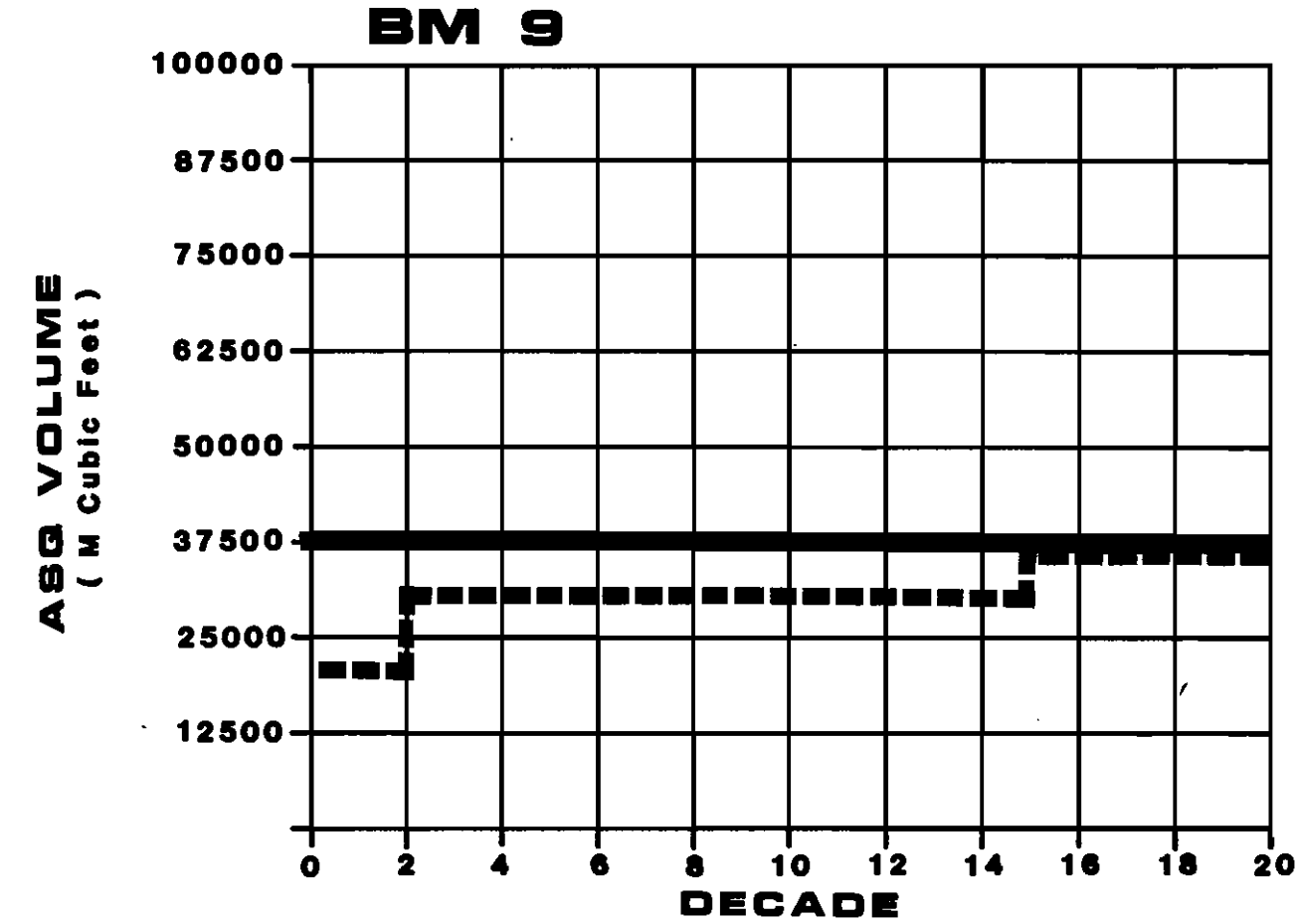
The following graphs display the allowable sale quantities produced and the Long Range Sustained Yield for each benchmark (BM) and alternative (ALT). BM14 maximixes the Long Range Sustained Yield.

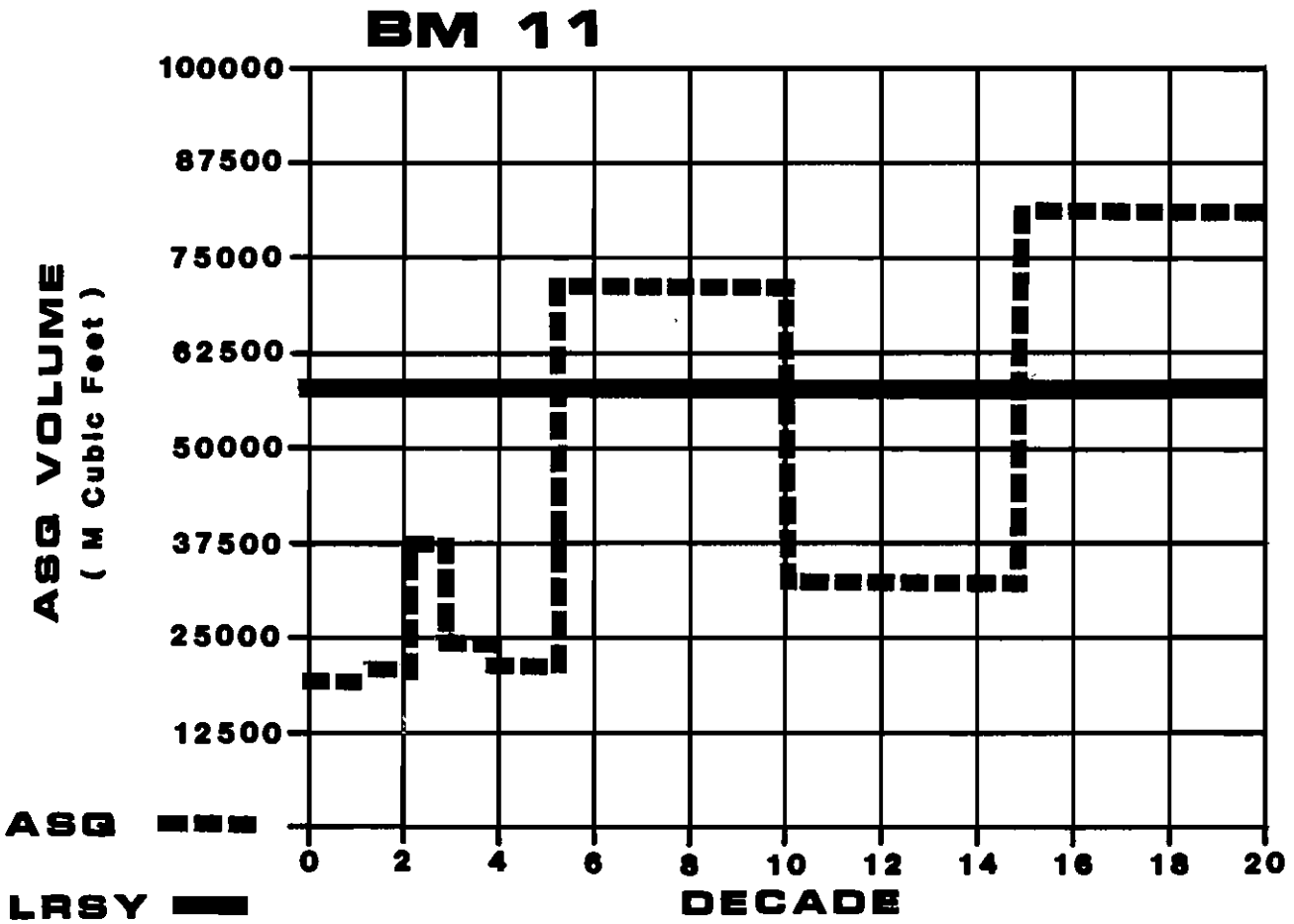

BM 3
ASQ VOLUME
(M Cubic Feet)
100000
87500
75000
62500
50000
37500
25000
12500
0
2
4
6
8
10
12
14
16
18
20
DECADE

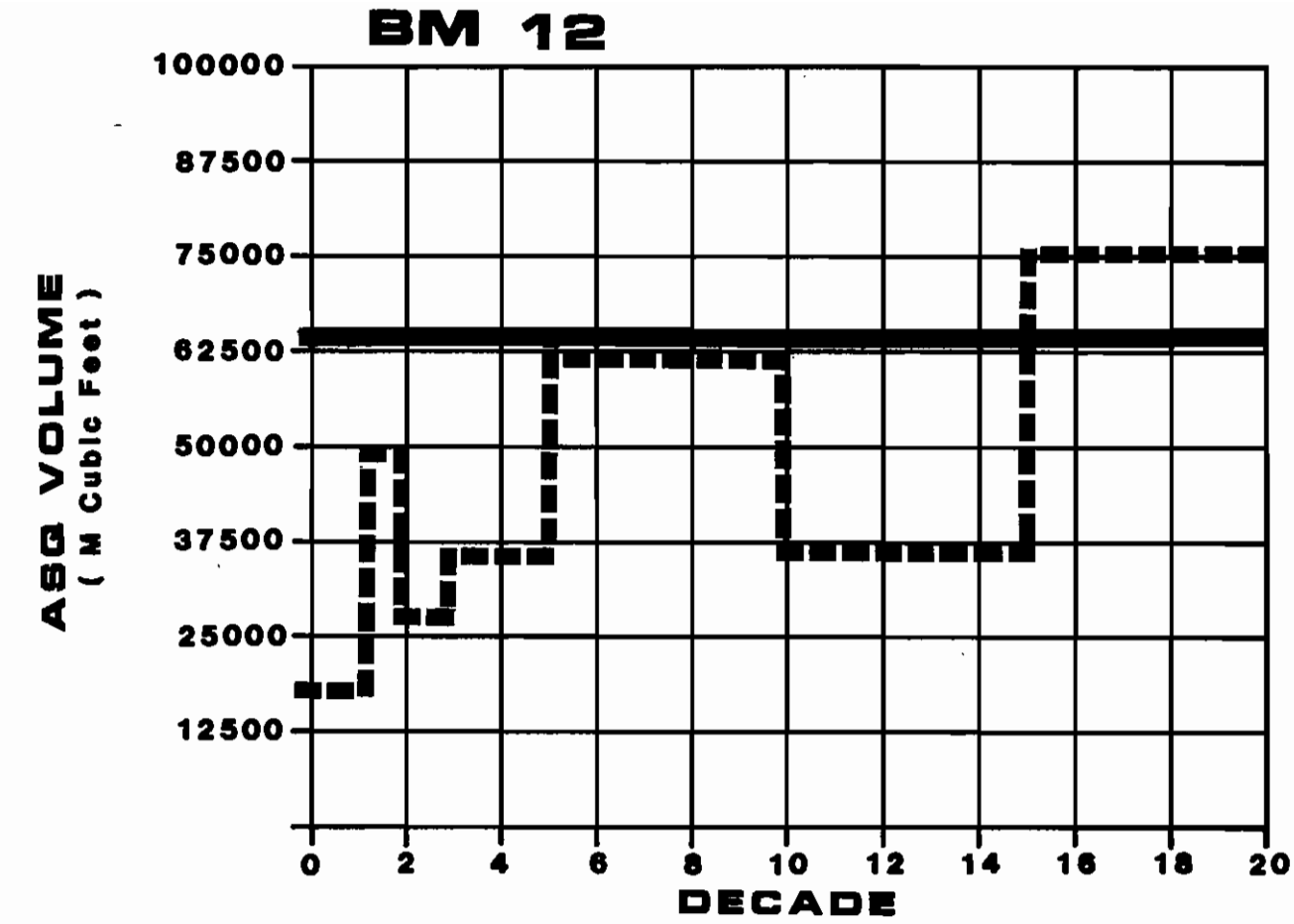

BM 5
BM 7
ASQ VOLUME
(M Cubic Feet)
100000
87500
75000
62500
50000
37500
25000
12500
ASQ
LRSY
0
2
4
6
8
10
12
14
16
18
20
DECADE

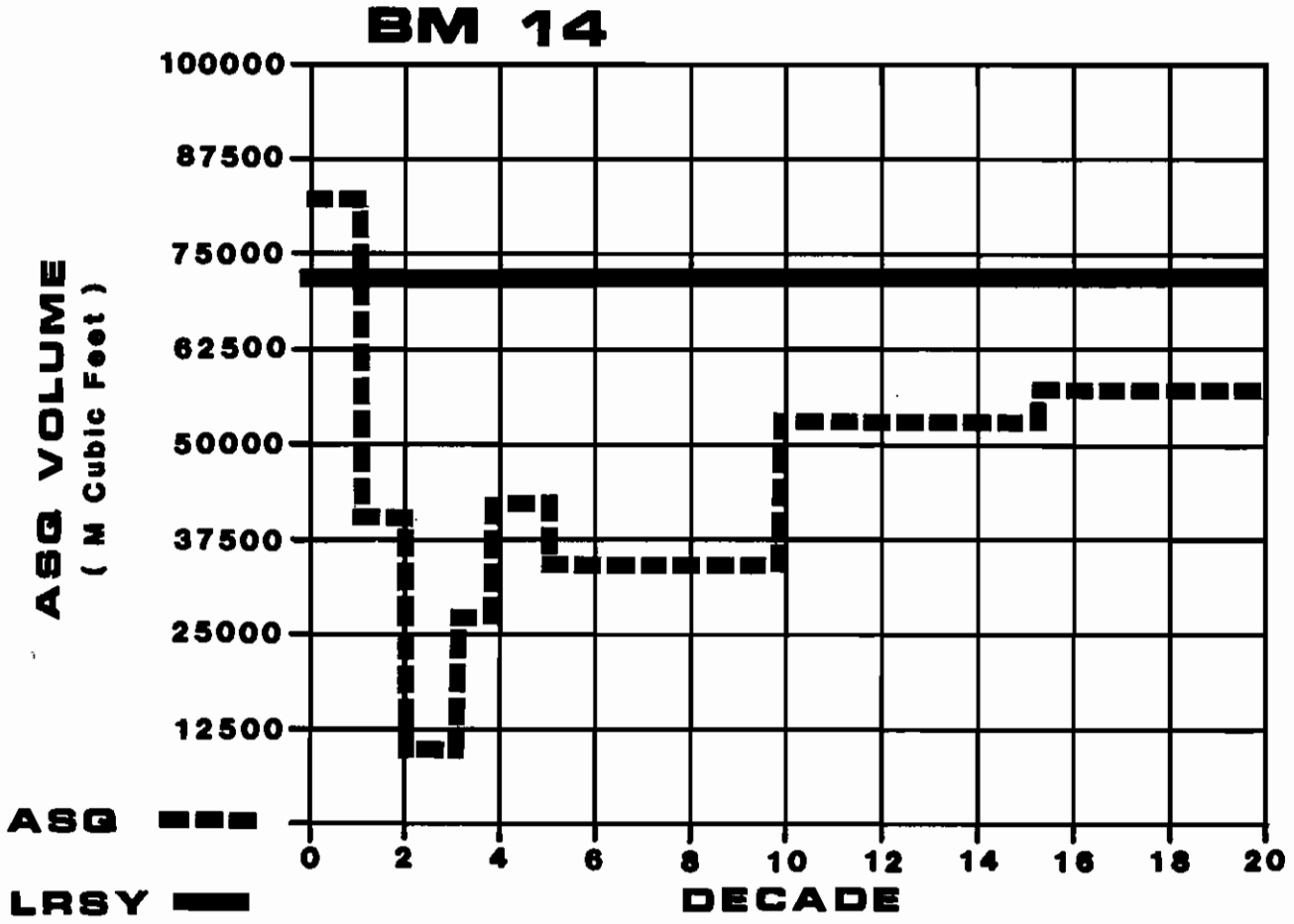

BM 6
ASQ VOLUME
(M Cubic Feet)
100000
87500
75000
62500
50000
37500
25000
12500
0
2
4
6
8
10
12
14
16
18
20
DECADE

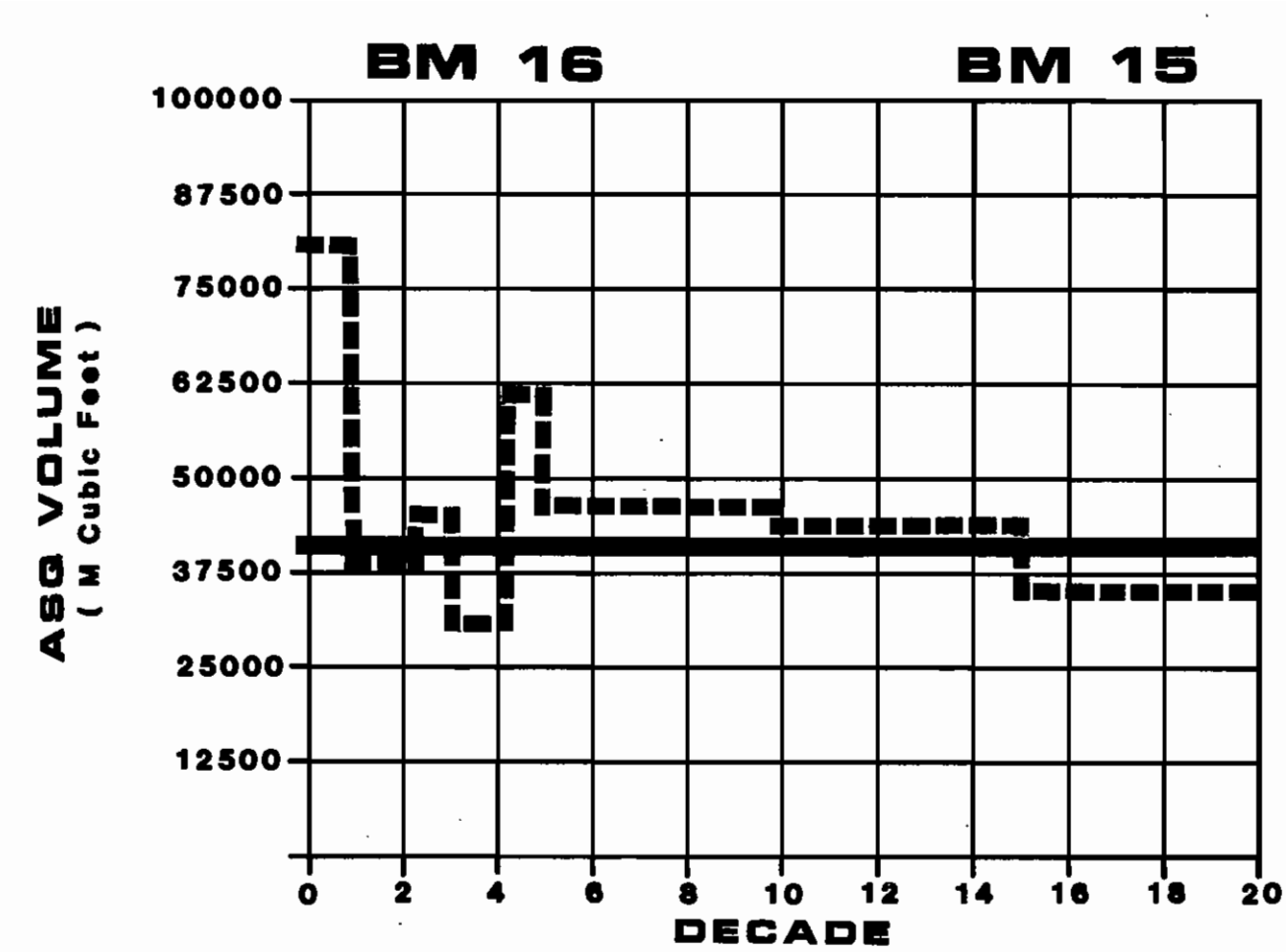

BM 8
ASQ VOLUME
(M Cubic Feet)
100000
87500
75000
62500
50000
37500
25000
12500
ASQ
LRSY
0
2
4
6
8
10
12
14
16
18
20
DECADE

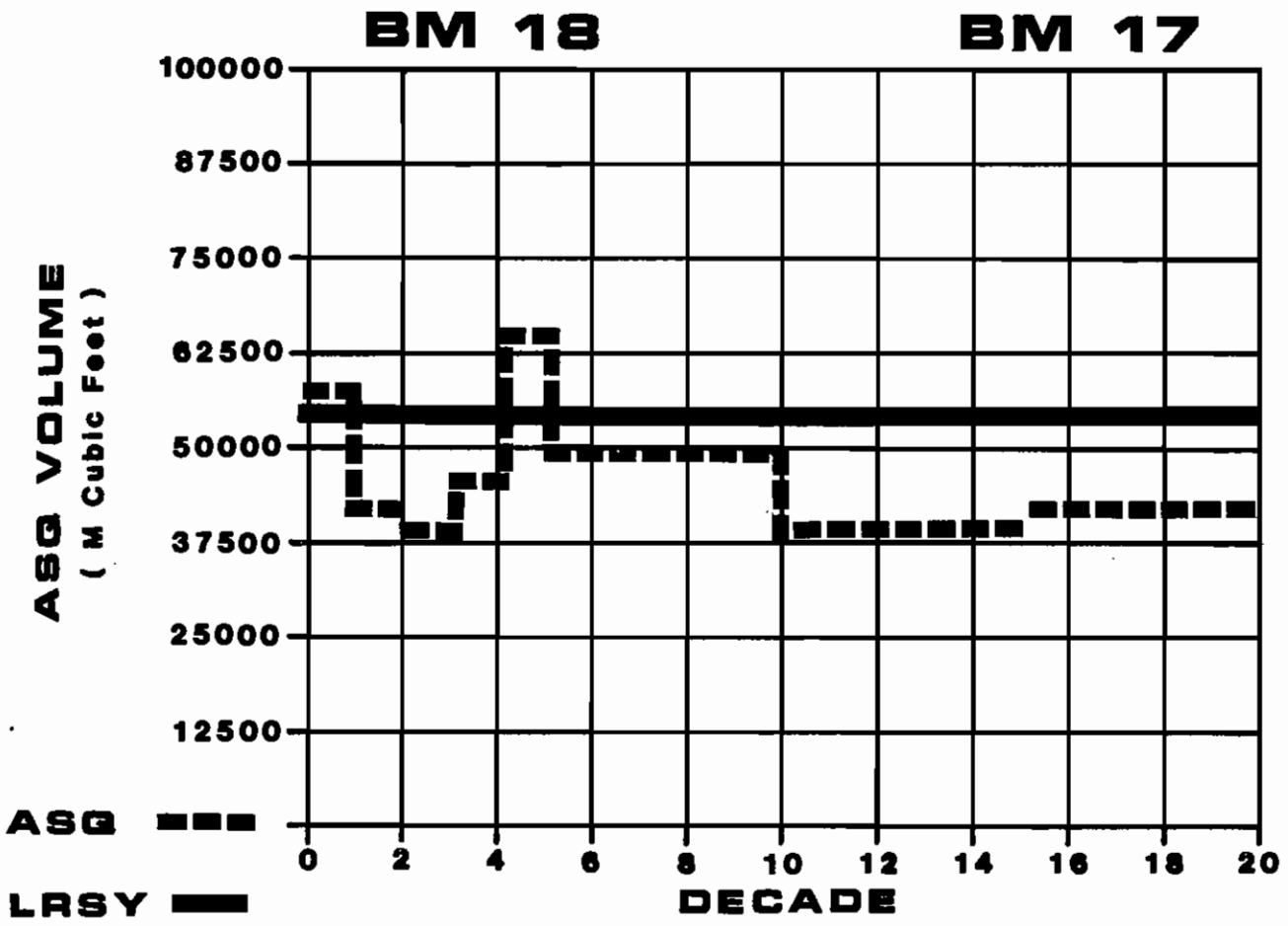

BM 9
ASQ VOLUME
(M Cubic Feet)
100000
87500
75000
62500
50000
37500
25000
12500
0
2
4
6
8
10
12
14
16
18
20
DECADE

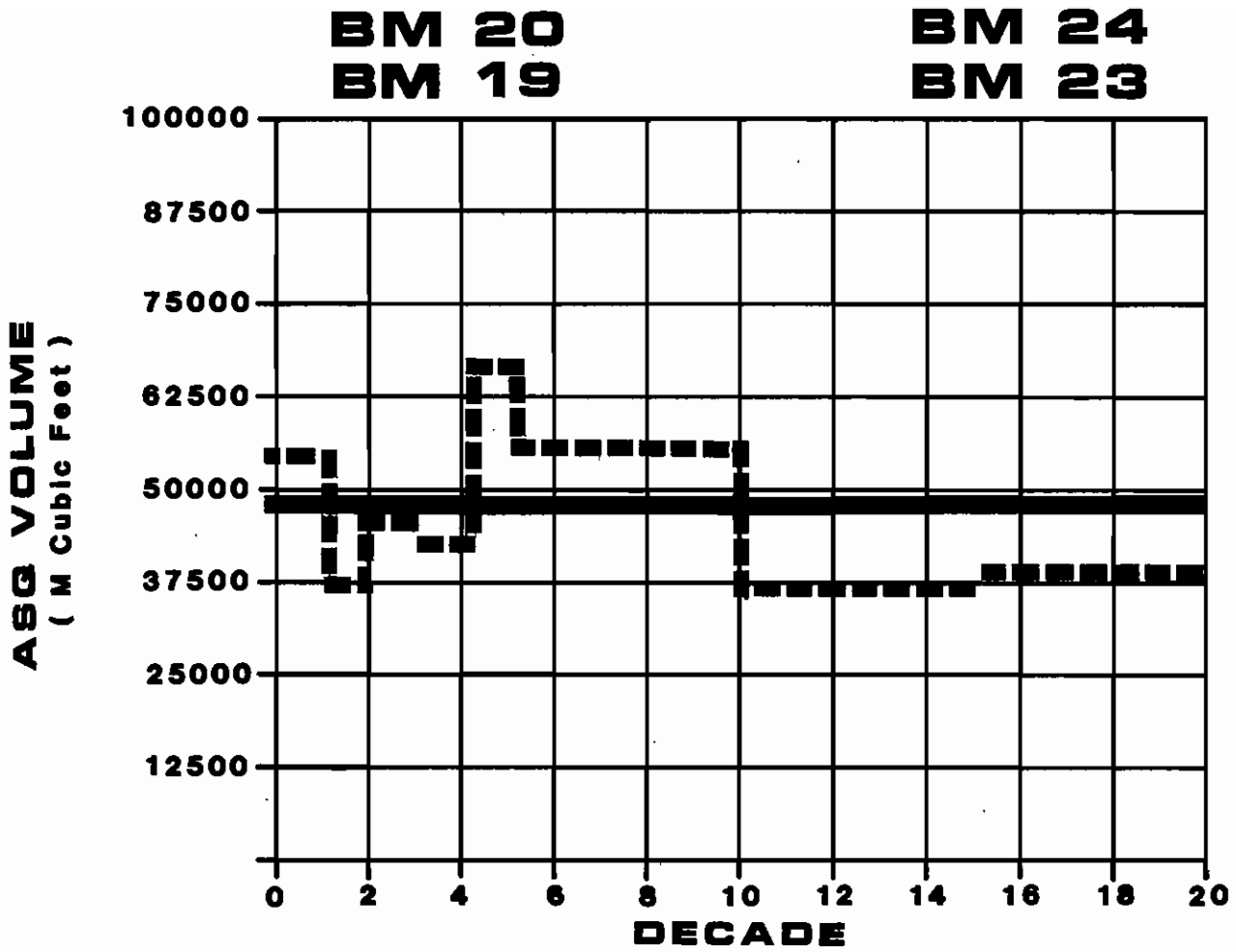

BM 11
ASQ VOLUME
(M Cubic Feet)
100000
87500
75000
62500
50000
37500
25000
12500
0
2
4
6
8
10
12
14
16
18
20
DECADE
ASQ
LRSY

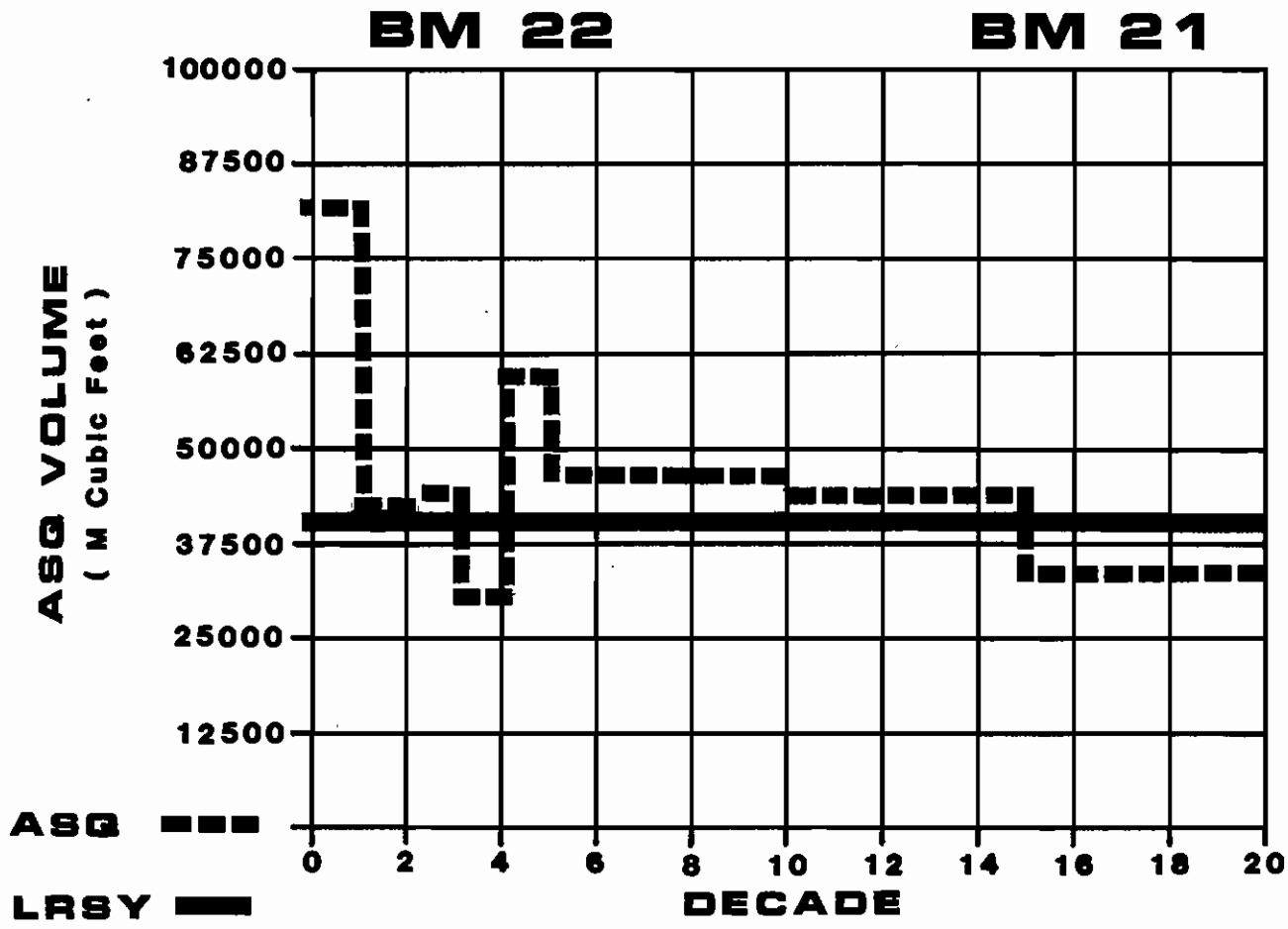

BM 12
100000
87500
75000
62500
50000
37500
25000
12500
ASG VOLUME
(M Cubic Feet)
0
2
4
6
8
10
12
14
16
18
20
DECADE

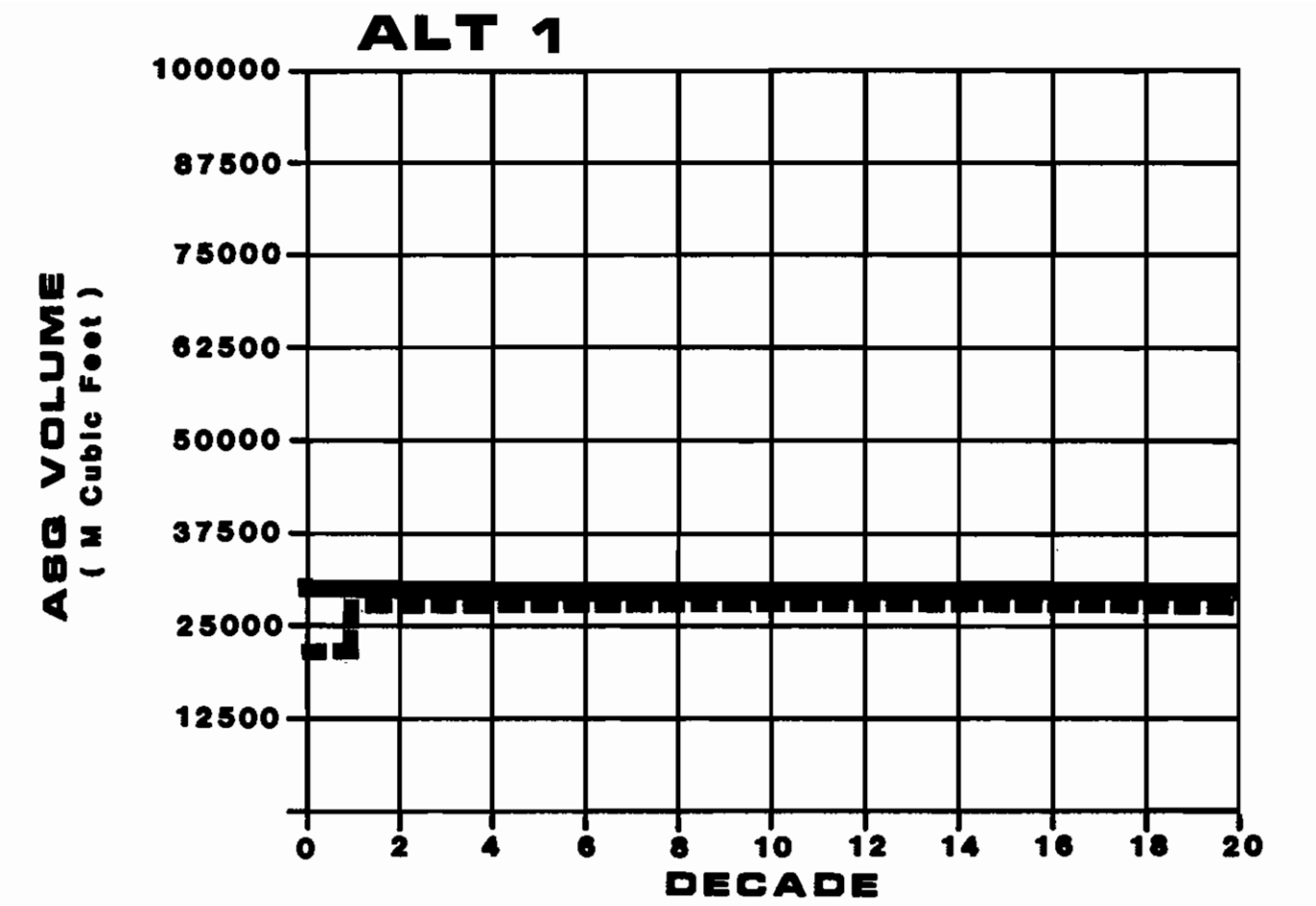

BM 14
100000
87500
75000
62500
50000
37500
25000
12500
ASG VOLUME
(M Cubic Feet)
ASG
LRSY
0
2
4
6
8
10
12
14
16
18
20
DECADE

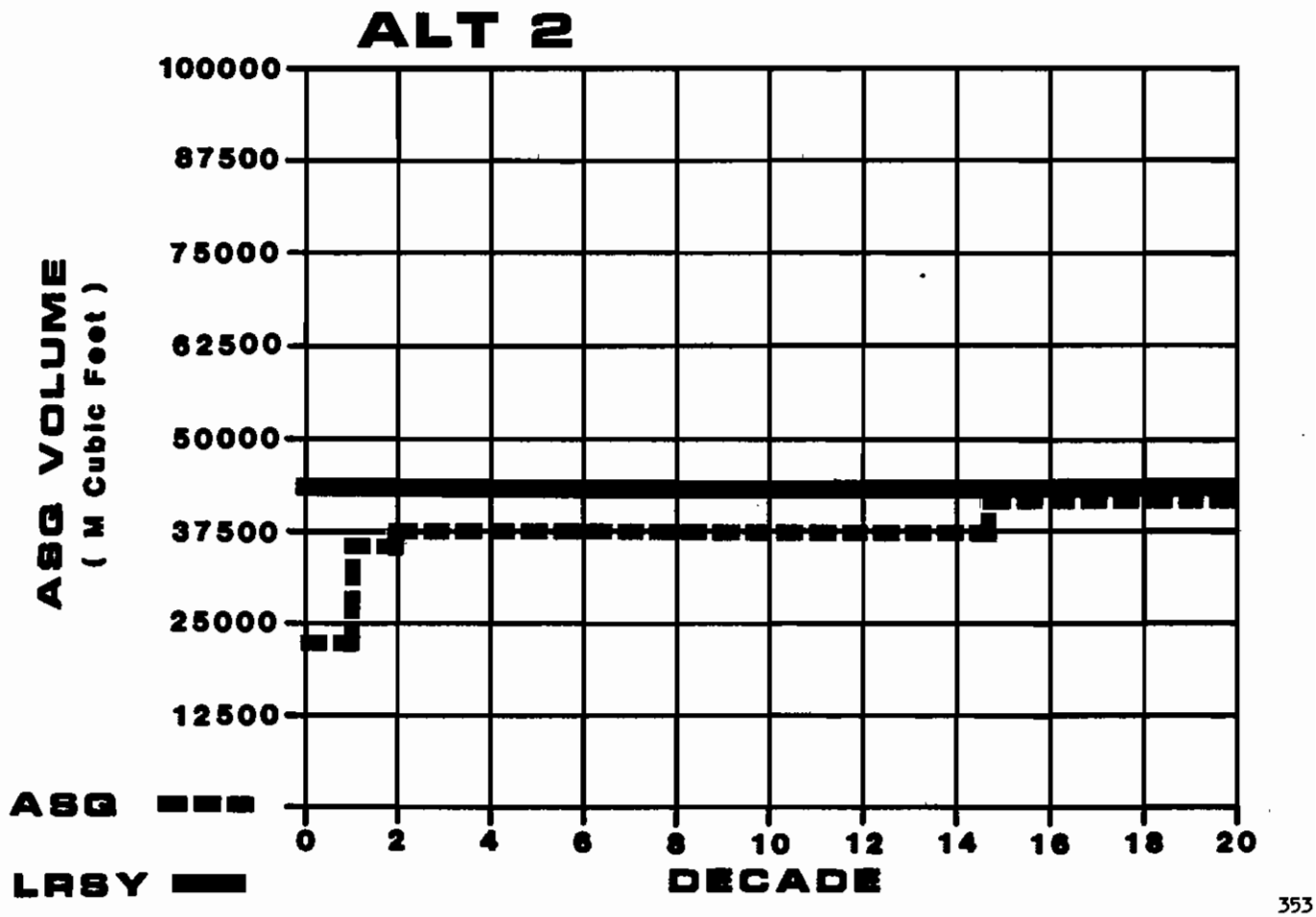

BM 16
BM 15
100000
87500
75000
62500
50000
37500
25000
12500
ASQ VOLUME
(M Cubic Feet)
0
2
4
6
8
10
12
14
16
18
20
DECADE

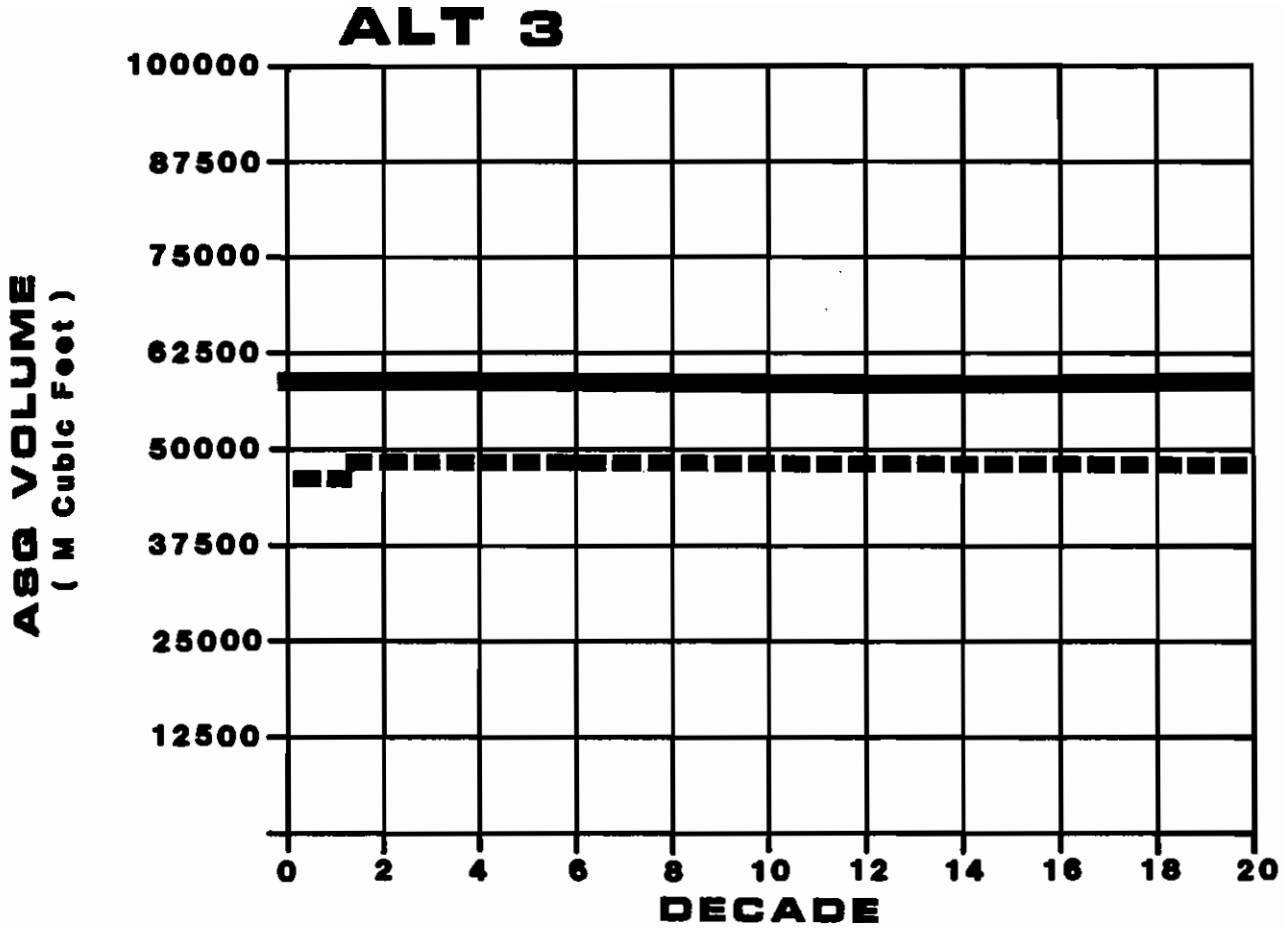

BM 18
BM 17
100000
87500
75000
62500
50000
37500
25000
12500
ASQ VOLUME
(M Cubic Feet)
ASQ
LRSY
0
2
4
6
8
10
12
14
16
18
20
DECADE

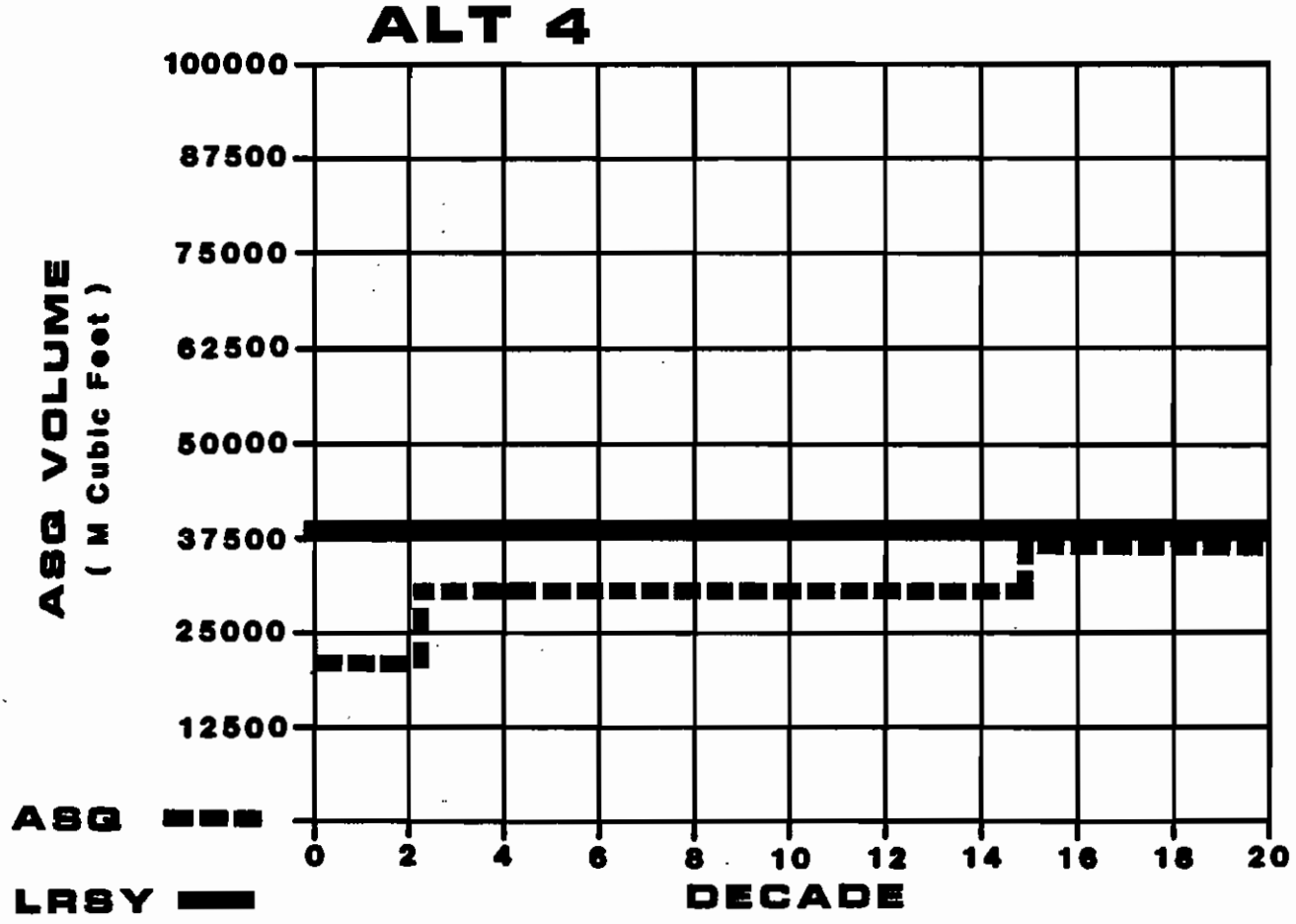

BM 20
BM 19
BM 24
BM 23
ASG VOLUME
(M Cubic Feet)
100000
87500
75000
62500
50000
37500
25000
12500
0
2
4
6
8
10
12
14
16
18
20
DECADE

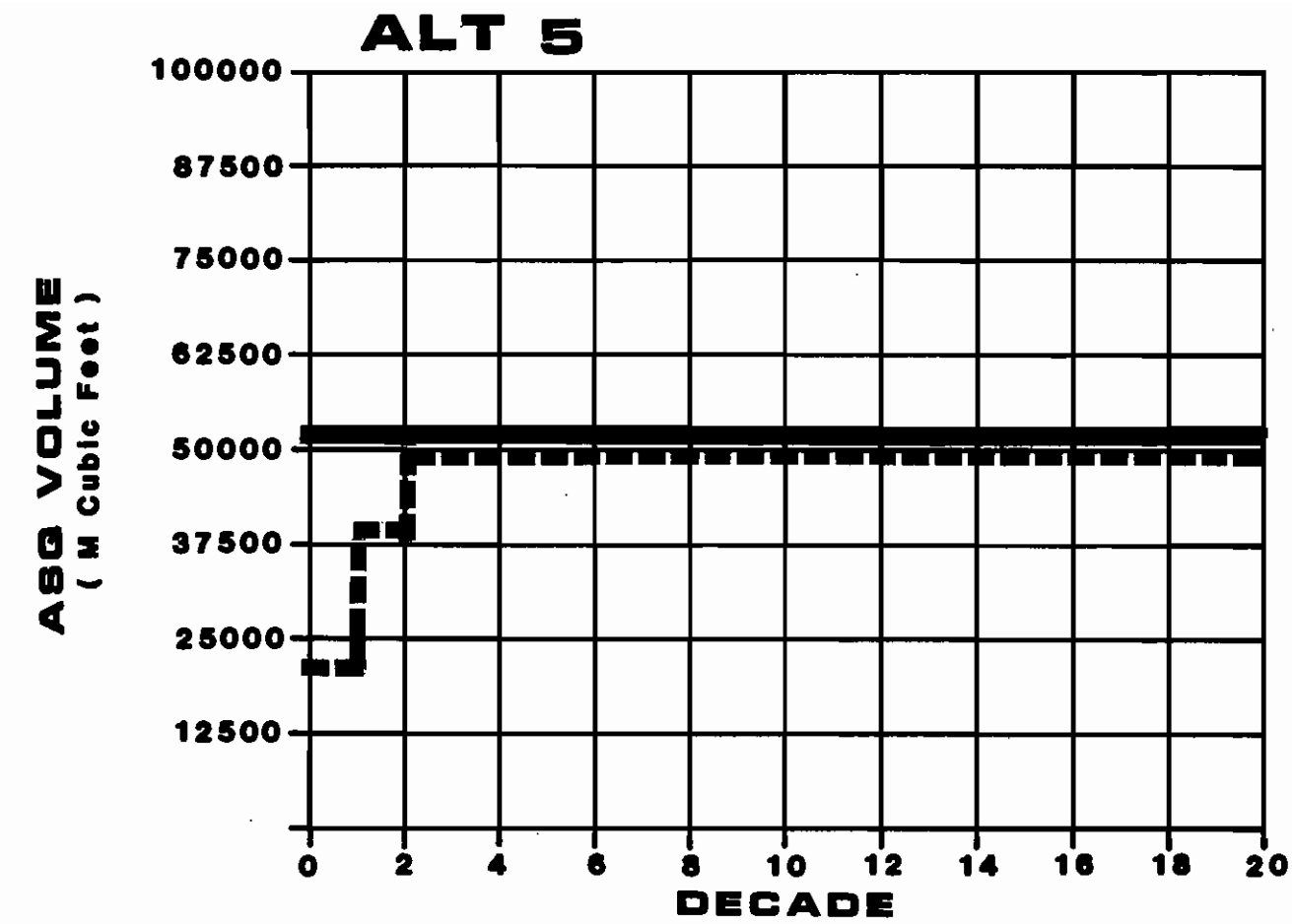

BM 22
BM 21
ASG VOLUME
(M Cubic Feet)
100000
87500
75000
62500
50000
37500
25000
12500
0
2
4
6
8
10
12
14
16
18
20
DECADE
ASG
LRSY

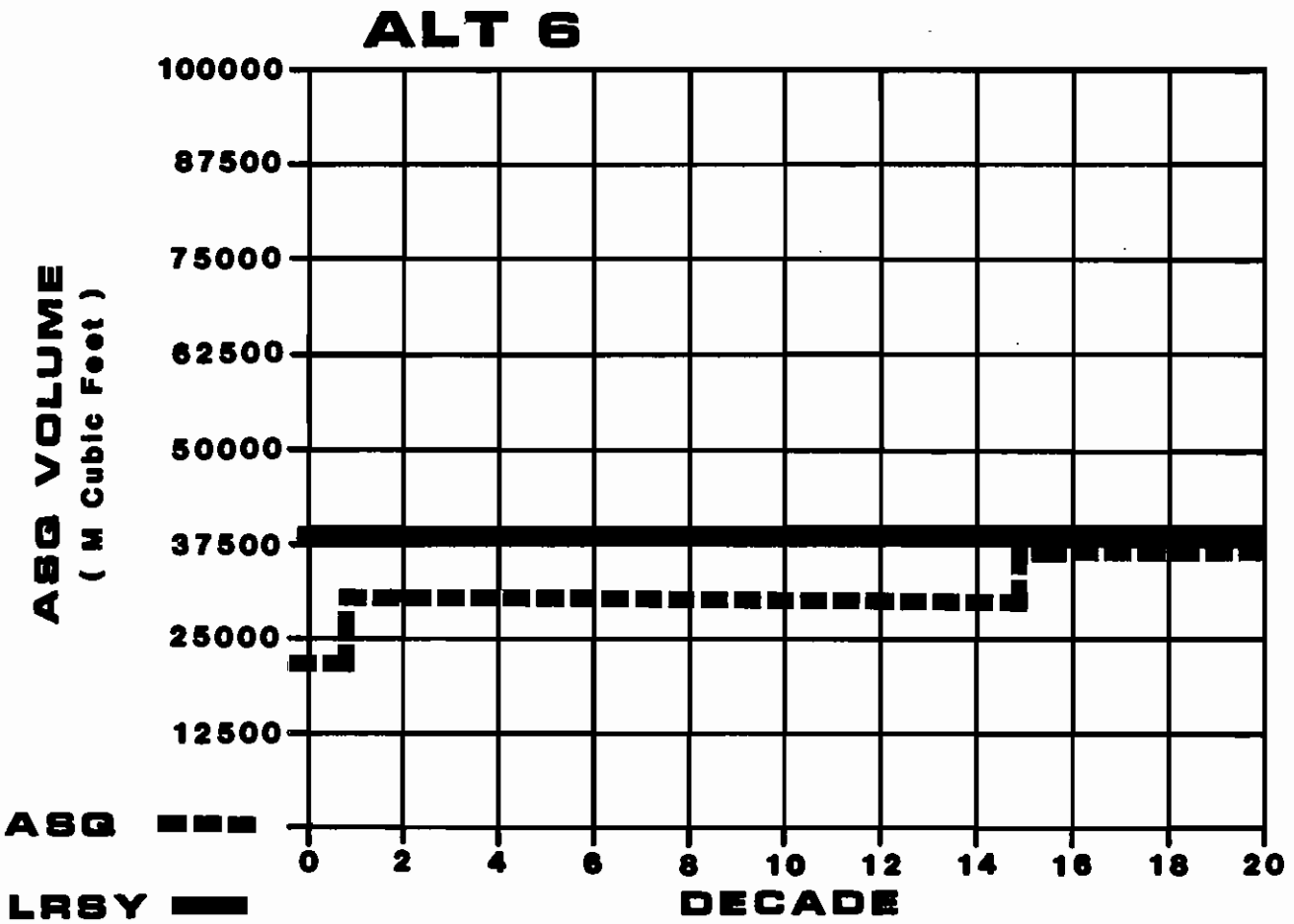

ALT 1
ASQ VOLUME
(M Cubic Feet)
100000
87500
75000
62500
50000
37500
25000
12500
0
2
4
6
8
10
12
14
16
18
20
DECADE

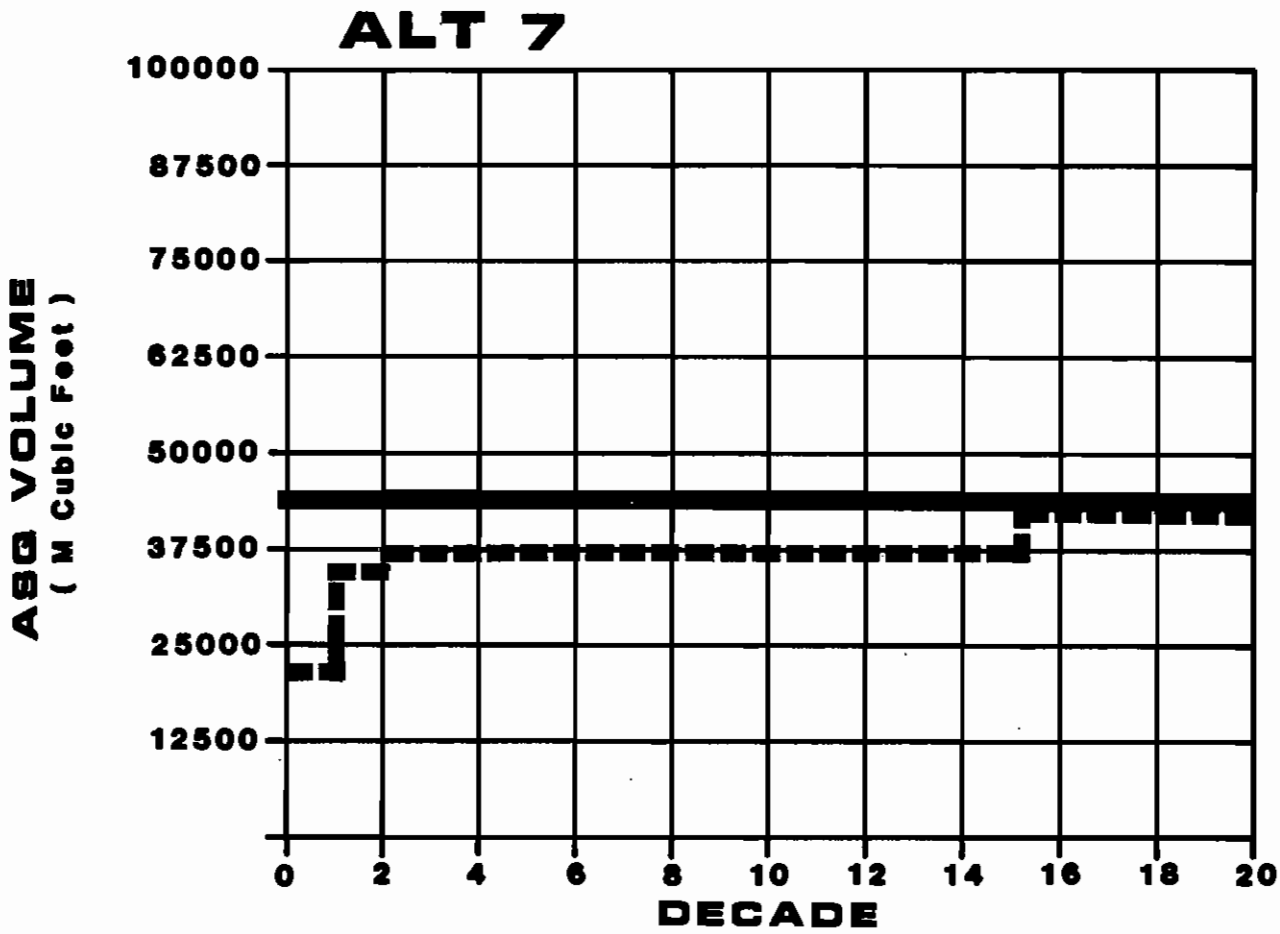

ALT 2
ASQ VOLUME
(M Cubic Feet)
100000
87500
75000
62500
50000
37500
25000
12500
ASQ
LRSY
0
2
4
6
8
10
12
14
16
18
20
DECADE

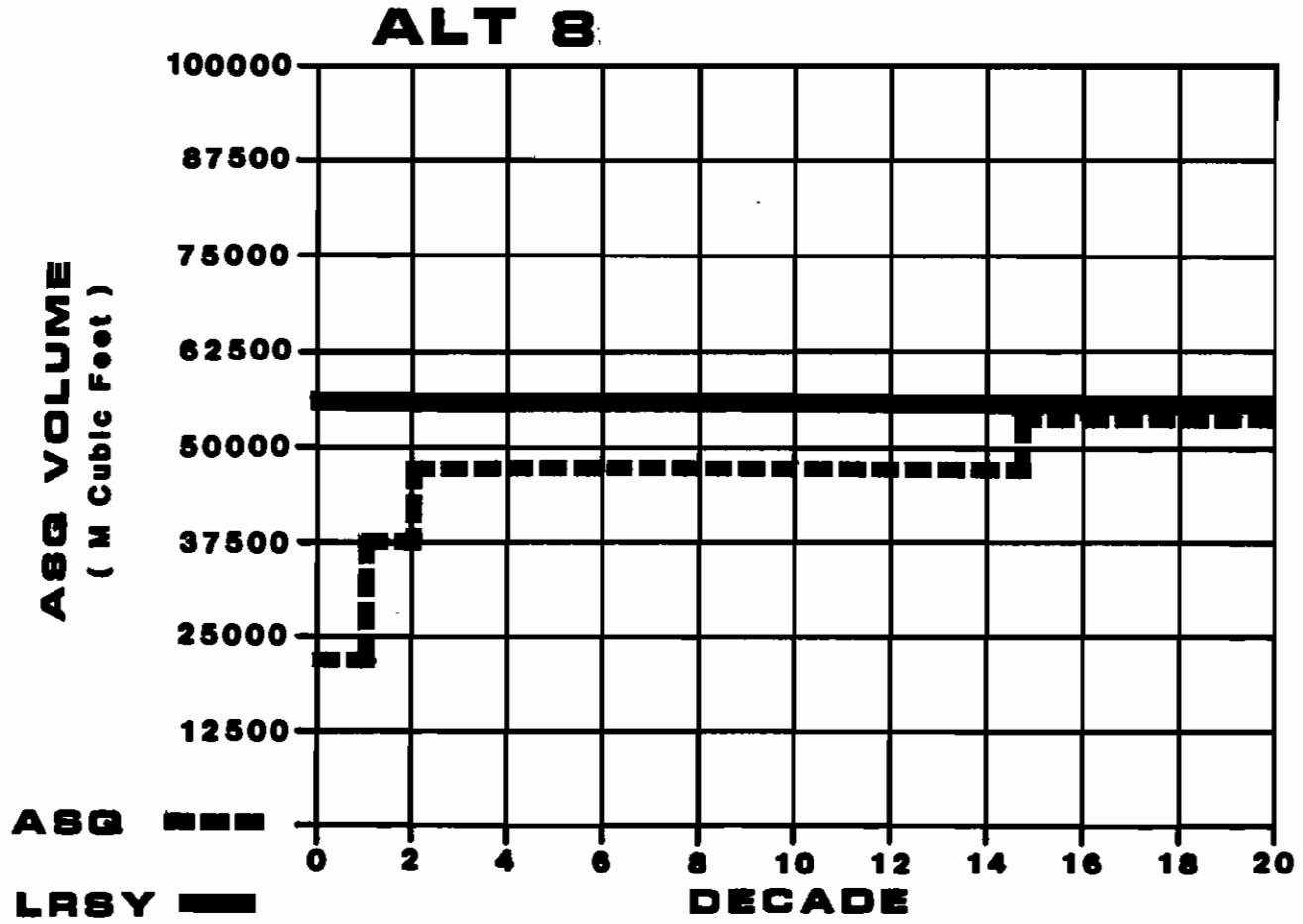

ALT 3
ASQ VOLUME
(M Cubic Feet)
100000
87500
75000
62500
50000
37500
25000
12500
0
2
4
6
8
10
12
14
16
18
20
DECADE

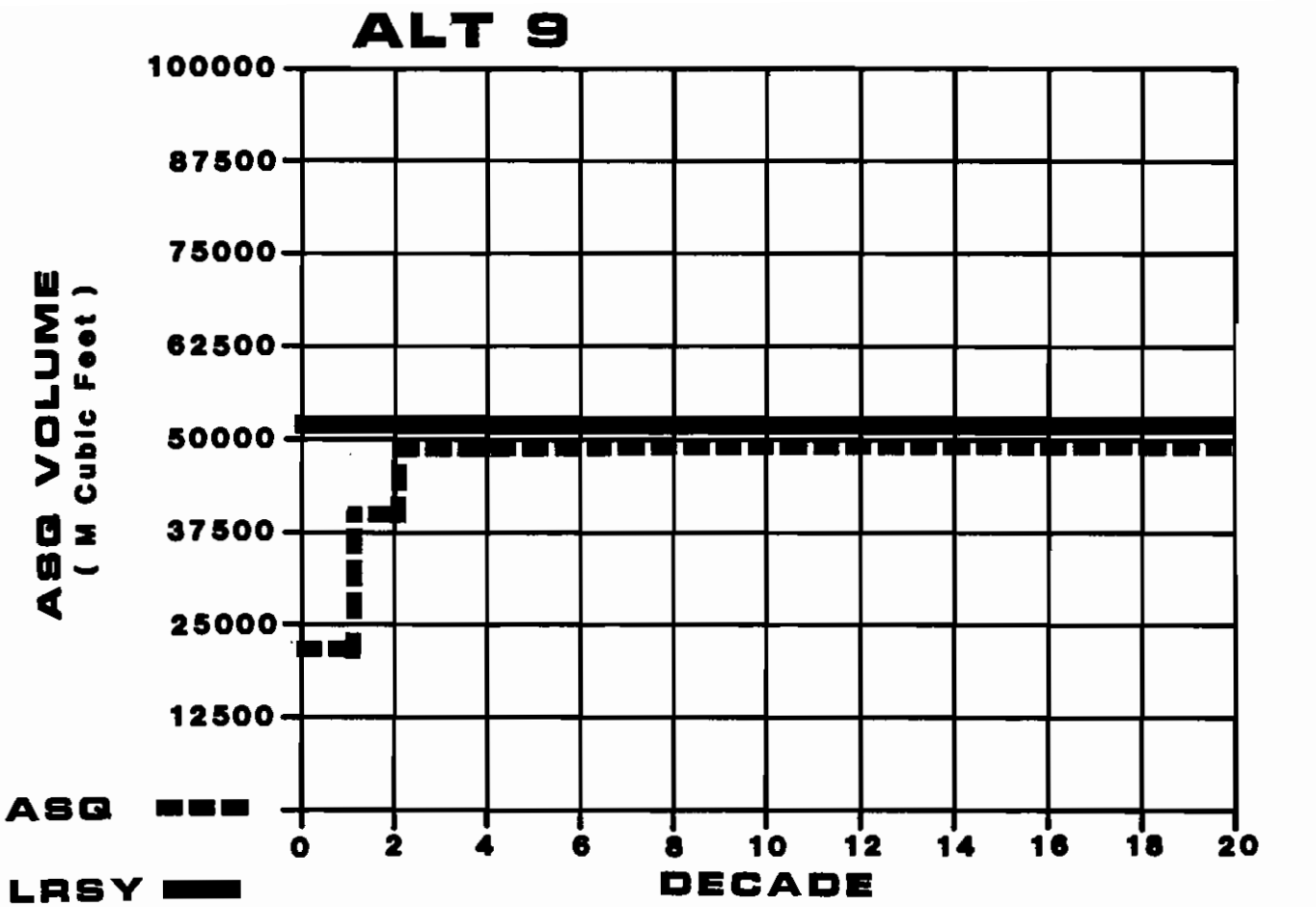

ALT 4
ASQ VOLUME
(M Cubic Feet)
100000
87500
75000
62500
50000
37500
25000
12500
ASQ
LRSY
0
2
4
6
8
10
12
14
16
18
20
DECADE

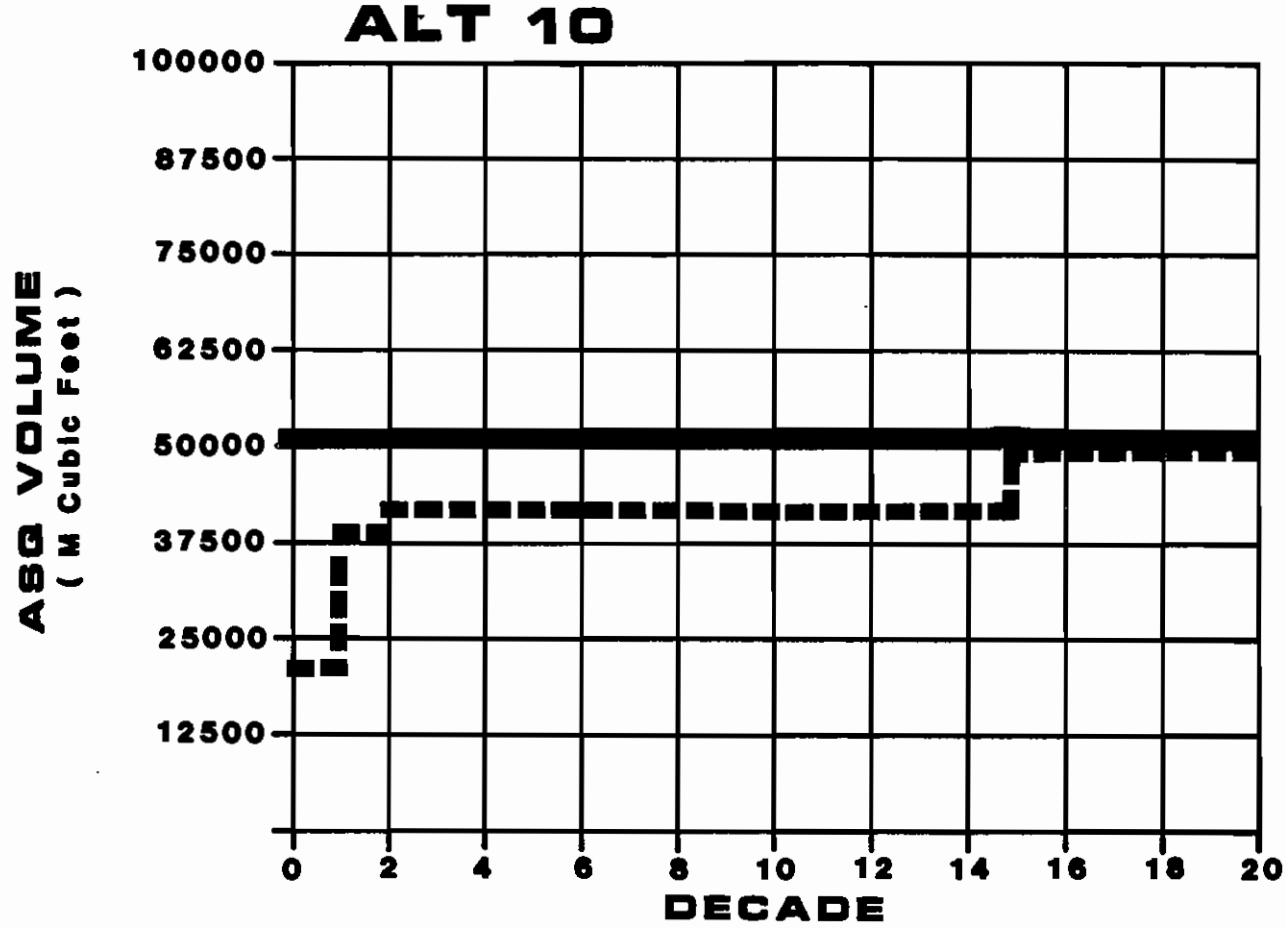

ALT 5
ASQ VOLUME
(M Cubic Feet)
100000
87500
75000
62500
50000
37500
25000
12500
0
2
4
6
8
10
12
14
16
18
20
DECADE

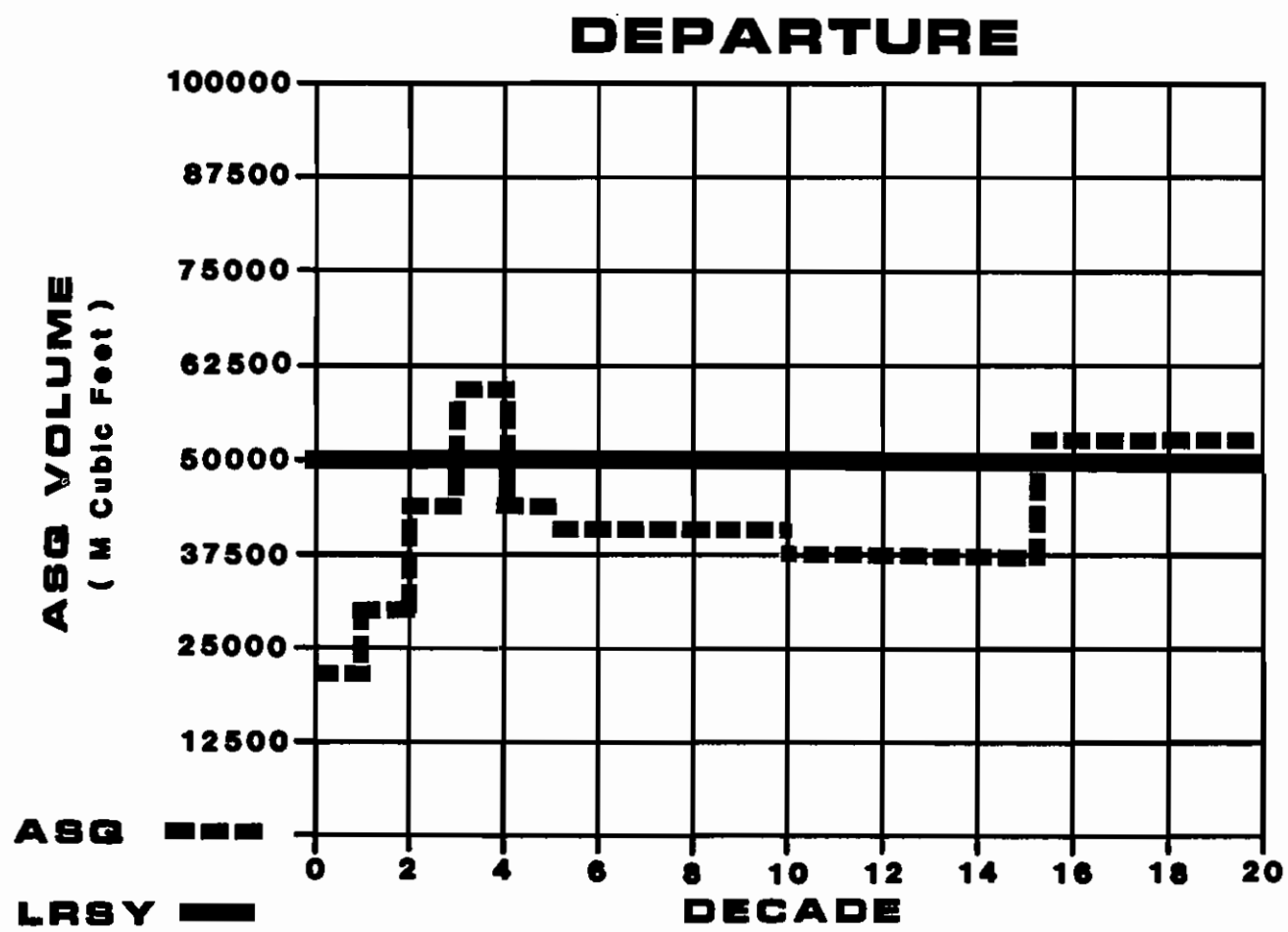

ALT 6
ASQ VOLUME
(M Cubic Feet)
100000
87500
75000
62500
50000
37500
25000
12500
ASQ
LRSY
0
2
4
6
8
10
12
14
16
18
20
DECADE


ALT 7
ASQ VOLUME
(M Cubic Feet)
100000
87500
75000
62500
50000
37500
25000
12500
0
2
4
6
8
10
12
14
16
18
20
DECADE


ALT 8
ASQ VOLUME
(M Cubic Feet)
100000
87500
75000
62500
50000
37500
25000
12500
ASQ
LRSY
0
2
4
6
8
10
12
14
16
18
20
DECADE


ALT 9
100000
87500
75000
62500
50000
37500
25000
12500
ASQ VOLUME
(M Cubic Feet)
ASQ
LRSY
0
2
4
6
8
10
12
14
16
18
20
DECADE


ALT 10
ASQ VOLUME
(M Cubic Feet)
100000
87500
75000
62500
50000
37500
25000
12500
0
2
4
6
8
10
12
14
16
18
20
DECADE


DEPARTURE
ASQ VOLUME
(M Cubic Feet)
100000
87500
75000
62500
50000
37500
25000
12500
ASQ
LRSY
0
2
4
6
8
10
12
14
16
18
20
DECADE

Appendix

Table 99

Present and Future Timber Conditions (Proposed Action)

Present Forest:	Unit of Measure	Suitable Lands Current Inventory	Suitable Lands Plan Model	Unsuitable Lands Current Inventory	Unsuitable Lands Plan Model
Growing Stock	MMCF		2.165		1.503
	MMBF		7.578		5.260
Live Cull	MMCF		0.087		0.006
	MMCF		1.212		0.084

Future Forest: (Decade 20)

Growing Stock	MMCF	5.015
LTSY	MMCF	50617
Rotation Age	Years	120 to 240

	Age Class	Present Forest	Future Forest
Age Class Distribution Acres	1-20	5,454	13,741
	21-40	34,470	35,429
	41-60	47,326	- 0 -
	61-80	17,237	5,005
	81-100	- 0 -	1,903
	101-120	5,005	43,889
	121-140	- 0 -	4,034
	141-160	- 0 -	4,987
	200 +	- 0 -	504
		109,492	109,492

The current inventory items were left blank because we had no inventory data to work with. Timber inventory computer runs were unavailable. Inventory data from previous inventories was also unavailable for use.

Appendix

TIMBER MANAGEMENT
UNSUITABLE LANDS

Unsuitable forest land, for all alternatives, will be harvested primarily on a sanitation/salvage basis. Recreation areas (campgrounds, homesites, etc.) will be managed for safety of the public and health and vigor of the stands as needed. Diseased trees and hazard trees may be removed as the need for such arises. Salvage and sanitation cuttings will be allowed along scenic roadways when the need for such arises. Other unregulated areas such as large KV line corridors, where timber height growth is limited for safety reasons, will be harvested for marketable products where and when market opportunities exist.

Land classified as unproductive forest land (pinyon-juniper type) will be managed and harvested to meet various management objectives. The Utah juniper will be managed by block cutting on a 120-year rotation. Alligator juniper stands will be harvested to re-establish a savannah situation leaving larger mature to overmature trees distributed over the harvest areas. Other associated woodland species will be harvested using the individual tree selection method. Emphasis will be primarily for wildlife habitat and fuelwood production needs.

Appendix

ANNUAL GROWTH RATE

Attainment of 90 percent of the annual growth rate at LTSY by the end of the 5th period:

Annual growth at LTSY = 50617 MCF/period

Annual growth 5th period = 3946 MCF/year x 10 = 39460 MCF/period.

(39460 ÷ 50617) x 100 = 77.96 = 78%

Management Measures to Achieve 90 Percent:

Present Age Class Distribution			Age Class Distribution @ 50 Years		
01-20	5454 Acres-		01-20	- 0 - Acres	
21-40	34470	(31%)	21-40	300	
41-60	47326	(43%)	41-60	4705	
61-80	17237	(16%)	61-80	39924	(36%)
81-100	- 0 -		81-100	7877	
101-120	5005		101-120	56686	(52%)
			121-240 1/	- 0 -	

The above tables illustrate that the age class distribution over the forest does not improve during the first 50 years. Instead of having the majority of acres in pole-size trees (present condition), the majority of acres is re-distributed to large poles/small sawtimber and mature sawtimber categories (50 years).

Measures that could be implemented during the first 50 years to bring up the annual growth rate are:

(1) Implement seed cuts during the first or second decades on the 5,005 acres currently in age class 101-120. No treatment is planned during the first two decades for this age class.

(2) Apply intermediate cuts (precommercial thinning) to more of 21-40 age class during the first decade. Currently, only about 1/3 of the acreage is planned for precommercial thinning the first decade.

(3) Apply an intermediate cut (commercial thinning) to 25-50% of the acreage in the 41-60 age class during the first decade. Currently, only removal harvests are scheduled for this age class during the first decade. This would stimulate growth, and help increase the growth rate in this age class which comprises about 43 percent of the acreage of operable-suitable timber.

(4) Apply an intermediate cut (commercial thinning) to 25-50% of the acreage in the 61-80 age class. No harvest is scheduled at all for this age class during the first decade.

NOTE: Prescriptions selected by FORPLAN to meet economic constraints did not provide the array of harvest methods needed to approach the Forest goal of better age-class distribution. This problem is recognized and by using upcoming stand examinations to recognize where opportunities for regeneration harvests exist, it is possible to prescribe and start treatment during the first decade to provide some of the needed 0-20 age class. An effort will be made during the first decade to treat stands to provide for this age class deficit.

1/ No old growth stands will exist at the end of 50 years by the prescriptions selected. However, if regeneration cuts are made in the first decade, it is possible that this age class will also be provided during the second decade.

Appendix

TIMBER SALE PROGRAM

10 Year Timber Sale Action Plan 1/

Year	Sale	Volume 2/ MMBF	Estimated Acreage	Estimated Miles of Road	District
1986	Elk	1.0	1,200	1	Payson
1986	Colcord	4.5	2,600	11	Pleasant Valley
1986	Small ST Sales	0.5	500		Payson
1987	Valentine	5.0	2,880	21	Pleasant Valley
1987	Meeds	1.0	1,000	4	Payson
1988	Canyon	5.0	3,000	11	Pleasant Valley
1988	Small ST Sales	0.5	500		Payson
1989	Cherry	4.0	5,500	24	Pleasant Valley
1989	Small ST Sales	1.0	1,000		Payson
1990	Red Lake	3.5	5,100	10	Pleasant Valley
1990	Woffidd	1.0	1,000		Payson
1991	Crouch	6.4	2,400	10	Pleasant Valley
1991	Small ST Sales	1.0	1,000		Payson
1992	Rose	8.9	4,000	15	Pleasant Valley
1992	Small ST Sales	0.5	500		Payson
1993	Salt	6.9	3,800	12	Pleasant Valley
1993	Small ST Sales	1.0	1,000		Payson
1994	Ridge	8.4	3,000	15	Pleasant Valley
1994	Small ST Sales	0.5	500		Payson
1995	Unknown	5.0	3,000	10	Pleasant Valley
1995	Small ST Sales	1.0	1,000		Payson
TOTAL:		66.6			

1/ No cable units are included in the timber offering schedule for Period 1.

2/ Additional volume needed to meet planned annual harvest levels is 12.4 MMBF, under contract in the Colorado Plateau pulpwood sale.

Appendix

Table 100

Historical Records of Past Timber Management Activities

Timber sell and harvest levels:

Year	Sell Volume	Year	Harvest Volume
1971	5250 MBF (Sawtimber)		
1972	- 0 -		
1973	- 0 -		
1974	4900 MBF (S/T)		
1975	4700 MBF (S/T)		
1976	4700 MBF (S/T)	1974	10,100 MBF
1977	no data	1975	13,937 MBF
1978	9794 MBF (S/T)	1976	9,543 MBF
	9394 cds. (other)	1977	11,136 MBF
1979	11607 MBF (S/T)	1978	10,824 MBF
	937 cds. (other)	1979	6,789 MBF
1980	4764 MBF (S/T)	1980	8,965 MBF
	4272 cds. (other)	1981	11,167 MBF
1981	4306 MBF (S/T)	1982	8,606 MBF
	15,463 cds. (other)	1983	5,419 MBF
1982	3854 MBF (S/T)		
	12047 cds. (other)		
1983	2872 MBF (S/T)		
	10,540 cds. (other)		

	Acres TSI Accomplished	Acres Reforested	Acres Reforestation Certified
1977	288	25	
1978	1,535	43	Information not determined
1979	1,914	122	Information not determined
1980	2,624	21	
1981	709	38	
1982	1,040	68	
1983	2,675	16	

Appendix

The previous management plan called for reforestation of 2,200 acres of old burns, in actuality only 333 acres were reforested during the period 1977-1983. Most of the acreage classed as backlog reforestation by the old plan has since been reclassified as unproductive because of the marginal timber sites involved and the unlikelyhood of successfully regenerating these sites. The 2,200 acre backlog has been reduced to zero.

The average annual harvest volume for the period 1974-1983 was 9648.6 MBF which includes sawtimber, pulpwood, and fuelwood (latter presumed, as the data was teletyped by Washington Office and totals were not broken down by product). All of this volume was Ponderosa-pine, except for the portion comprised of fuelwood.

DEPARTURES

Display of Each Alternative Against Criteria for Departure

Criteria for Departure	Alternatives									
	1	2	3	4	5	6	7	8	9	10
Mortality Losses Reduced or Prevented	No	No	No	No	No	No	No	No	No	No
Age-Size Class Distribution Improved Facilitating LTSYC	No	No	No	No	No	No	No	No	No	No
Corresponding BSS Would Cause Adverse Economic Impact Upon a Community	No	No	No	No	No	No	No	No	No	No
No Alternatives Considered Provide a BSS that Achieve Goals of RPA	No	No	No	No	No	No	No	No	No	No
Overall Multiple-Use Objectives Would Be Better Met	No	No	No	No	No	No	No	No	No	No

None of the departure criteria was met by any of the alternatives considered.

A departure run was made for the proposed action, but none were made for any of the other alternatives because of the lack of criteria being met for departure. The departure run for the proposed action was made primarily to compare volumes produced and the LTSYC, not because any of the identified criteria were necessarily met.

Appendix

F

Introduction

Tables 101, 102, and 103 provide a description of the significant environmental consequences of the alternative plans for the Central Arizona Project. These tables summarize the analyses in a large number of Central Arizona Water Control Study (CAWCS) Technical reports, including Stage III Methodology for Environmental Quality Assessment, Environmental Impacts and Effects of Plans (7 volumes), Social Impacts and Effects of CAWCS Plans, and Economics-Financial Supporting Document.

Effects were determined on the basis of the impact's direction (beneficial or adverse), duration (short-term or long-term), magnitude (degree of change), and the quality of the affected resource. Beneficial effects indicate that the quality of the resource is improved; adverse effects indicate the quality is degraded. Depending on the characteristics of the impact, one of the following effect levels has been assigned:

- Insignificant (I): Small, ephemeral change, usually affecting a low-quality resource.
- Significant Beneficial (SB): Major improvement in a condition, usually long-term and affecting a high-quality resource.
- Beneficial Flag (BF): Extraordinary beneficial change in a unique, protected, or very high-quality resource.
- Significant Adverse (SA): Major degradation of a condition, usually long-term and affecting a high-quality resource.
- Adverse Flag (AF): Extraordinary adverse change in a unique, protected, or very high-quality resource.

Mitigation measures shown in Tables 101 and 102 represent mitigation concepts which were developed for the impacts in each of the resource areas. After selection of Plan 6 as the Preferred Alternative, the Bureau of Reclamation has developed a mitigation program.

Table 101

SUMMARY OF ENVIRONMENTAL IMPACTS AND EFFECTS OF CENTRAL ARIZONA PROJECT PLANS

Factors/Measures	Plan 8 CAWCS No Action (Future Without Project)	Plan 1	Plan 2	Plan 3	Plan 6	Plan 7	Plan 9
BIOLOGICAL RESOURCES							
Threatened/Endangered Plants and Wildlife							
Loss of acres of preferred habitat in typical year (bald eagle in all plans and Yuma clapper rail in Plan 3)	+300 (2,260 acres in site areas)	-440	-430	-1,030	-440	-440	-170
Number of bald eagle breeding areas with disrupted productivity as a result of loss of stream miles (see Perennial Stream/Riverine Communities factor)	0 (5 breeding areas in site areas, of which 3 most productive are at Confluence; 6 breeding areas in CAWCS area; 13 breeding areas in southwestern U.S.)	1	0	2	3	1	0
Conceptual Mitigation		Establish 230 acres preferred habitat	None proposed	Establish 370 acres preferred habitat	Section 7 reasonable and prudent alternatives will be implemented	Establish 280 acres preferred habitat	None proposed
Typical Year Unmitigated/ Mitigated Effect		SA/I	I	AF/AF	SA/I	SA/I	I
Riparian/Wetland Biotic Communities							
Loss or gain of high quality habitat in typical year	-2,260 (9,970 acres in site areas)	-930	-900	-3,330	-1,140	-1,140	-740
Loss or gain of low-quality habitat in typical year	-90 (1,940 acres in site areas)	+420	+860	+1,040	+1,030	+1,020	+740
Total loss or gain of acres of habitat in typical year	-2,350 (11,910 acres in site areas)	-510	-40	-2,290	-110	-120	0
Conceptual Mitigation		Establish 480 acres of high quality habitat	Establish 790 acres of high quality habitat	Establish 1,060 acres of high quality habitat	Establish 1,060 acres of high quality habitat	Establish 1,060 acres of high quality habitat	Establish 120 acres of high quality habitat
Typical Year Unmitigated/ Mitigated Effect (on high quality habitat)		SA/SA	SA/SA	AF/AF	SA/I	SA/SA	I/I

Table 101 (continued)

Factors/Measures	Plan 8 CAWCS No Action (Future Without Project)	Plan 1	Plan 2	Plan 3	Plan 6	Plan 7	Plan 9
BIOLOGICAL RESOURCES Cont'd							
Perennial Stream/ Riverine Communities							
Loss of miles of perennial stream in typical year	0 (70 miles in site areas; 137 miles in CAWCS area)	-3	+1	-16	+1	-2	0
Change in flow characteristics of Salt and Verde Rivers	No change (on average, 106 days/ year ≤ 50 cfs in Salt, 61 days/year ≤ 50 cfs in Verde)	No change	No change	No change	No change	Guaranteed minimum flows of 200 cfs in Salt and Verde	No change
Conceptual Mitigation		None proposed	None proposed	Stream losses not mitigatable	None proposed	None proposed	None proposed
Typical Year Unmitigated/ Mitigated Effect		I	I	AF/AF	I	SB	I
Reservoir Aquatic Communities							
Gain or loss of surface acres of habitat in typical year	0 (13,640 acres in site areas; 30,000 acres in CAWCS area)	+400	-360	+3,080	+1,900	+3,690	+1,770
Gain of guaranteed minimum pool(s)	0 (no guaranteed minimum pools at SRP lakes or Lake Pleasant)	0	0	+1 minimum pool at Confluence	+1 minimum pool at New Waddell	+2 minimum pools at Cliff and New Waddell	0
Drawdown rates greater than 2 inches/day during spawning season	No change (drawdown rates 1.3 in/day at Roosevelt, 9.2 in/day at Horseshoe, 1.6 in/day at Lake Pleasant)	4.6 in/day at Cliff (decrease from current condition)	9.2 in/day at Cliff (no change from current condition)	4.0 in/day at Cliff and 2.6 in/day at Confluence (increase over current condition)	4.0 in/day at Cliff and 4.7 in/day at New Waddell (increase over current condition)	4.5 in/day at Cliff and 4.7 in/day at New Waddell (increase over current condition)	4.7 in/day at New Waddell
Conceptual Mitigation		None proposed	None proposed		Reduction in drawdown rates to 2 in/day during spawning season		
Typical Year Unmitigated/ Mitigated Effect		I	I	SA/SB	SA/SB	SA/BF	SA/SB

Table 101 (continued)

Factors/Measures	Plan 8 CAWCS No Action (Future Without Project)	Plan 1	Plan 2	Plan 3	Plan 6	Plan 7	Plan 9
WATER QUALITY							
Constituents							
	CAP water in local systems at locations and times chosen by users. Local surface water sources maintain quality independent of CAP influence. CAP water known to have high levels of dissolved organics	Average of 70,000 af of SRP (Verde River) water exchanged w/CAP each year. Comparison of Water Sources[a] (mg/l) Verde / CAP Ca 42.5 / 85.6 D Cd 0.00156 / <0.000286 T Cd 0.00619 / <0.00462 T Fe 0.192 / 9.159 Hard 212. / 339. Na 30.5 / 107. D Pb 0.00300 / 0.00144 T Pb 0.0714 / 0.0408 D Se 0.000750 / <0.00300 T Se 0.000600 / <0.00279 SO_4 52.9 / 309. TDS 314. / 722. After-exchange maximum concentrations reach new highs for numerous constituents. Degradation of some SRP water during period when only Verde River water is normally delivered. Possible short-term impacts to M&I and agricultural users. Short exchange period effects only 8% of SRP surface water.	No change from future-without condition.	Annual average of 845,000 af of SRP surface water mixed with 250,000 af of CAP water at Confluence site. 30-35% of SRP water treated for M&I use. Changes in Average Verde River Concentrations[a] (mg/l) Ca 42.5 to 61.4 (+44%) D Cd 0.00156 to 0.00100 (-36%) T Cd 0.00619 to 0.00550 (-11%) T Fe 0.192 to 0.178 (-7%) Hard 212. to 268. (+26%) Na 30.4 to 64.0 (+111%) D Pb 0.00300 to 0.00232 (-23%) T Pb 0.0714 to 0.0580 (-19%) D Se 0.000750 to 0.00174 (+132%) T Se 0.000600 to 0.00156 (+160%) SO_4 52.9 to 165. (+212%) TDS 314. to 493. (+57%) After-mix maximum SRP concentrations reach new highs for numerous constituents. All of SRP surface water degraded and possible increased M&I treatment costs with short-term maximum CAP concentrations. Possible changes in agribultural operation only during period when Verde River water is normally delivered. High dissolved organic levels in CAP water reach water treatment plants which otherwise would receive only SRP water.	Annual average of 25,000 af of MCMWCD#1 surface water mixed with 701,800 af of CAP water at Waddell site. None of the MCMWCD#1 water treated for M&I uses. Changes in Average MCMWCD#1 Concentrations[a] (mg/l) Ca 50.8 to 84.4 (+66%) D Cd <0.00300 to 0.000378 (-87%) T Cd <0.00150 to 0.00451 (+201%) T Fe 2.04 to 0.223 (-89%) Hard 215. to 335. (+56%) Na 37.8 to 105. (+178%) D Pb 0.00200 to 0.00146 (-27%) T Pb 0.00425 to 0.0396 (+832%) D Se <0.00100 to 0.00293 (+193%) T Se <0.00100 to 0.00273 (+173%) SO_4 85.0 to 301. (+254%) TDS 358. to 710. (+98%) After-mix maximum MCMWCD#1 concentrations reach new highs for numerous constituents with no significant effect on agricultural users.		
Conceptual Mitigation		None proposed	Not applicable	None proposed	None proposed	None proposed	
Typical Year Unmitigated Effect		I	No effect	SA	I	I	

Table 101 (continued)

Factors/Measures	Plan 8 CAWCS No Action (Future Without Project)	Plan 1	Plan 2	Plan 3	Plan 6	Plan 7	Plan 9
WATER QUALITY cont'd.							
Eutrophication							
Potential for eutrophic conditions to occur in reservoirs which store CAP Colorado River water in CAWCS study area[b].	No Colorado River water storage reservoir in study area.	Same as Future Without Condition		Confluence Reservoir has high potential for eutrophication with high probability for blue-green algal dominance. Probable aesthetic impacts on Verde arm in most years. Eutrophication provides potential organics in Confluence Reservoir water.	New Waddell Reservoir has low to moderate potential for eutrophication with no projected problems.		
Conceptual Mitigation		------- Not applicable -------		Downstream impacts mitigatable with different disinfection process for SRP M&I water.	None proposed		
Typical Year Unmitigated/ Mitigated Effect		------- No effect -------		SA/I	I	I	
Salt Loading							
Increased amount of dissolved salts imported in Colorado River water.	Baseline CAP imports average of 1,020,000 tons of dissolved salts each year.	10.6% increase in average annual imported salt volume.	1.6% increase in average annual imported salt volume.	16.2% increase in average annual imported salt volume	13.3% increase in average annual imported salt volume.	11.3% increase in average annual imported salt volume.	
Conceptual Mitigation		None proposed	None proposed	None proposed	None proposed	None proposed	
Typical Year Unmitigated/ Effect		I	I	I	I	I	

[a]Prefix D means dissolved fraction while T means total recoverable. All values shown rounded to three significant figures. Constituents shown on this table were selected to show some significant impacts; a more complete list of constituents and their impacts is included in Chapter IVB2.

[b]Eutrophication potentials were computed using the Canfield and Bachman equations described in the USBR Technical Memorandum titled "Guidelines for Studies of Potential Eutrophication" Denver, Co., 1981. Risk of eutrophication under normal operating conditions is based on phosphorus concentration which is assumed uniform over the studied area.

Table 101 (continued)

Factors/Measures	Plan 8 CAWCS No Action (Future Without Project)	Plan 1	Plan 2	Plan 3	Plan 6	Plan 7	Plan 9
CULTURAL RESOURCES							
Prehistoric Cultural Resources							
Number of sites destroyed by construction activities/total number of sites potentially affected in dam site areas[c]	0 sites in site areas)	132/2,942	72/2,942	156/3,208		158/3,062	53/3,603
Acres of archaeological deposits affected	0 acres of deposits in site areas)	4,272	4,272	12,015		4,374	4,688
Effects Factor (for total sites affected)[d]		-5,760	-4,747	-14,665		-5,887	-5,456
Conceptual Mitigation		Avoiding resource; partial data recovery (e.g., mapping sites, collection of surface artifacts, use of remote sensing techniques, test excavations, partial site excavations); site protection (e.g., fencing around site, policing, site monitoring, enforcement of laws against vandalism). Complete mitigation of impacts not possible.					
Unmitigated/ Mitigated Effect		AF/AF	AF/AF	AF/AF		AF/AF	AF/AF
Historic Cultural Resources							
Number of sites destroyed by construction and related activities/ total number of sites potentially affected in dam site areas[c]	0 (192 sites in site areas)	29/64	29/64	73/90		39/73	36/67
Effects Factor (Range)[d]		-73 to -320	-173 to -370	-438 to -798		-225 to -422	-207 to -383
Conceptual Mitigation		Avoiding resource; partial data recovery; site protection; site documentation (e.g., recording surface architecture or structural features); additional historical research.					
		Roosevelt Dam and Verde River Sheep Bridge impacts only partially mitigable.		Fort McDowell, Roosevelt Dam, and Verde River Sheep Bridge impacts only partially mitigable.		Roosevelt Dam and Verde River Sheep Bridge impacts only partially mitigable.	Roosevelt Dam impacts only partially mitigable.
Unmitigated/ Mitigated Effect		AF/AF	AF/AF	AF/AF		AF/AF	AF/AF

[c]Affected areas include all reservoir pool zones plus a secondary impact zone that extends approximately 1 mile beyond the maximum water surface elevation.
[d]This factor incorporates both the quality of the resource and the severity of the impacts. See Stage III Methodology for Environmental Quality Assessment (Dames & Moore, 1981) for details.

Table 101 (continued)

Factors/Measures	Plan 8 CAWCS No Action (Future Without Project)	Plan 1	Plan 2	Plan 3	Plan 6	Plan 7	Plan 9
RECREATION							
Stream-Oriented Recreation							
Net loss or gain of mile: of perennial stream/loss of tubing miles in typical year	0/0 (70 stream miles in site areas; 986 miles in 5-county region)	-3/0	+1/0	-16/17	+1/0	-2/0	0/0
Net loss or gain in maximum annual recreation days for stream-oriented oriented activities in typical year	0/0 (2,280,000 stream-oriented recreation days in site areas; 8,236,000 in 5-county region)	+5,850	+696	-1,504,802	+7,992	+6,386	0
Conceptual Mitigation		None proposed	None proposed	Loss of stream miles not mitigatable	None proposed	None proposed	None proposed
Typical Year Unmitigated/ Mitigated Effect		I	I	AF/AF	I	I	I
Reservoir-Oriented Recreation							
Net loss or gain in usable surface acres in typical year	0 (16,000 acres in site areas; 35,000 in 5-county region)	+683	-853	+5,243	+4,222	+5,095	+4,233
Net loss or gain in maximum annual recreation days for reservoir-oriented activities in typical year	0 (822,000 reservoir-oriented recreation days in site areas; 6,479,000 for 5-county region)	+670,520	-48,647	+3,537,383	+1,066,005	+1,085,873	+884,000
Conceptual Mitigation		---------- None proposed for this factor ----------					
Typical Year Unmitigated Effect		SB	I	SB	SB	BF	SB

Table 102

SUMMARY OF SOCIAL IMPACTS AND EFFECTS OF CENTRAL ARIZONA PROJECT PLANS

	Relocation of Indian People	Relocation of Non-Indian People	Flood Damage Reduction
Plan 8 CAWCS No Action (Future Without the Project)	For 374 Fort McDowell Indian Community residents: Normal incidence of physical and mental health problems. High satisfaction with way of life. High levels of personal autonomy. High potential for increased financial self-sufficiency. High levels of extended family ties. Normal incidence of family problems. High community cohesion and viability. High potential for increased tribal economic self-sufficiency. Moderate levels of unemployment. High potential for sustaining Yavapai culture.	For 596 Roosevelt Lake area residents: Normal incidence of physical and mental health problems. High levels of personal autonomy. High satisfaction with way of life. High potential for financial self-sufficiency. Low levels of informal support networks in all communities except Roosevelt Gardens. Low to moderate community cohesion in all communities except Roosevelt Gardens. Community development likely to remain at present low level.	For 46,560 people living in the flood prone areas by the year 2000 (conditions occur with a 200-year flood of 275,000 cfs) COMMUNITIES AFFECTED: Mesa, Tempe, Phoenix, Salt River Pima Maricopa Indian Community (SRPMIC), Gila River Indian Community (GRIC), Buckeye, Holly Acres: Potential for inundation for 46,560 individuals. High probability for large numbers of flood-related deaths. Projected $87,292,000 in residential property damage. Temporary lifestyle disruption for 46,560 individuals subjected to inundation by floodwaters. Permanent changes in lifestyle for majority of 525 sequential disaster victims in Holly Acres. Damages to roads and bridges projected to be $15,800,000. Transportation delay costs projected to be $39,694,000. Air and rail facility damages projected to be $7,021,000. Damages of $6,400,000 to power facilities. >$275,000 in damages to treatment plants. Temporary delays in telephone service. Business losses of $68,713,000; combined with both short- and long-term revenue losses, costs could be in excess of $150 million. Short- and long-term losses to tourism. Civil defense warning system fully activated. Emergency costs of $1,109,000. No additional land available for development.

Table 102 (continued)

	Relocation of Indian People	Relocation of Non-Indian People	Flood Damage Reduction
Plan 1	Same as Future-Without conditions.	IMPACTS For 347 Roosevelt Lake area residents: Slight increase in incidence of physical and mental health problems. Substantial decrease in personal autonomy. Substantial decrease in satisfaction with way of life. Moderately reduced financial capacity. Moderate decrease in informal support networks. Moderate decrease in community cohesion. Substantial decrease in community viability. MITIGATION: Relocate only those people who live within the 200-year flood pool, with no relocation of people in the IDF area. Provide Forest Service land in the Roosevelt Lake area for relocations, allowing enough space so neighbors may relocate near each other if they wish. Provide monetary compensation for all relocation expenses incurred by residents. Provide special services to meet needs that are unique to these communities. Provide an accurate and reliable system for disseminating information to residents so that they are constantly informed about relocation proceedings; provide a means by which residents can participate in the relocation planning process. UNMITIGATED/MITIGATED EFFECT: SA/I	IMPACTS For 46,560 people living in the flood-prone areas by the year 2000 (conditions occur with reduction of a 200-year flood to 70-92,000 cfs at airport): Potential for inundation for less than 100 individuals in Holly Acres area. Projected $602,000 in residential property damage. Temporary lifestyle disruption for <100 individuals; permanent lifestyle disruption for majority of sequential disaster victims in Holly Acres. 15 bridge crossings remain operable. Damages to roads and bridges totaling <$5,000,000. No significant delays in transportation. Damages to electrical transmission towers and power lines would be well below $1 million. Possibility of delays in telephone service for some. No delays in delivery schedules of newspapers, mail, etc. Business losses totaling $6,194,000; majority of damages occurring to sand and gravel operations. No significant disruption to tourist trade. Emergency costs would be below $60,000. Approximately 3,563 additional acres valued at $107,311,000 available for higher urban uses. MITIGATION: Not required. UNMITIGATED EFFECT: BF

Table 102 (continued)

	Relocation of Indian People	Relocation of Non-Indian People	Flood Damage Reduction
Plan 2	Same as Future-Without conditions.	IMPACTS For 247 Roosevelt Lake area residents: Slight increase in incidance of physical and mental health problems. Substantial decrease in personal autonomy. Moderate decrease in satisfaction with way of life. Moderately reduced financial capacity. Moderate decrease in informal support networks. Moderate decrease in community cohesion and slight decrease in social organization. Substantial decrease in potential for sustained community viability. MITIGATION: Relocate only those people who live within the 200-year flood pool, with no relocation of people in the IDF area. UNMITIGATED/MITIGATED EFFECT: SA/No effect	IMPACTS For 46,560 people living in the flood-prone areas by the year 2000 (conditions occur with a reduction of 200-year flood to 157,000 cfs at airport): Potential for inundation of approximately 525 individuals. Low probability of flood-related deaths. Projected $5,684,000 in residential property damage. Temporary lifestyle disruption for 525 individuals inundated; permanent lifestyle disruption for many sequential disaster victims in Holly Acres. 15 bridge crossings remain operable. Closure of all dip crossings. Damages to roads and bridge crossings totaling >$5,000,000. No significant delays in transportation. Damages totaling $1,500,000 to electrical transmission towers and power lines. Approximately $80,000 in damages to sewage and wastewater treatment plants. Temporary delays in telephone service in some areas. No delays in delivery schedules of newspapers, mail, etc. Business losses totaling $6,977,000; majority of damages to sand and gravel operations. No significant disruption in tourist trade. Civil defense warning system fully activated. Emergency costs in excess of $505,000. 2,248 acres valued at $66,026,000 available for higher urban uses. MITIGATION: Not required. UNMITIGATED EFFECT: SB

Table 102 (continued)

	Relocation of Indian People	Relocation of Non-Indian People	Flood Damage Reduction
Plan 3	IMPACTS: For 290 Fort McDowell Indian Community residents: High incidence of physical and mental health problems which is expected to result in increased illness and mortality. Extreme decline in levels of personal autonomy. Extreme decrease in satisfaction with way of life. Substantial decrease in potential for sustained financial self-sufficiency. Substantial decrease in extended family ties. Substantial increase in incidence of family problems. Extreme decrease in community cohesion and viability. Substantial decrease in potential for tribal economic self-sufficiency; substantial increase in unemployment. Extreme decrease in potential to sustein Yavapai culture. MITIGATION: Relocate the entire community together. Provide land of the highest available quality contiguous to the reservation. Monetary compensation should cover all expenditures. Provide for participation of the entire community in all decisions and plans. Provide a system for disseminating information to residents. UNMITIGATED/MITIGATED EFFECT: AF/AF	Impacts and effects same as Plan 1.	Impacts and effects same as Plan 1.
Plan 6 (Agency Proposed Action)	Same as Future-Without conditions.	Impacts and effects same as Plan 1.	Impacts and effects same as Plan 1.
Plan 7	Same as Future-Without conditions.	Impacts and effects same as Plan 1.	Impacts and effects same as Plan 1.

Table 102 (continued)

	Relocation of Indian People	Relocation of Non-Indian People	Flood Damage Reduction
Plan 9	Same as Future-Without conditions.	Impacts and effects same as Plan 1.	IMPACTS For 46,560 people living in the flood-prone areas by the year 2000 (conditions occur with a reduction of 200-year flood to 215,000 cfs at airport): Potential for inundation of >525 individuals. Low probability of flood-related deaths. Projected $18,954,000 in residential property damage. Temporary lifestyle disruption for >525 individuals inundated; permanent lifestyle disruption for many sequential disaster victims in Holly Acres. 3 bridge crossing remain operable. Closure of all dip crossings. Damage to roads and bridge crossings totaling $9,100,000. Significant delay in transportation. Damages totaling $4,800,000 to electrical transmission towers and power lines. Greater than $135,000 in damages to sewage and wastewater treatment plants. Temporary delays in telephone service in some areas. Delays in delivery schedules of newspapers, mail, etc. Business losses totaling $21,761,000; majority of damages to sand and gravel operations. Short-term disruption in tourist trade. Civil defense warning system fully activated. Emergency costs in excess of $809,000. MITIGATION: Not required. UNMITIGATED EFFECT: B

Table 103

SUMMARY OF ECONOMIC COSTS AND BENEFITS OF CENTRAL ARIZONA PROJECT PLANS

ECONOMICS Plan	Total Construction Cost ($ Range)[a]	Total Annual Cost ($ Range)[a]	Total Annual Benefits ($)	Net Economic Benefits ($ Range)[a]
Plan 8 (No CAWCS Action)	0	0	0	0
Plan 1	694,940,000 to 874,230,000	58,060,000 to 71,300,000	89,040,000	30,980,000 to 17,740,000
Plan 2[b]	541,570,000 to 627,460,000	41,870,000 to 48,210,000	53,310,000	11,440,000 to 5,100,000
Plan 3	1,116,250,000 to 1,295,540,000	93,970,000 to 107,200,000	125,970,000	32,000,000 to 18,770,000
Plan 6 (Agency Proposed Action)	978,430,000 to 1,157,720,000	82,710,000 to 95,940,000	174,290,000	91,580,000 to 78,350,000
Plan 7	same as Plan 6	same as Plan 6	168,160,000	85,450,000 to 72,220,000
Plan 9	931,790,000 to 1,111,080,000	76,030,000 to 89,260,000	143,089,000	53,829,000 to 60,169,000

[a]Costs range from Modified Roosevelt/Modified Stewart Mountain options to New Roosevelt/New Stewart Mountain options. Net economic benefits correspond to these options. Costs of plans would be allocated among several funding sources; for this analysis 2 sources were assumed: Reclamation Safety of Dams Act and Colorado River Basin Project Act.

[b]New Roosevelt is not included in Plan 2.

Index

In

Index

Index

*U.S. GOVERNMENT PRINTING OFFICE: 1985-0-576-105/20035

Tonto National Forest
2324 East McDowell Road
P.O. Box 5348
Phoenix, AZ 85010

PRIORITY MAIL