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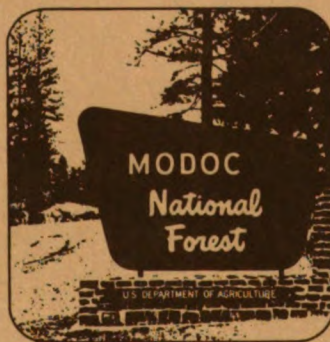
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Land and Resource Management Plan

NORTHWESTERN UNIVERSITY

## Modoc National Forest

# Final Environmental Impact Statement







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# **Environmental Impact Statement**

## **Modoc National Forest**

**1991**

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**Abstract:** This final Environmental Impact Statement (FEIS) describes six alternatives for managing the land and resources of the Modoc National Forest. The land area involved is 1.6 million acres. The alternatives assign a range and mix of forest practices and management area prescriptions to the Forest land base. Management activities produce a variety of outputs, amenities and costs. This FEIS is the basis for the Land and Resource Management Plan which accompanies this document.





## Acknowledgments

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*The Modoc National Forest  
gratefully acknowledges  
the following individuals  
for their artistic contributions to the  
Environmental Impact Statement and Plan:*

**Gerry Gates**

**Modoc National Forest**

**Lynette Shoemaker**

**Modoc National Forest**

**Warner Mountain Ranger District**

**Dan Delany**

**Umatilla National Forest**

**North Fork John Day Ranger District**



# Environmental Impact Statement

## Modoc National Forest

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## Chapter 1. Purpose and Need

This Environmental Impact Statement describes alternatives for managing the Modoc National Forest's land and resources for the next 10-15 years. The alternatives respond to solicited public issues, management concerns, and resource use and development opportunities (see Chapter 1, Section F). The Preferred (PRF) Alternative is the basis for the proposed Modoc National Forest Land and Resource Management Plan (Forest Plan) which is detailed in a separate, companion document.

Preparation of the FEIS is required by the National Environmental Policy Act (NEPA) of 1969, Council on Environmental Quality (CEQ) regulations found in 40 CFR 1500, and implementing regulations of the National Forest Management Act (NFMA) of 1976 in 36 CFR 219. Preparation of the Forest Plan is required by the Forest and Rangeland Resources Planning Act (RPA) of 1974, as amended by NFMA. When the Forest Plan is approved, all management activities affecting the Forest will comply with it.

While the Plan directs Forest management for the next 10-15 years, it will be reviewed every five years to determine if revisions are necessary. Amendments may be made when necessary.

Public issues are the driving force behind the Forest Plan. Chapter 2 presents alternative treatment of the issues listed below. The alternatives are derived from quantitative and qualitative analyses of Forest resources. Chapter 3 summarizes the elements of environment to be affected by the alternatives. Chapter 4 details the environmental consequences of each alternative. The Plan seeks to resolve issues and concerns through the Preferred Alternative.

### The Issues

#### Cultural Resources

What direction will be provided for the inventory, management, and interpretation of cultural resources?

#### Diversity

How will management provide for diversity of plant and animal communities so that diversity is at least as great as that which presently exists?

#### Energy

How will Forest management contribute to the federal policy of achieving national energy self-sufficiency?

#### Facilities

How and where will the transportation and communication system be managed and maintained?

#### Fire Management

How will fire be managed to protect and improve Forest resources?

#### Firewood

How and where will firewood be managed?

#### Lands

What will be the priorities for adjustments in land ownership to meet public demand and to support resource management goals and administrative needs?

#### Minerals

How will mineral areas be managed?

#### Pests

How will Forest pests be controlled?

Under what conditions will pesticides be used?

#### Range

What will be the level of range use and development?

#### Recreation

What recreation opportunities will be provided?

#### Socio-Economic

How will the effects of management be considered in relation to community stability?

#### Timber

What amounts, methods, and locations of timber harvest and other silvicultural activities will be practiced?

#### Visual Resources

How will the visual resource be managed to protect the scenic quality of the Forest?

## **Water and Soil**

How will watersheds be managed to maintain or enhance water quantity, water quality, and soil productivity?

## **Wetlands and Riparian Areas**

What will be the management direction for wetland and riparian habitats?

## **Wildlife and Fish**

Where, what kind, and how much habitat will be provided for fish and wildlife species?

How will habitats be maintained or improved for threatened, endangered, and sensitive plant and animal species?

outputs, subject to a moderate budget increase (20%) above the current level. Emphasis is placed on:

- maintaining as high a sustainable level of timber sale offerings as possible, commensurate with other resource emphases;
- harvesting timber using a mix of silvicultural practices, including uneven-aged management and even-aged management with retention of viable advance regeneration;
- implementing a fire management program at the most cost-efficient level;
- achieving an upward trend in snag numbers for eastside pine; and concentrating snag treatments on acres entered for timber harvest;
- managing for adopted levels of visual quality;
- managing desired areas for semi-primitive recreation;
- protecting and enhancing habitat for a mixture of wildlife species that depend on early and late successional stages;
- meeting objectives in deer herd plans, providing livestock grazing for community stability, and producing forage in a cost-efficient manner;
- continuing Forest wetland development; and
- restoring degraded riparian habitat in high priority areas.

Other resources will be managed to complement these emphases.

## **CUR – Current Alternative (No Action)**

This alternative continues base year 1982 management policies and practices subject to maintaining expenses at the current level. Emphasis is placed on:

- maintaining the base year 1982 timber harvest level;
- maintaining forage for livestock as close to the current level as possible;
- maintaining recommended levels of visual quality;
- managing desired areas for semi-primitive recreation;
- continuing Forest wetland development; and
- restoring degraded riparian habitat in high priority areas.
- achieving snag standards by the end of the 3rd decade through extensive treatments in eastside pine.

---

## **Chapter 2. Alternatives**

An alternative is a set of goals and objectives centered around a theme that guides the management of Forest resources from the current condition to a desired future state. The linear programming model FORPLAN was used to examine benchmarks which define minimum and maximum output levels for each resource. Alternatives' themes were developed from the limits and opportunities defined in the benchmarks. Each theme guides the management of Forest resources from the current condition to a desired future state. By combining management prescriptions and activity schedules, each alternative results in various resource outputs, land uses, and goods and services for the public. Major considerations in developing alternatives are regulatory requirements; issues, concerns, and opportunities; and net public benefits.

Of the 18 alternatives developed from benchmarks, 6 were selected for detailed study. The remaining 12 were eliminated from detailed consideration because of unacceptable responses to specific issues or insignificant differences from another alternative considered in detail.

All alternatives considered in detail include minimum requirements to ensure compliance with applicable laws and regulations. The multiple-use nature of the alternatives provides a mix of outputs and ensures that no single resource is emphasized to the exclusion of another.

Themes of the six alternatives considered in detail follow.

### **PRF – Preferred Alternative**

This alternative responds to many resource demands by emphasizing a wide range of commodity and amenity

Other resources will be managed to complement these emphases.

#### **RPD – RPA Alternative with Departure**

This alternative attempts to respond to targets from the 1980 RPA Program by providing commodity and amenity outputs established for the Modoc National Forest. A departure alternative approaches as closely as possible the RPA timber target in the 1st decade, but the timber target in the 5th decade is not met. Emphasis is placed on:

- increasing timber outputs above the base year 1982 level by allowing a departure from the base sale schedule in the 1st decade;
- reducing timber outputs in the 2nd decade to no less than 15% of the base sale schedule;
- meeting range targets established by the Program;
- completing cultural resource inventories by 1995;
- maintaining recommended levels of visual quality;
- managing desired areas for semi-primitive recreation;
- increasing habitat for wildlife, specifically mule deer and trout; and
- continuing Forest wetland developments.
- achieving snag standards by the end of the 3rd decade through extensive treatments in eastside pine.

Other resources will be managed to complement these emphases.

#### **IND – Industry Alternative**

This alternative provides high levels of timber and range outputs while preserving other resource values at low levels. Emphasis is placed on:

- increasing timber outputs;
- minimizing the reduction in pine volume offered for sale in the 1st decade;
- maintaining forage for livestock at the current level for at least another decade;
- allowing reductions in semi-primitive recreation opportunities, and from recommended visual quality objectives;
- continuing Forest wetland development; and
- restoring degraded riparian habitat in high priority areas.

- achieving an upward trend in snag numbers for eastside pine; and concentrating snag treatments on acres entered for timber harvest.

Other resources will be managed to complement these emphases.

#### **RBV – Reduced Budget Alternative**

This alternative produces a mix of commodity and amenity outputs subject to a budget reduced to 75% of the current level. Emphasis is placed on:

- providing timber outputs at the highest level permitted by the budget;
- providing timber outputs from the Big Valley Federal Sustained-Yield Unit needed for community stability;
- providing livestock forage at a moderate level;
- allowing reductions from semi-primitive recreation opportunities, and in recommended visual quality objectives;
- managing the Forest wetland program at a minimum level.
- achieving snag standards by the end of the 3rd decade through extensive treatments in eastside pine.

Other resources will be managed to complement these emphases.

#### **AMN – Amenity Alternative**

This alternative responds to amenity demands while providing for commodity outputs at cost-efficient levels. Emphasis is placed on:

- maintaining a high level of visual quality;
- managing for extensive semi-primitive recreation;
- protecting and enhancing habitat for wildlife species dependent on late seral stages;
- reintroducing California bighorn sheep throughout their historic range, and closing or reducing livestock grazing in allotments where combined use would be incompatible;
- continuing Forest wetland development;
- restoring degraded riparian habitat Forestwide; and
- utilizing many uneven-aged management techniques for timber harvest.
- achieving an upward trend in snag numbers for eastside pine; and concentrating snag treatments on acres entered for timber harvest.

Other resources will be managed to complement these emphases.

#### **Comparison of Alternatives**

Table 1 summarizes by alternative the treatment of issues and concerns, except economics. Figure 1 graphically depicts key comparison between alternatives.



**Table 1. Summary Treatment of Issues and Concerns.**

Issue	Output or Effect to be Measured	Units	PRF	CUR	RPD	IND	RBU	AMN
Cultural Resources								
What direction will be provided for the inventory, management, and interpretation of cultural resources?	Protection	All alternatives protect significant and unevaluated sites through project redesign and avoidance.						
	Inventory	On a project basis; complete Forest inventory by 2050.	On a project basis; complete Forest inventory by 2050.	On a project basis; complete Forest inventory by 1995.	On a project basis; plus 149,000 non-project acres/yr; complete inventory by 1995.	On a project basis; complete Forest inventory by 2050.	On a project basis.	On a project basis plus 33,400 non-project acres/yr; complete inventory by 2010.
		In all alternatives, nominate eligible sites to NRHP.						
	Resource enhancement	Site/yr						
	-signed sites	3	0	0	3	1	0	5
	-evaluate backlog	50	0	0	63	0	0	50
	Concerns of Native American heritage	Continue consultation on a project basis.	Continue consultation on a project basis.	Increase consultation to include non-project inventory areas.	Continue consultation on a project basis.	Continue consultation on a project basis.	Continue consultation on a project basis.	Increase consultation to include non-project inventory areas.
Diversity								
How will management provide for diversity of plant and animal communities so that diversity is at least as great as that which presently exists?	Vegetation Types and Seral Stages	See Chapter 4, Figures 4-1 through 4-11 for the anticipated vegetation types and seral stages resulting from each alternative in decades 1, 5, and 10.						

Table 1. Summary Treatment of Issues and Concerns. (continued)								
Issue	Output or Effect to be Measured	Units	PRF	CUR	RPD	IND	RBU	AMN
	Old-Growth Timber -Decade 1	% of > 20 Timber Acres	12%	10%	11%	12%	12%	12%
	-Decade 5		9%	8%	6%	7%	9%	11%
Energy								
How will Forest management contribute to the federal policy of achieving national energy self-sufficiency?			Forest-wide Standards and Guidelines encourage development of new energy sources while stressing energy efficiency in all alternatives for facilities, vehicles, and equipment.					
Facilities								
How and where will the transportation and communication system be managed and maintained?	Management		In all alternatives, Forest-wide Standards and Guidelines require developing and managing the transportation and communication systems to help meet other resource direction and objectives.					
	Road construction and reconstruction	Miles/yr	36.5	26.7	43.7	43.0	19.1	31.0
Fire Management								
How will fire be managed to protect and improve Forest resources?	Fire Management Budget		All alternatives except CUR and RBU have a proposed budget equal to current levels. CUR and RBU operate under fire budgets 20% less than current.					
	Prescribed fire	Acres/Yr	2,148	1,400	3,200	2,803	1,500	979
Firewood								
How and where will firewood be managed?	Quantity and type of firewood available		Firewood suitable for home heating will be reserved in quantities sufficient to meet at least current demand of local Forest communities.					

**Table 1. Summary Treatment of Issues and Concerns. (continued)**

Issue	Output or Effect to be Measured	Units	PRF	CUR	RPD	IND	RBU	AMN
<b>Lands</b>								
What will be the priorities for adjustments in land ownership to meet public demand and to support resource management goals and administrative needs?	Most alternatives will have an active land adjustment program to consolidate ownerships, facilitate management, and minimize conflicts with adjacent land users. Funding limits would curtail this program under the RBU alternative.							
<b>Minerals</b>								
How will mineral areas be managed?	The Forest is open to mineral exploration and development, except for the South Warner Wilderness, Devil's Garden Research Natural Area, three Geologic Special Interest Areas, and certain administrative sites. Forest-wide Standards and Guidelines and management prescriptions are used to protect the land and resources from unacceptable environmental effects. Forest lands open to mineral development are similar for all alternatives.							
<b>Pests</b>								
How will damage from Forest pests be controlled?	In all alternatives, Forest-wide Standards and Guidelines call for application of integrated pest management to reduce pest impacts. Pest management levels vary between alternatives and depend on the level of vegetation management and resource outputs.							
Under what conditions will pesticides be used?	Selection of any particular method will be made at the project level, based on site-specific analysis of relative effectiveness, environmental effects, and costs.							
<b>Range</b>								
What will be the level of range use and development?	AUMa/Yr							
-Livestock			118,800	120,000	122,500	138,400	100,000	97,300
-Big Game			47,900	39,700	52,100	35,700	47,900	59,700
-Wild Horses			4,400	4,400	4,400	4,400	4,400	4,400

**Table 1. Summary Treatment of Issues and Concerns. (continued)**

Issue	Output or Effect to be Measured	Units	PRF	CUR	RPD	IND	RBU	AMN
Actual allocations of AUMs for domestic livestock will be determined in allotment management plans. Big game forage requirements are primarily a reflection of deer herd numbers and are based on California Department of Fish and Game herd goals.								
Livestock Forage Improvement								
	-non-structural (M AUMs)		11.8	13.5	21.4	14.5	10.4	13.0
<b>Recreation</b>								
What recreation opportunities will be provided?	Developed Recreation	Demand	Maintain existing campgrounds and construct new ones to meet future demand. Expand interpretive services.	Maintain existing campgrounds and construct new ones to meet future demand. Expand interpretive services.	Maintain existing campgrounds and construct new ones to meet future demand. Expand interpretive services.	Maintain existing campgrounds and construct new ones to meet future demand. Expand interpretive services.	Some existing opportunities will be lost. No new opportunities will be provided, and future demand will not be met.	Maintain existing campgrounds and construct many new ones. Emphasize and expand interpretive services.
		Mgmt. Level	Std	Std	Std	Std	<Std	Std
<b>Disp. Recreation</b>								
	-SPNM	Acres	317,000	317,000	317,000	304,100	304,100	341,000
	-SPM		219,800	219,800	219,800	222,900	222,900	234,400
	-RN		1,056,400	1,056,400	1,056,400	1,066,200	1,066,200	1,017,800
		Mgmt. Level	Std	Std	Std	Std	<Std	Std
	Wilderness	Mgmt. Level	Std	Std	Std	Std	<Std	Std
	OHV Areas	%						

Table 1. Summary Treatment of Issues and Concerns. (continued)									
Issue	Output or Effect to be Measured	Units	PRF	CUR	RPD	IND	RBU	AMN	
	-Open - Use-able Summer	Decade 1	61	61	61	64	64	49	
		Decade 5	61	61	61	64	64	49	
	-Open - Use-able Winter	Decade 1	62	62	62	65	65	57	
		Decade 5	62	62	62	65	65	57	
<b>Timber</b>									
What amounts, methods, and locations of timber harvest and other silvicultural activities will be practiced?	Timber production emphasis - Full Yields (Reg. Class I)	Acres	145,859	228,029	153,494	180,453	202,645	30,793	
	Timber production and other resources equally emphasized - Reduced Yields (Reg. Class II)		194,240	134,885	210,728	186,340	174,831	244,776	
	Limited timber production with emphasis on other resources - Reduced Yields (Reg. Class III)		36,764	36,764	36,764	28,490	28,490	79,060	
	Timber production on low productivity lands (Reg. Class III)		142,117	120,704	134,501	167,245	0	132,868	

**Table 1. Summary Treatment of Issues and Concerns. (continued)**

Issue	Output or Effect to be Measured	Units	PRF	CUR	RPD	IND	RBU	AMN
Silvicultural Practices								
	-Clearcut		3,100	2,300	3,900	3,600	1,600	600
	-Shelterwood		300	300	500	100	400	200
	-Intermediate Harvest		200	700	800	400	200	1,600
	-Uneven-aged		300	0	0	240	0	1,170
	Forest-wide AI-lowable Sale Quantity	MMBF/Yr	45.5	51.4	74.6 (departure)	60.1	36.9	31.8
	Big Valley Federal Sustained-Yield Unit Harvest	MMBF/Yr	9.0	11.0	11.0	11.0	8.5	5.7
<b>Socio-Economic</b>								
How will the effects of management be considered in relation to community stability?	Change in Jobs Available	Person-Years	+14	+1	+188	+93	-88	-54
	Receipts to Counties	\$MM/Yr	2.3	2.3	3.4	2.8	1.6	1.5
	Change in Local Income	\$ M/Yr	+94.1	-64.9	+5,414.7	+2,593.1	-2,858.4	-2,012.2
<b>Visual Resources</b>								
How will the visual resource be managed to protect the scenic quality of the Forest?	Adopted VQO	Acres/%						
-Preservation			84,700/5.1	84,700/5.1	84,700/5.1	84,700/5.1	84,700/5.1	84,700/5.1

**Table 1. Summary Treatment of Issues and Concerns. (continued)**

[illegible]

Table 1. Summary Treatment of Issues and Concerns. (continued)								
Issue	Output or Effect to be Measured	Units	PRF	CUR	RPD	IND	RBU	AMN
Wetlands and Riparian								
What will be the management direction for wetland habitat?	Wetland Improvement	Acres/Yr	363	243	363	243	79	363
What will be the management direction for riparian habitat?	Riparian Areas	All Riparian areas will be protected through Forest-wide Standards and Guidelines.						
Rehabilitation of Deteriorated Areas in 5th Decade			100%	100%	100%	94%	100%	100%
Riparian Area Prescription	Acres		9,274	9,274	9,274	9,274	9,274	9,274
Wildlife and Fish								
Where, what kind, and how much habitat will be provided for fish and wildlife species?	Threatened and Endangered Species	Habitat for all threatened and endangered species will be managed to meet recovery levels.						
How will habitats be maintained or improved for threatened, endangered, and sensitive plant and animal species?	Bighorn Sheep	#s/5th Decade	100	100	100	100	100	300
Management Indicator Species (MIS)	Habitat for MIS is maintained or improved through Standards and Guidelines and management prescriptions. Habitat quantity and quality is increased above current levels.							

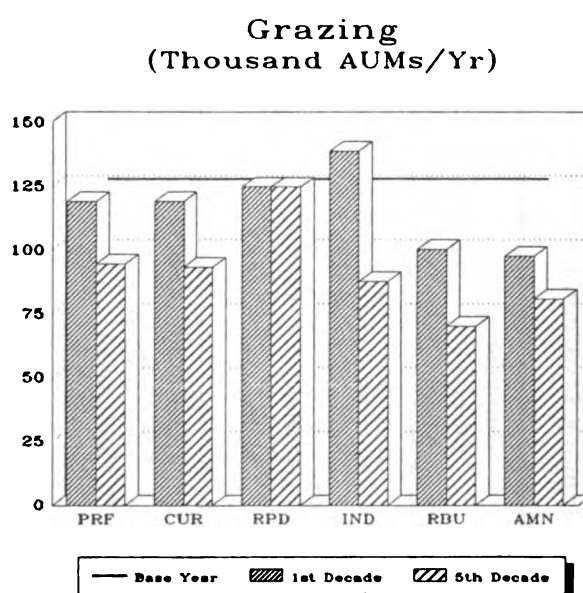
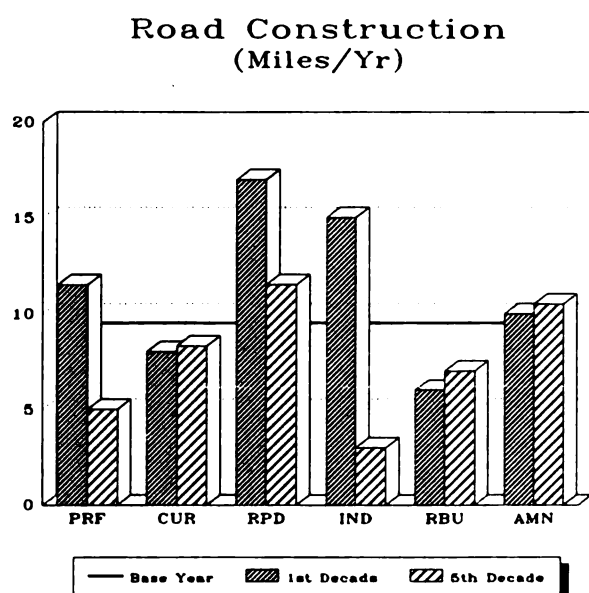
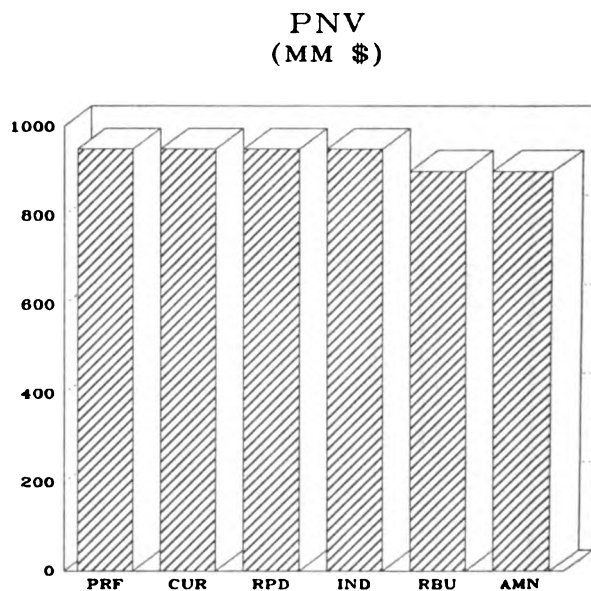
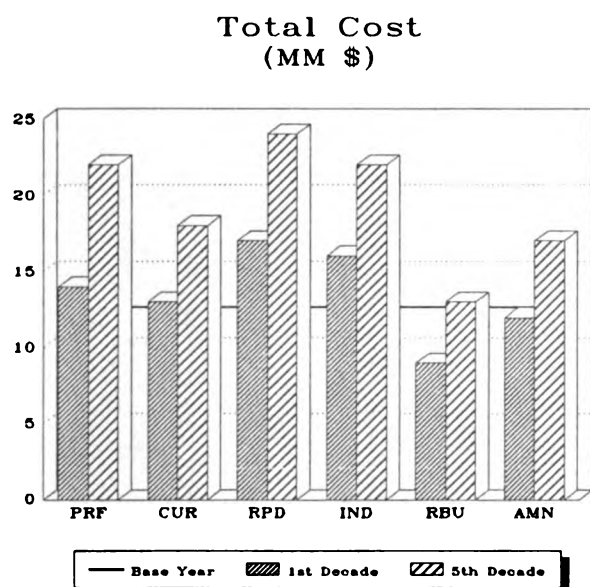


Table 1. Summary Treatment of Issues and Concerns. (continued)

Issue	Output or Effect to be Measured	Units	PRF	CUR	RPD	IND	RBU	AMN
	Goshawk	#s/Yr	100	73	73	73	73	73
	Deer	#s/Yr	34,200	28,900	35,600	25,500	34,500	34,600
	Resident Fish	lbs/Yr	118,800	118,500	118,800	117,400	117,800	117,800
	Big Game For- age	AUMs/ Yr	47,900	39,700	52,100	35,700	47,900	59,700
	Timber-Forage Prescription	Acres/Yr	1,470	250	2,210	250	1,900	2,160
	Direct Habitat Improvement							
	-Deer	Acres/Yr	330	0	2,870	0	0	0
	-Fish	Miles/Yr	1.5	2.5	1.5	1.0	1.5	1.5
	Snags in eastside pine	1st Decade Snags/Acre	0.5	1.1	1.1	0.5	1.1	0.5
		5th Decade	1.1	1.5	1.5	1.1	1.5	1.1
	Sensitive Plants							

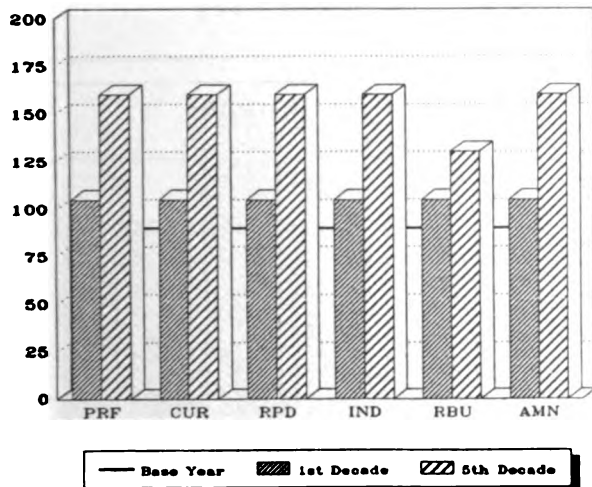
Forest-wide Standards and Guidelines ensure protection.

**Figure 1. Key Comparisons Between Alternatives.**

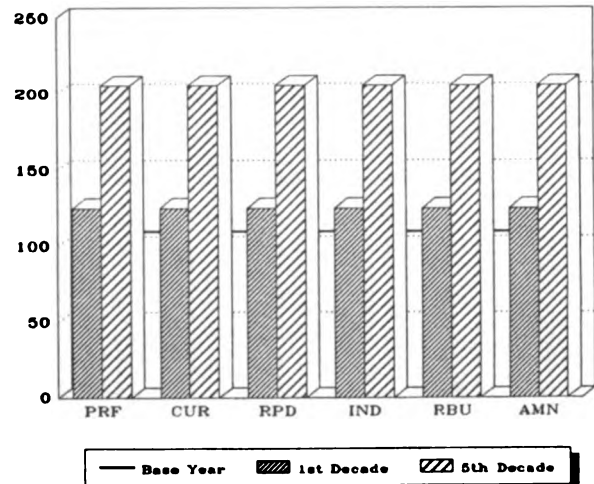


**Figure 1. Key Comparisons Between Alternatives.(continued)**

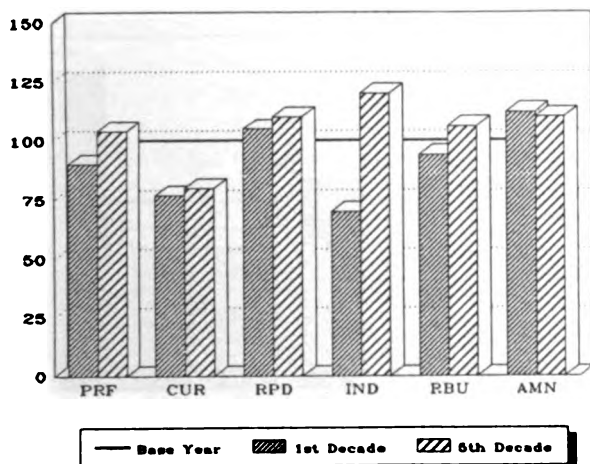
**Developed Recreation  
(Thousand RVDs/Yr)**



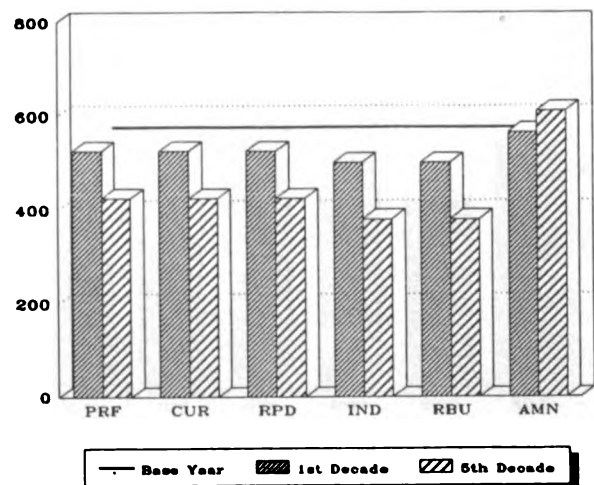
**Dispersed Recreation  
(Thousand RVDs/Yr)**



**Hunting-Related  
Dispersed Recreation  
(Thousand RVDs/Yr)**

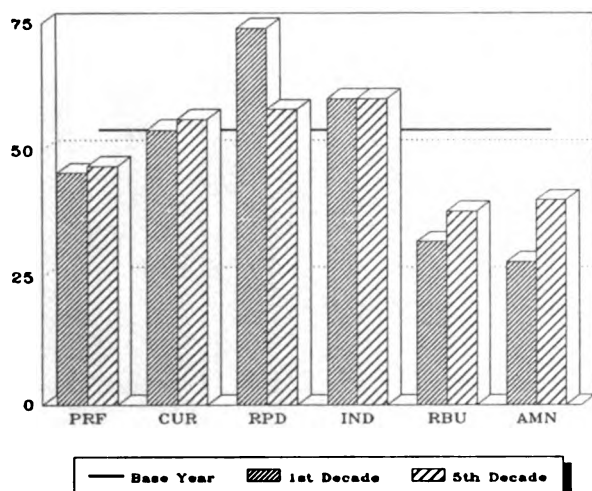


**Semi-Primitive Recreation  
(Thousand Acres)  
(Does not include Wilderness)**

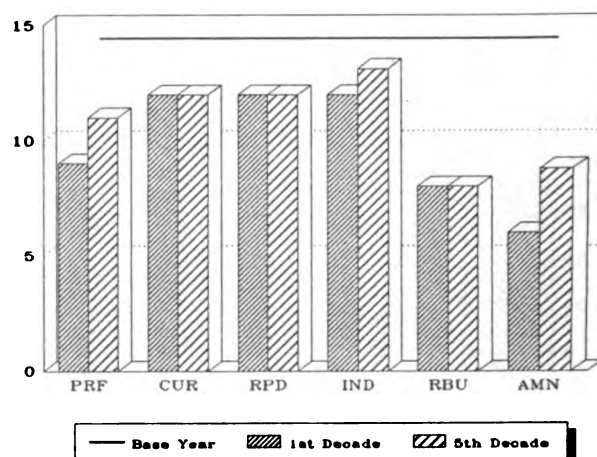


**Figure 1. Key Comparisons Between Alternatives.(continued)**

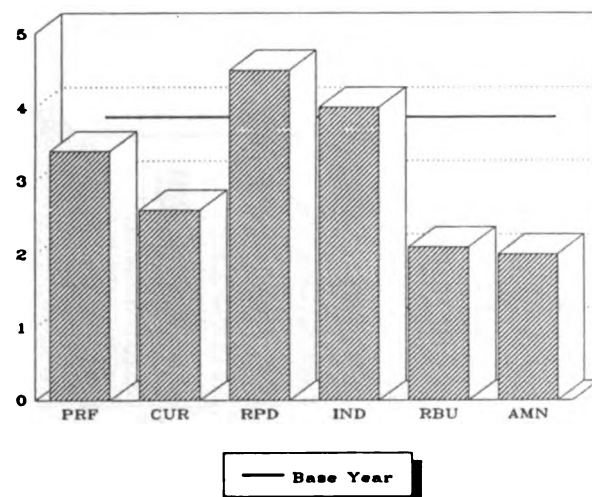
**Allowable Sale Quantity  
(MMBF/Yr)**



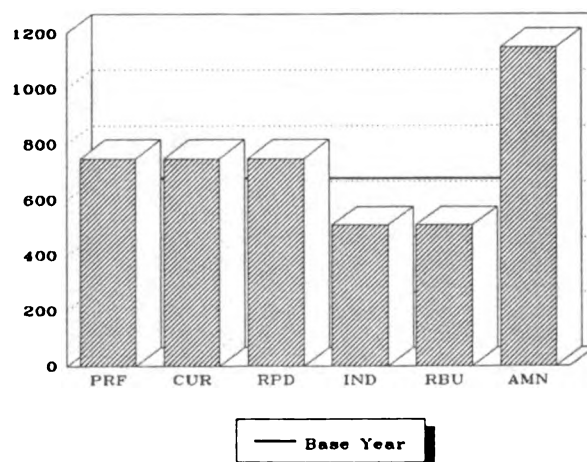
**Big Valley Federal  
Sustained-Yield Unit  
(MMBF/Yr)**



**Reforestation  
(Thousand Acres/Yr)**

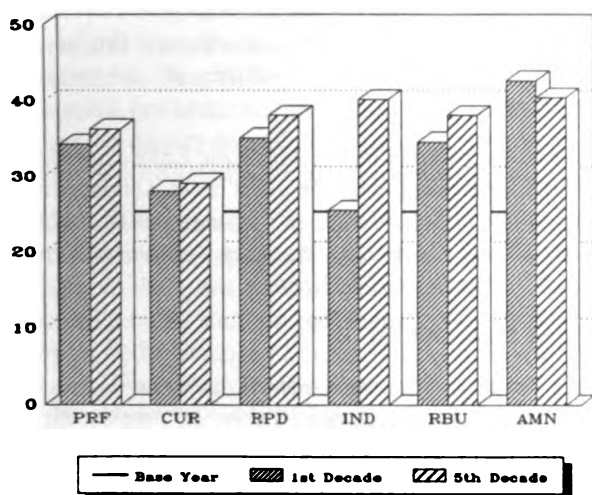


**Preservation, Retention,  
and Partial Retention  
(Thousand Acres)**

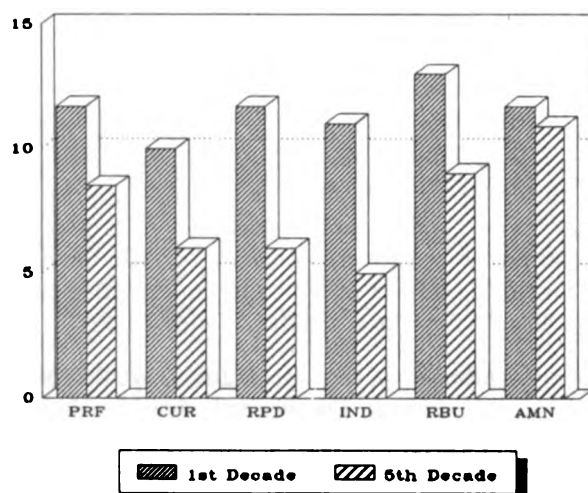


**Figure 1. Key Comparisons Between Alternatives.(continued)**

**Deer  
(M Individuals)**



**Old-Growth Timber  
(% of >20 Timberlands)**



## Economic Analysis

The goal of planning is to develop a plan that obtains the highest net public benefit. Net public benefits, conceptually, are the sum of non-priced values such as visual quality and community stability and present net value (PNV). PNV is the difference between the discounted value of all outputs to which monetary values or established prices are assigned and the total discounted costs of managing the Forest. PNV is a prime indicator of economic efficiency.

For the Modoc, change in PNV is tied to species mix and timber harvest level for the first 5 decades. Alternatives with high timber harvest generally have a high PNV; alternatives with low harvest levels have a low PNV. Alternatives that emphasize eastside pine harvesting promote timber industry stability but lower PNV due to higher relative costs.

Reductions in PNV are greatest when suitable timber lands are removed from production. The snag constraint reduces timber harvest and accounts for the greatest change in PNV. The dispersion constraint limits clearcut size and prohibits adjacent openings, and has the next most significant impact on PNV. Retaining old-growth habitat has the third most significant affect on PNV.

Income and employment opportunities are primarily linked to timber output. The Forest budget, receipts to counties, and wildlife recreation also have a large effect on income and employment.

In the 1st decade, net cash flows are negative, except timber cash flows, in all alternatives due to high costs incurred to meet minimum management requirements. By the 5th decade, these costs have decreased and net cash flow is positive for all alternatives. Noncash benefits are high for all alternatives and remain relatively constant over decades 1-5.

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## Chapter 3. Affected Environment

### General Description

The most remote forest in California, the Modoc is bordered by Oregon to the north and Nevada to the east, with the Shasta-Trinity and Klamath National Forests neighboring the west and the Lassen National Forest the south. Of the 1.9 million acres within the proclaimed boundary, the Forest administers 1.6 million acres. The remaining 300,000 acres are privately owned or administered by other public agencies. Elevations range from 4,000 to nearly 10,000 feet above sea level.

At lower elevations sage, bunchgrass, and juniper are common vegetative types, while higher elevations include alpine meadows, mixed stands of ponderosa and Jeffrey pine, lodgepole and western white pine, red fir, and white fir with bitterbrush, mahogany, and sage. The variable climate ranges from warm, dry summers to cold, severe, moderately wet winters. In Alturas, approximately 12 inches of annual precipitation falls primarily as rain and about 25% of the total as snow. Forested areas receive more precipitation.

On the east side of the Forest the Warner Mountains have moderate to steep slopes on the western face. The eastern aspect is very steep and often precipitous. Much of the western northwestern parts of the Forest are located on a relatively flat, volcanic plateau with an average elevation of 4,800 feet. The plateau supports the largest continuous stand of western juniper in the western United States.

Beyond the plateau lie the Medicine Lake Highlands which include explosion craters, lava flows, and lava tube ice caves. The Highlands are an eastern extension of the Cascade Range which includes other inactive volcanoes such as Mt. Shasta and Mt. Lassen.

### Economic Environment

The Forest's primary zone of influence includes Modoc, Lassen and portions of Siskiyou Counties. These areas are characterized by a rural setting, low population density, and limited job diversity centered around agriculture, the timber industry, and recreation. The counties are most affected by Forest Service employment, timber, range, wildlife, and recreation. The economies of each county are dependent on the supply of natural resources such as sawtimber, firewood, forage, minerals, energy, and recreation opportunities.

The current population of Modoc, Lassen, and Siskiyou Counties is 70,000 people. From 1970 to 1980, the population increased at a faster rate than the State, primarily because of in-migration. Between 1980 and 2020, the Counties' populations are expected to increase more slowly than the average annual Statewide growth rate of 1.8%.

Historic land settlement patterns of Modoc, Lassen, and eastern Siskiyou Counties are linked to the livestock industry. The Forest was established largely as the result of ranchers' requests for the federal government to alleviate the problem of overgrazing public reserve lands.

Modoc County employment is dominated by federal, State and local government (38%), and agriculture and forestry (19%), percentages far greater than Statewide averages. Per capita income and rates of change in

Modoc, Lassen, and Siskiyou Counties are lower than the Statewide average.

### **Social Environment**

Social groups within the Forest's zone of influence include ranchers and farmers, timber industry workers, retail and service personnel, retirees and second homeowners, government employees, recreationists, and Native Americans. The Forest directly influences local lifestyles in supplying various goods, services, and opportunities.

### **Resource Environment**

**Air Quality**—Crisp, clean mountain air is a hallmark of the Forest. The South Warner Wilderness and Lava Beds Wilderness in the Lava Beds National Monument are rated as Class I areas, while the rest of the Forest is designated as Class II. Because Modoc County has a low population, few industrial plants, and low vehicle concentrations, air quality degradation is insignificant. Stable air conditions (inversions) are uncommon in this area.

**Cultural Resources**—Physical remains of over 11,000 years of human history are found throughout the Forest. Prehistoric site types include winter village complexes, scattered hunting stations, tool manufacturing sites, petroglyphs, bedrock mortars, caves and obsidian and basalt quarries. The most common historic sites on the Forest are homesteaders' cabins, mining sites, logging railroads and camps, and emigrant trails. About 16% of the Forest has been inventoried for cultural resources, and seven properties are on the National Register of Historic Places.

**Diversity**—Although diversity is not a specific resource that can be managed, it can be evaluated by richness, evenness, and pattern. The presence of 17 major vegetation types on the Forest indicates that the Modoc is a diverse forest spanning a wide range of environmental conditions. Vegetative richness is also reflected in the richness of 354 vertebrate species supported by the Forest. Although juniper and eastside pine clearly dominate the Forest, other vegetative types add to its richness and are important to animal communities. Old-growth habitat in eastside pine is insufficient and a serious problem. Mixed conifer and red fir contain sufficient old growth although distribution is inadequate in some parts of the Forest. The pattern aspect of diversity is expressed in the Forest's expansive juniper and sagebrush plain in the middle, Medicine Lake Highlands contrasting dramatically with open rangelands to the west, and timbered slopes of the Warner Mountains to the east.

**Energy**—Firewood is the Forest's major energy source, followed by geothermal, biomass, and hydroelec-

tric energy. Firewood is discussed separately below. Exploration for geothermal energy is slow on the two known geothermal resource areas of the Forest, although demand could increase as future energy demands and environmental concerns rise. Use of biomass is left to the discretion of timber purchasers or thinning contractors; demand is currently low. No hydroelectric plants are currently in operation on the Forest, although feasibility studies indicate potential energy totalling 31.1 million kWh per year.

**Facilities**—The Forest administers a 3,178-mile road system, 118 miles of trails, 14 road bridges, 127 dams (120 are owned by the Forest), 16 administrative sites, and 35 electronic sites. The Forest road system is nearly complete, but some sections require reconstruction. The government leases four administrative sites from private parties.

**Fire and Fuels**—The average number of fires is about 100 annually—23% caused by people, and 77% started by lightning. Annual acreage burned varies widely because unusually large fires add many acres to the annual average. From 1970 through 1979, the annual average was 12,900 acres, while the average from 1980 to 1985 was 1,300 acres. Most of the fire budget is allocated to attack, and the remainder to prevention, detection, and fuels treatment. The Forest treats about 5,100 acres of accumulated fuels each year, most of which are timber-related. Most fuels are treated by non-burning methods, such as crushing, lopping, and scattering.

**Firewood**—In 1980, permits were issued for 23,000 cords of firewood. The demand could reach nearly 35,000 cords by 2020. The Forest can easily meet demand with a supply of 56,000 cords available per year from western juniper and logging slash. Woodcutters prefer juniper for firewood, with logging slash of secondary importance. In addition to personal use charge permits, the Forest also issues free-use permits to encourage people to collect logging debris. Commercial firewood sales are offered routinely to provide local employment opportunities and accomplish land management objectives such as rangeland improvement.

**Geology**—Although the Forest is not situated in an areas of high seismicity, numerous active and inactive faults are found within its boundaries. If a major earthquake were to occur on Forest lands, the estimated amount of overall damage would be minimal. Geologically, the Forest is composed predominantly of volcanic and associated sedimentary formations. The Medicine Lake Highlands is one of the most probable sites in California where a volcanic eruption may occur. However, an eruption in the Highlands would be comparatively non-catastrophic. The risk of landslide is low on



85% of the Forest because of gentle slopes, stable volcanic bedrock, and much cohesive soil. The Forest currently uses about 30 acre-feet of groundwater per year for human needs, fire suppression, livestock, and road construction. Existing groundwater should meet future needs of the Forest.

**Lands**—The lands program includes landownership adjustments, special uses, right-of-way acquisitions, and land line location. The primary method of landownership adjustment is exchange. The Forest administers over 200 special use permits (affecting 26,000 acres) primarily for utilities, communications, water, transportation, and agriculture. Right-of-way acquisitions are usually associated with timber sales. The Forest survey program consists of about 22 miles of line and 90 corners per year. At this rate the Resource Planning Act goal of completing all landline surveys by 2020 will not be met.

**Law Enforcement**—The Forest's major law enforcement problems are theft of firewood; cultural resource depredation; clandestine drug manufacturing; vandalism to and theft of property; and human-caused and arson fires. Law enforcement activities include prevention, protection, investigation, and cooperation.

**Minerals**—Cinders, aggregate, and decorative rock are the principal common variety minerals on Forest. Demand for road surfacing material will probably increase 10-20% by the next decade. Geothermal energy is the most actively sought leasable mineral on the Forest. In addition to geothermal interest, more than 300 applications have been filed for oil and gas leases; 68 are currently active. The primary locatable mineral commodities on the Forest are perlite, silver, copper, calcite, mercury, and various gemstones. As of 1985, 465 mining claims had been filed. The Forest has withdrawn more than 87,800 acres (5%) from mineral entry or leasing, primarily for Wilderness, administration sites, recreation sites, and special areas.

**Pests**—Effects of pests and diseases in an ecosystem are usually the result of a pest complex rather than the action of a single organism. The Integrated Pest Management approach to controlling pests emphasizes integrating prevention, surveillance, detection, evaluation, suppression and monitoring with resource management planning and decision. Primary pests on the Forest include root diseases, bark and engraver beetles, dwarf mistletoes, defoliators, rodents and noxious weeds.

**Range**—The range management program on the Forest is important to local and adjacent livestock industries. The Modoc provides 23% of the permitted livestock forage produced in the Region, and ranks first among 18 national forests in California. The Forest is divided into

84 grazing allotments and administers more than 119 term grazing permits. Current forage capacity is 149,000 animal unit months (AUMs). Of this capacity, 122,500 AUMs are obligated to livestock, 4,400 AUMs to wild horses, and the remaining 22,100 AUMs to wildlife. Rangelands provide forage and habitat for eight deer herds and five pronghorn herds.

Approximately 1.0 million acres (63%) is rangeland, of which 90% is suitable for grazing. Ecological condition is satisfactory if current range condition is good to excellent with static trend, or fair with static or upward trend. Ranges are in unsatisfactory ecological condition if current range conditions are poor or very poor with static or downward trend. Most of the Forest's permanent rangelands are in satisfactory ecological condition: 120,000 acres are in good to excellent range condition, while 462,000 acres are in fair range condition. About 342,000 acres are in unsatisfactory ecological condition; the amount of forage available on these areas is limited. Generally, less forage is produced from rangelands in unsatisfactory range condition. However, trend is generally static to upward.

Unsatisfactory ecological conditions have resulted from improper grazing practices, including overstocking livestock, wildlife, and wild horses; lack of uniform livestock distribution and forage utilization; and extensive encroachment by juniper stands due to history grazing practices and suppression of natural fires. All factors combine to reduce forage production on these sites.

In contrast to permanent rangeland, transitory rangeland provides forage for only a limited time following timber harvest. Livestock permittees depend on transitory range for 26% of the forage. That figure increases to 46% when one includes timberlands capable of producing less than 20 cubic feet per year.

**Recreation**—The Modoc is best known for its remote location and uncrowded recreation opportunities. In 1981, total recreation use on the Forest was 377,400 recreation visitor days (RVDs) and wildlife and fish user days (WFUDs), of which developed recreation accounts for less than 20%. Camping is the major developed recreation activity. The Forest provides a developed recreation capacity of 165,000 RVDs, but use is currently at 50%. Overall developed recreation use is projected to rise to 131,000 RVDs by 2010. Because popular sites now receive heavy use, they will exceed capacity in less than two decades.

Big game hunting and driving for pleasure are major dispersed recreation activities. Demand for most dispersed recreation activities can easily be met for the next



50 years, although some popular locations will experience overuse.

**Research Natural Areas**—The Forest's only designated research natural area (RNA) is the Devil's Garden RNA which consists of open stands of western juniper in association with brush and grasses on an expansive plateau littered with volcanic rock. The Forest nominated Raider Basin as a potential RNA. Approximately 25% of this 6,500-acre basin in the South Warner Wilderness is composed of pristine white fir forest.

**Riparian Areas**—Riparian areas cover almost 19,000 acres, primarily on the Warner Mountain Ranger District. Current Forest riparian areas are generally in satisfactory ecological condition. However, conditions have not improved beyond this level because of past logging and grazing practices. Riparian areas are vital for certain vegetation communities, water quality, fish and wildlife. About 275 terrestrial species and 195 birds depend on riparian habitat.

**Sensitive Plants**—Eleven sensitive plant species are known or suspected to grow on the Modoc. All potentially disturbing activities are subject to current management policy protecting sensitive plants. The current program is not controversial on this Forest, and management is working well.

**Soils**—Soils on this Forest are of volcanic origin, and over 100 soil types have been identified. A major goal for soil resource management is long-term maintenance of productivity and watershed protection. About 1,121,000 acres (67%) produce range and wildlife forage with an average annual yield of 327 pounds per acre. More than 492,000 acres (30%) produce more than 20 cubic feet of timber per year ranging from 20 to 165 cubic feet, depending on the soil type. Erosion, compaction, displacement, and cumulative watershed impacts are the primary factors which degrade soil productivity.

**Special Interest Areas**—The designated geologic special interest areas (SIAs) on the Modoc are the Burnt Lava Flow, the Medicine Lake Glass Flow, and the Glass Mountain Glass Flow. All are located within the Medicine Lake Highlands geomorphic province. Currently, the Forest has no designated cultural resource SIAs. However, seven cultural resource sites are listed in the National Register of Historic Places. When we implement the Forest Plan, we will evaluate those seven sites for designation. Eight additional areas of cultural resource value qualify for nomination to the Register.

**Timber**—Eastside pine, mixed conifer, red fir, and lodgepole pine comprise four major commercial conifer types found on 640,000 acres (40%) of the Forest. Significant features of the timber land base are: 1) two-thirds

is poorly stocked, 2) 10% is in plantations, and 3) two-thirds is 70-120 years old. Standing volume amounts to 4.5 billion board feet (800 M cubic feet), and growth averages 24 cubic feet per acre per year.

The 1975 Timber Management Plan classified 557,000 acres as commercial forest land with an annual programmed allowable harvest of 62 million board feet. Harvest practices under the timber management plan are based on even-aged management. Regeneration cuts (shelterwood and clearcutting methods), intermediate cuts, and overstory removal are used in the standard component. Selection cutting is used in other components. Incorrect overstory removal during the last decade has created many understocked stands in need of regeneration. Since 1984, when Forests were ordered to stop herbicide application, the Forest has relied only on mechanical site preparation.

Unique to Region 5, the Big Valley Federal Sustained-Yield Unit (BVFSYU) was established in 1950. In a sustained-yield unit, timber bidding is restricted to operators who manufacture lumber within a designated zone, in this case Adin, Bieber, and Lookout. The annual allowable sale quantity for the BVFSYU was 13.3 MMBF for 1975-1985.

During the past ten years, the Modoc has contributed 3% to the Regional average harvest. While the Forest does not significantly influence Regional demand, the Forest timber program notably affects the local economy. The sale of wood products generates employment and payments to counties. Of the timber harvested from the Forest 84% is processed in Modoc and Lassen counties. This volume is 34% of all timber processed in the two counties. Currently, the Forest supplies timber to about 12 mills. From 1976 to 1984, an annual average of 70 MMBF was harvested from Forest lands. Large fire salvage volumes from the late 1970's increased the annual average above the 1975 allowable sale quantity.

Because most of the available large old-growth trees will be cut in the next 30 years, mills must convert to small log manufacturing to sustain current harvest volumes on the Forest.

**Visual Resources**—Three types of landscape characterize the Forest. A distinctive landscape covers 9%, mostly in the Warner Mountains. A common landscape is scattered throughout the Forest on 38% of the land. The predominant landscape covering 58% of the Forest, primarily on the Devil's Garden Plateau, is minimal with little variation in size, texture, or color. A third of the Forest is managed for a Retention or Partial Retention visual quality objective (VQO), while the remainder is assigned a Modification or Maximum Modification

VQO. Activities causing visual disturbances include site conversions in geometric shapes, rock and cinder pits, road construction, and large-scale fire suppression. The overall visual quality of the landscape will continue to decline.

**Water**—Twenty watersheds on the Forest produce a cumulative annual yield of 565,800 acre-feet of water per year. Current demand for water exceeds the supply of natural surface runoff. Minimal increases in water yield are possible through vegetative manipulation; but they will be undetectable because yearly climatic variations will mask them.

Past logging practices, road construction, and past and present grazing have degraded water quality. Cumulative watershed impacts cause sedimentation and erosion within stream channels. Approximately 37% of the water produced on the Forest does not meet established water quality objectives. On the other hand, 63% exceeds water quality objectives for known beneficial uses.

**Wilderness and Roadless Areas**—Encompassing more than 70,000 acres of primitive land, the South Warner Wilderness contains rugged topography, expansive vistas, mountain meadows, and the highest peaks in northeastern California. Although the Wilderness is inventoried as providing a semi-primitive non-motorized (SPNM) experience because of its physical setting, the Forest manages the Wilderness to provide a primitive recreation experience wherever possible. Eighty-one miles of maintained trails provide access to most of the Wilderness. Visitor use in 1981 was 12,000 RVDs, of which 40% was local use. Recreation use is projected to increase over 60% by the year 2000.

After the 1978 Roadless Area Review and Evaluation, the Forest Service recommended five areas for incorporation into the Wilderness: Granger (400 acres), Jess (300 acres), Mill (670 acre), Parker (200 acres), and Pepperdine (370 acres) (Figure 3-32). On September 28, 1984, the California Wilderness Act (Public Law 98-425) added these areas (1,940 acres) to the South Warner Wilderness.

All other roadless areas were released from wilderness consideration for this planning period (Appendix E). No other wilderness planning areas exist on the Forest.

**Wildlife and Fish**—The Forest supports 354 species of wildlife which live in a wide variety of habitats. These include six Threatened and Endangered species (bald eagle, peregrine falcon, and Modoc sucker, Lost River and shortnose suckers, and northern spotted owl) and four Sensitive species (goshawk, willow flycatcher, California bighorn sheep and pine marten. In addition to these ten, the Forest selected 20 other management indi-

cator species to represent various special habitats including early and late seral stages, snags, dead and down wood, hardwoods, wetlands, and meadows and riparian areas.

The Forest is characterized by several unique wildlife situations. Northeastern California provides habitat for approximately half of all the bald eagles wintering in the State. The Modoc sucker is currently found in only six creeks, all located on the Forest. California bighorn sheep have made a dramatic recovery in the Warner Mountains since several were reintroduced to that historic range in 1980. Waterfowl use the Modoc Plateau during migration from Alaska and Canada to Mexico. It is the largest concentration point for waterfowl in North America. The Forest supports eight mule deer herds and five pronghorn herds. Both species are popular big game animals.

Special habitats on the Forest include black oak woodlands, dead and down wood, snags, and wetlands. Black oaks provide nesting cavities for various birds and mammals, particularly the western gray squirrel on this Forest. Wildlife species dependent on dead and down material for habitat include marten, pileated woodpeckers, blue grouse, and quail. Nearly 55 species of birds and mammals depend on snags for roosting, nesting, and feeding. Approximately 60% of the Forest land suitable for managing snags is currently snag deficient. Currently 233 wetlands cover 35,000 acres of the Forest. They provide important resting and holding areas for migrating waterfowl and shorebirds, habitat for largemouth bass and rainbow trout, and forage for domestic livestock and wildlife.

Demand for wildlife and fish is determined by commercial, ecological, and social or recreational uses. Furbearing animals are the only wildlife on the Forest with commercial value. Demand for them is expected to continue. The Forest applies minimum management requirements to meet the minimum level of demand. Projections indicate an overall 60% increase in participation in hunting, fishing and nonconsumptive use during the next 50 years.

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## Chapter 4. Environmental Consequences

A combination of theme, resource program direction, and land allocation to management prescriptions produces different resource outputs and uses in each alternative. The consequences of each alternative fall within limits determined by a common set of management requirements and practices. Mitigating and coordinating

measures are applied to all alternatives to protect the physical and biological environment and provide social and economic benefits. All alternatives maintain or improve the long-term productivity of the land while producing outputs, goods, and services.

The following narrative summarizes key environmental consequences which are expected from the six alternatives considered in detail. Chapter 4 is the basis for this summary. Table 1 summarizes the treatment of issues and concerns by alternative.

### **Economics**

PNV, employment, and income are highly correlated to timber yields and the Forest budget. In general, the higher the timber yields and budget, the higher the PNV, employment and income.

PNV is highest under IND, moderate under PRF, CUR and RPD, and low under RBU and AMN. Income and employment are highest under RPD and lowest under RBU. The greatest percentage of eastside pine in the allowable sale quantity is provided under PRF and IND; virtually none is provided under RBU and CUR. RPD provides the highest Forest budget and RBU provides the lowest.

### **Social**

PRF benefits the most groups, except for ranchers and farmers who have less grazing available for their livestock. RPD benefits most groups, except for retirees, second home owners and Native American traditionalists who do not always favor increased outputs and activities. Overall, RBU and AMN most negatively impact social groups. RBU and AMN do not benefit groups dependent on the Forest for goods and services. Ranchers and farmers, timber industry workers, retail and service personnel, local, State, and federal employees, and non-traditional Native Americans probably will not prefer these alternatives. On the other hand, many retirees, second home owners, recreationists, and Native American traditionalists find RBU and AMN compatible with their lifestyles, attitudes, beliefs, and values.

### **Air Quality**

RPD and IND have the highest potential for impairing air quality because of wildfires and number of acres to which prescription burning is applied; AMN has the lowest potential. Considering road construction and reconstruction, RPD, PRF, IND and AMN have the greatest potential for air quality impairment; RBU and CUR have the least potential.

### **Cultural Resources**

All alternatives meet legal requirements. RBU alternative provides the lowest level cultural resource program of Native American consultation, inventory and evaluation on a project-needs basis. IND, CUR and PRF alternatives are similar to RBU and offer a low level of interpretive services. The cultural resource program and public benefit from interpretive services, such as signing significant cultural resource sites, and simple brochures and displays at Forest Service offices and the County Museum. Under the RPD alternative, the cultural resource program, Native American consultation, and interpretive possibilities dramatically increase. The AMN alternative would also dramatically increase the cultural resource program in those areas, but would allow more interpretive services by developing cultural resource sites for public education and enjoyment.

### **Diversity**

A minimum of 5% will be maintained in each seral stage in eastside pine, mixed conifer, white fir, red fir and lodgepole pine on lands capable of producing  $\geq 20$  cubic feet of timber per acre per year.

An objective to provide a minimum of 5% old growth for each conifer type in each management area was set in all alternatives except AMN. The objective was 10% old growth in mixed conifer and red fir in the AMN alternative. Under PRF, CUR, RPD, RBU and IND, closed-canopied old growth declines Forestwide from 12% in the 1st decade to 5-9% in the 5th decade. The AMN alternative produces less timber volume and requires fewer acres of harvest. Old growth is reduced under AMN to 11% by the 5th decade. Diversity of non-timbered types will be maintained at current levels for all alternatives.

### **Facilities**

Under PRF, RPD, and IND, less road construction and reconstruction for timber activities occur than in the base year. However, new construction for accessing range and recreation sites increases total road construction above the base year. Because existing temporary roads are added to the inventoried road system for management and maintenance purposes, and fewer roads are obliterated than added, road maintenance mileage increases over time.

Under CUR and RBU, road construction and reconstruction are below base year levels. Transportation planning primarily involves timber management activities. In the 5th decade under CUR, road maintenance miles are greater than base year level because more miles are added to the system than obliterated. Conversely, in the

same decade under RBU, road maintenance miles are fewer than base year level because fewer miles are constructed than obliterated. Road closures and obliteration increase.

Under AMN, road construction and reconstruction for timber activities are considerably less than in the base year. However, new construction access for recreation use increases total road construction to slightly above the base year. Because more miles are added to the system than obliterated, road maintenance miles increase over time and are higher than base year levels by the 5th decade.

### Fire and Fuels

Under PRF, RPD, IND, and AMN, the fire management budget is equal to the base year's budget; emphasis is on suppression. Under CUR and RBU, the budget is 20% lower than the base year; prevention is emphasized. By the 5th decade the funding level increases to the current level because of increased acres in plantations. Average annual acres burned are essentially the same under all alternatives.

As a result of timber harvesting, the number of acres receiving fuels treatments (both burning and non-burning methods) is highest under RPD and IND in the 1st decade. By the 5th decade fuel treatment acres are highest under RPD, PRF, IND, and AMN, with the latter three alternatives treating essentially the same number. The lowest number of fuel acres are treated under RBU in the 1st and 5th decades.

### Range

In the 1st decade under all alternatives except RPD and IND, livestock AUMs are estimated to decrease from the base level of 122.5 M AUMs. Decreases range from 2% in CUR to 21% in AMN. The estimated decrease from base level is attributable to increased forage available for deer. AUMs are estimated to increase by 12% under IND and remain at base year level in RPD.

By the 5th decade AUMs are estimated to decrease in all alternatives (31% in PRF to 43% in RBU), except under RPD which shows a negligible increase. Loss of transitory range and increased deer forage availability accounts for the estimated decrease in livestock AUMs from the 1st to the 5th decades.

Acres of nonstructural improvements vary widely throughout all alternatives, from no acres (RBU) to 191,400 acres (RPD). Similarly, acres of seedings range from no acres to 29,350 acres in the same alternatives. Unsatisfactory ecological condition improves under all alternatives.

### Recreation

*Developed:* Developed recreation has a very low emphasis in RBU, a high emphasis in AMN, and a moderate emphasis in all other alternatives. In RBU new sites are not constructed, existing sites are neither rehabilitated nor fully maintained, and eventually many sites are closed. Demand is not met. In AMN, new opportunities enhance the experience of visitors. Sites are expanded or constructed before serious crowding occurs, and they are well maintained. Interpretive services are emphasized. All other alternatives meet demand through expansion when needed, and provide adequate maintenance and additional interpretive services. The decision to expand is made on a case-by-case basis. Sites may be expanded as early as the 1st decade if an existing site's capacity is reached and additional use cannot be directed to less popular sites. If a popular dispersed recreation site is damaged from overuse, it may be converted to a developed site.

*Dispersed:* Dispersed recreation has a very low emphasis in RBU, a low emphasis in IND, a moderate emphasis in RPD, CUR, and PRF, and a high emphasis in AMN. RBU does not include semi-primitive non-motorized (SPNM) management except in special interest areas and the research natural area. Semi-primitive motorized (SPM) is managed on 380,000 acres. Some trails are abandoned while the rest are minimally maintained. IND also does not include SPNM management, but adds 82 miles of new trails, and provides adequate maintenance. RPD, CUR, and PRF include 78,000 acres of SPNM, 370,000 acres of SPM, add 131 miles of trails, and provide adequate maintenance. AMN includes 198,000 acres of SPNM, 440,000 acres of SPM, adds 375 miles of new trails, and provides adequate trail maintenance. The AMN alternative emphasizes interpretation of the environment, which enhances many dispersed recreation activities. Ninety-one percent of the Forest remains open to OHVs in RBU and IND; 87% in CUR, RPD, and PRF; and 70% in AMN. To compensate for loss of OHV opportunities in the AMN alternative, 125 miles of OHV trails are managed.

### Sensitive Plants

Potential for harm to sensitive plants is low. Under all alternatives, surveys are conducted prior to all land-disturbing activities. Consequently, the chances of disturbing unknown populations of sensitive plants are reduced. A low probability of unintentional disturbance exists with any land-disturbing activity; but alternatives with much land disturbance have higher probabilities of adversely affecting sensitive plants. RPD alternative has the highest probability of disturbance. Risk of disturbance is low in

PRF, CUR, and IND alternatives, and lowest in RBU and AMN alternatives.

### Soils

The potential for erosion and sedimentation is greatest under RPD and IND, and least under RBU and CUR. AMN and PRF have only a slightly higher potential for erosion and sedimentation than CUR. The soil erosion and sedimentation index is explained in Chapter 4, Section 18.

Although RPD, IND, PRF and AMN result in more soil disturbing activities, soil erosion and sedimentation are checked because mitigating projects are planned and implemented.

Under all alternatives, soil and water projects are implemented to improve deteriorated watersheds. Over five decades these projects improve 10,200 acres under IND and RPD; 3950 acres under RBU; 4,200 acres under CUR; 7,400 acres under AMN; and 7,450 acres under PRF. In addition, other degraded watershed acres improve naturally over the next two decades primarily because livestock grazing practices are improved. The most rapid improvement is realized under AMN, followed (in descending order) by PRF, RBU, IND, RPA and CUR.

### Timber

RPD yields the highest allowable sale quantity with 75 MMBF per year in the 1st decade, 33% above the base level of 50.4 MMBF. In the 2nd decade, volume decreases to 50 MMBF per year under this alternative and climbs to 59 MMBF per year in the 5th decade. AMN yields the lowest volume at 31.8 MMBF per year. All alternatives except PRF, RBU and AMN provide a sustained yield of 11 MMBF in the Big Valley Federal Sustained-Yield Unit. In the 1st decade, RBU and AMN schedule 8.5 and 5.7 MMBF per year, respectively. PRF schedules 9 MMBF in the 1st decade; by the 5th decade 11 MMBF is reached.

Acres available for timber production range from 406,000 under RBU to 562,500 in IND. The difference is attributable to acreages allocated to Semi-primitive Non-motorized and Minimum Management Level prescriptions which support the retention of late seral stages, but do not provide for timber production. Other acres have visual retention requirements which also reduce timber production.

Except for RBU, all alternatives harvest from <20 lands under low intensity management. Regulated volume from riparian areas, visual retention areas, and lands producing <20 cubic feet of timber are highest under

AMN; moderate under RPD, PRF, IND and CUR; and lowest under RBU.

In the 1st decade, reforested acres range from 45,000 under RPD to 21,000 under AMN and RBU. RBU provides most of the regeneration harvest in existing poorly-stocked stands in the 1st decade. Other alternatives reforest more well-stocked stands.

Acres regenerated under the Timber-Forage prescription in the 1st decade range from a high of 2,200 acres per year in RPD to a low of 250 acres per year under CUR and IND and zero under AMN. Acres regenerated under the Even-Aged Timber prescription in the 1st decade range from a high of 3,520 acres per year in IND to a low of 120 acres in RBU.

### Visual Quality

The existing Inventoried Visual Quality Objectives (Appendix Q) can be used as a standard for comparing alternatives. It emphasizes retaining scenic values in areas of high scenic priority while allowing for visual changes in the landscape where scenic priorities are lower. The AMN alternative emphasizes retaining scenic values above IVQOs and also has the most semi-primitive designations to protect the landscape. PRF, CUR, and RPD are similar to the IVQOs, except slightly more change is allowed in landscapes where scenic priorities are low. RBU and IND reduce visual quality below IVQOs. Although less scenic values are retained, all distinctive scenery adjacent to major travel routes is protected.

### Water and Riparian Areas

Alternatives do not differ significantly in effects on water yield. Water quality and riparian areas improve under all alternatives. The AMN and RBU alternatives are the least land disturbing, meeting 100% of State water quality objectives by the 3rd decade. Riparian areas also recover from past land disturbing activities by the 3rd decade under these alternatives.

Under PRF and CUR, 100% of State water quality objectives are met and riparian areas recover by the 4th decade. The RPD alternative meets State water quality objectives and riparian areas recover by the 5th decade. The IND alternative, the most land disturbing, does not meet State water quality objectives by the 5th decade. Furthermore, riparian areas do not fully recover by the 5th decade under this alternative.

Under all alternatives, projects are implemented to improve deteriorated watersheds. Over five decades, these projects improve 10,200 acres under IND and

RPD; 3,950 acres under RBU; 4,200 acres under CUR; 7,400 acres under AMN, and 7,450 acres under PRF.

### Wilderness and Roadless Areas

RBU provides for little maintenance of trails and few contacts with users to achieve compliance with Wilderness regulations. All other alternatives provide adequate maintenance and visitor contacts. RBU and IND do not protect views from the Wilderness of adjacent Forest lands. CUR, RPD, and PRF protect views adjacent to the boundary, while AMN extends this protection further. Because RBU and IND do not provide SPNM areas outside the Wilderness, the quality of primitive recreation decreases over time within the Wilderness.

Under RBU's low standard management, concentrated use at popular locations causes resource damage. With standard management, IND improves primitive experiences for the short-term, but eventually use increases and concentration of visitors occurs. RPD, CUR, and PRF maintain present primitive values longer than IND, because SPNM areas are managed outside the Wilderness. Consequently, pressure on Wilderness for a primitive experience is alleviated. The wilderness setting is also maintained by providing additional visual resource protection outside the Wilderness, adjacent to the boundary. The AMN alternative enhances the wilderness setting and provides a higher quality primitive experience than that currently available. The Wilderness appears more natural without livestock grazing. Because other SPNM areas are available on the Forest, visitors are widely dispersed.

### Wildlife and Fish

Under all alternatives, threatened and endangered species (bald eagle, peregrine falcon, northern spotted owl, Modoc sucker, Lost River sucker, and shortnosed sucker) meet current and future recovery plan objectives. Current and potential habitat is maintained or improved.

All alternatives increase snag densities. Under PRF, IND and AMN, snag densities in eastside pine increase to 1.1 snags per acre by the 5th decade. Under these alternatives, snags are created (and replacement snags designated) as areas are harvested. Under CUR, RPD and RBU, snags are created throughout eastside pine. Snag densities in eastside pine reach 1.5 snags per acre by the 3rd decade.

All alternatives implement watershed and fish habitat improvements and the Riparian Area prescription, which improves fisheries above current conditions. Major differences in alternatives are the rapidity with which changes occur.

Habitat in streams is improved through changes in grazing management and structural improvements. Riparian habitat improvement objectives are achieved under AMN by the 1st decade, under RBU by the 3rd, under PRF and CUR by the 4th, and under RPD and IND by the 5th.

PRF provides for deer habitat and forage at moderate but stable levels, and meets State Deer Herd Plan goals for the Forest. Old-growth habitat decreases from current levels, but selected areas are specifically managed for old-growth-dependent species, such as pileated woodpeckers and marten. Bighorn sheep are reintroduced and managed according to the *California Mountain Sheep Recovery Guidelines for Northeastern California* for viable populations levels. All wetland areas suitable for development are constructed and maintained. Moderate levels of habitat improvement for upland and nongame are initiated.

CUR provides for wildlife species habitat at a lower level than PRF. Slightly less deer habitat and forage are provided under CUR, except during the 2nd and 3rd decades. Wetlands development is lower, but other habitat improvement is similar to PRF. Old-growth habitat is managed above minimum levels. Bighorn sheep and goshawks are managed at minimum levels.

Habitat provided under IND and RPD are similar. Deer populations are high, while old-growth habitat is at the lowest level of all alternatives. Wetland development under IND and CUR is similar, while RPD emphasizes development of all wetlands. Habitat for other species is managed at minimum levels.

AMN and RBU also have a common emphasis. Deer habitat is provided at relatively high levels due to reductions in livestock AUMs. AMN maintains more old growth than all other alternatives by the 5th decade. Under AMN, bighorn are reintroduced into all suitable habitat in the Warner Mountains, and populations are three times higher than other alternatives. Goshawk habitat is maintained above minimum levels and habitat is improved for upland and nongame species. All wetlands are developed under AMN, but only wetlands needed for bald eagles are developed under RBU.

Riparian-dependent species, including sandhill cranes, willow flycatchers, yellow warblers, and red-breasted and red-naped sapsuckers, are protected by the Riparian Area Management Prescription in all alternatives. Other MIS are protected under all alternatives by applying specific Forest-wide Standards and Guidelines as well as standards and guidelines in management prescriptions.









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# CHAPTER 1

## Purpose and Need

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### A. Introduction

This Final Environmental Impact Statement (FEIS) explains the proposed and alternative courses of action for the management of land and resources of the Modoc National Forest. It also describes the affected environment and the environmental consequences of the proposed action and the alternatives.

### B. Purpose and Nature of the Action

In the mid-1970's, Congress passed two laws addressing the need for coordinated and long-range planning of the uses and resources provided by national forests. The Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA), and the National Forest Management Act of 1976 (NFMA), amending RPA, require Forests to replace the separate and often uncoordinated resource management plans with comprehensive, long-range Forest plans.

Prior to developing a complete Forest Plan, additional legislation required Forests, to investigate and make public:

- alternative approaches which could be used in developing the Plan;
- the environment to be affected by the Plan; and
- anticipated environmental consequences of the alternatives.

These are the major subjects in this Final Environmental Impact Statement (FEIS), as required by the National Environmental Policy Act (NEPA), and the Council on Environmental Quality (CEQ) regulations.

The format established in 40 CFR 1502.10 of the CEQ regulations is followed in this FEIS.

From the alternatives described in the FEIS for managing Forest land and resources, one was selected as the preferred alternative and has been developed into the proposed Modoc National Forest Plan. Published separately from this FEIS as a companion document, the Forest Plan:

- will guide management of the Forest for ten to fifteen years;
- includes long-range objectives;

- outlines the combination of management activities for which the land is best suited;
- provides for multiple use and sustained yield of goods and services from the Modoc National Forest in a way that maximizes long-term net public benefits in an environmentally sound manner;
- responds to major issues, management concerns, and resource opportunities;
- will be revised at least every 15 years or whenever conditions or demands have significantly changed;
- will be reviewed every five years to determine the need for more frequent revision; and
- when approved, will supersede the current direction contained in most individual plans being used to manage the Forest.

All existing resource management plans were re-examined by the Forest's interdisciplinary planning team. Plans deemed consistent with, and still appropriate for, the Forest Plan are incorporated by reference. These include:

- Wild Horse Management Plan
- Modoc Sucker Recovery Action Plan
- Transportation Plan
- Road Obliteration Plan
- Deer Herd Plans - Warner Mountain, McCloud Flat (Glass Mountain), Interstate
- Three Sisters Bald Eagle Winter Roost Management Plan
- Mt. Dome Bald Eagle Winter Roost Management Plan

Other plans are incorporated by reference and amended:

- Range Allotment Plans
- Triangle Lands Development & Management Plan

The Big Valley Federal Sustained-Yield Unit (BVFSYU) policy statement and allowable sale quantity is also incorporated by reference and amended. The BVFSYU was established under the authority of the Sustained Yield Forest Management Act of 1944, by a

Declaration of the Chief of the Forest Service on January 27, 1950. The most recent policy statement concerning the BVFSYU prior to the DEIS and Plan was approved by the Chief on August 24, 1979. The periodic review of the BVFSYU, required by Forest Service Manual 2430, was included as part of the current planning effort. The review includes examining the level of harvest within the Unit, operating policies, and the need for the Unit.

With the issuance of this Final EIS and Forest Plan, implemented by the Record of Decision, all other existing resource management plans are superseded. These are:

- Ranger District Multiple Use Plans:
  - Big Valley Ranger District
  - Devil's Garden Ranger District
  - Doublehead Ranger District
  - Warner Mountain Ranger District
- Medicine Lake Unit Land Management Plan
- Timber Management Plan & Five-Year Action Plan
- Land Adjustment Plan
- South Warner Wilderness Interim Management Plan
- Off-highway Vehicle Plan
- Wetlands Development Plan 1979-84
- Geologic Special Interest Areas Interim Plan
- Fire Pre-Attack Plans

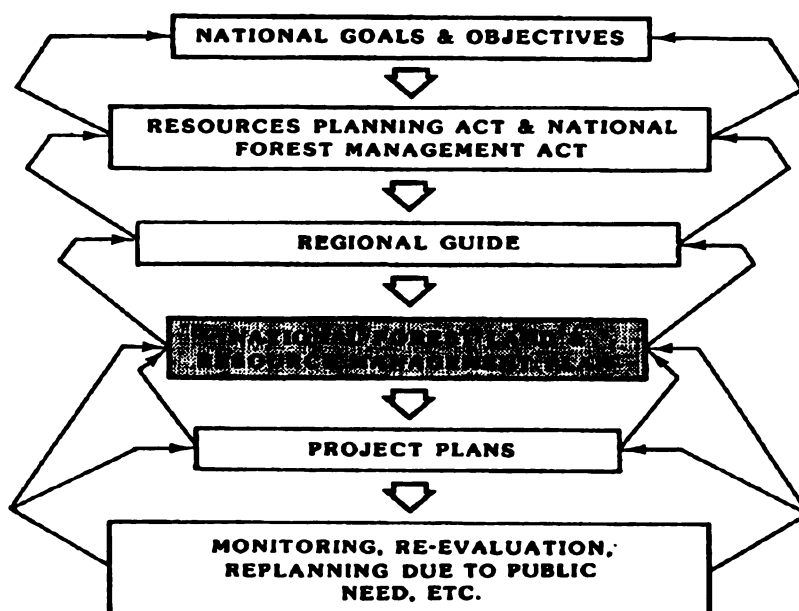
- Big Sage Fire Management Plan
- Fisheries Habitat Management Plan
- Deer Herd Habitat Management Plan
- Pronghorn Antelope Habitat Management Plan

As soon as practicable after approval of the Forest Plan, all permits, contracts, and other instruments for the use and occupancy of National Forest System lands must conform with the Forest Plan (16 USC 1604(i)). In addition, all subsequent activities affecting the Forest, including budget proposals, will comply with the Forest Plan (36 CFR 219.10(e)). Full accomplishment of the Forest's activities and outputs will depend on actual budget and personnel allocations during the life of the Plan.

### C. Planning Process

Forest Plans are only part of the Forest Service planning framework. Based on information from the Regions, the National RPA Recommended Program establishes direction and assigns targets to the Regions for producing goods and services. Providing direction, each Region delegates its share of the national production levels to its forests. Each Forest Plan validates or provides a basis for changing the production levels assigned by the Region (Figure 1 - 1.).

**Figure 1 - 1. Hierarchy Of Land Management Planning in the National Forest System**



Through local activities and projects, Forest managers carry out the direction developed in the Forest Plan. They can use all of the information in the Plan and the DEIS as a basis for local project environmental analyses. This process of *tying to* the broader documents and incorporating the Plan and DEIS by reference permits concentration on issues specific to subsequent smaller projects. Similarly, the Forest Plan is tied to the Pacific Southwest Regional guide (previously called the Regional Plan), which is tied to the National RPA Program.

The Forest planning process, as specified in the National Forest Management Act, is an interdisciplinary approach which, with public participation, gives full consideration to economic, environmental, and social impacts. It includes the following steps:

- 1) Identifying issues, concerns, and opportunities.
- 2) Developing planning criteria.
- 3) Collecting data and information.
- 4) Analyzing the management situation.
- 5) Formulating alternatives.
- 6) Estimating effects of alternatives.
- 7) Evaluating alternatives.
- 8) Selecting the preferred alternative (or proposed action).
- 9) Implementing the Plan.
- 10) Monitoring and evaluating the Plan.

This FEIS presents the results of planning actions one through seven and identifies the preferred alternative (proposed action) which formed the basis for the proposed Forest Plan. Public comments on the DEIS and the proposed Plan were used to develop the Final Environmental Impact Statement and selected Forest Plan. The Regional Forester's selection of a final Forest Plan is documented in a Record of Decision which is enclosed with this document.

The public may also review the planning records (files containing details of the planning process) at the Forest Supervisor's Office, Modoc National Forest, 441 N. Main Street, Alturas, CA 96101. These records are referenced throughout the FEIS and Forest Plan at appropriate points.

## D. Organization of this Environmental Document

The remainder of this chapter describes the Forest location and jurisdictions and the public issues and management concerns that guided the planning process.

Chapter 2 describes the alternative formulation process, outlines alternatives, and compares them in terms of land uses, outputs, present net value, environmental consequences, and public issues and management concerns.

Chapters 3 and 4 analyze in more detail the Affected Environment and the Environmental Consequences of the alternatives discussed in the previous chapter.

A glossary is included after Chapter 4.

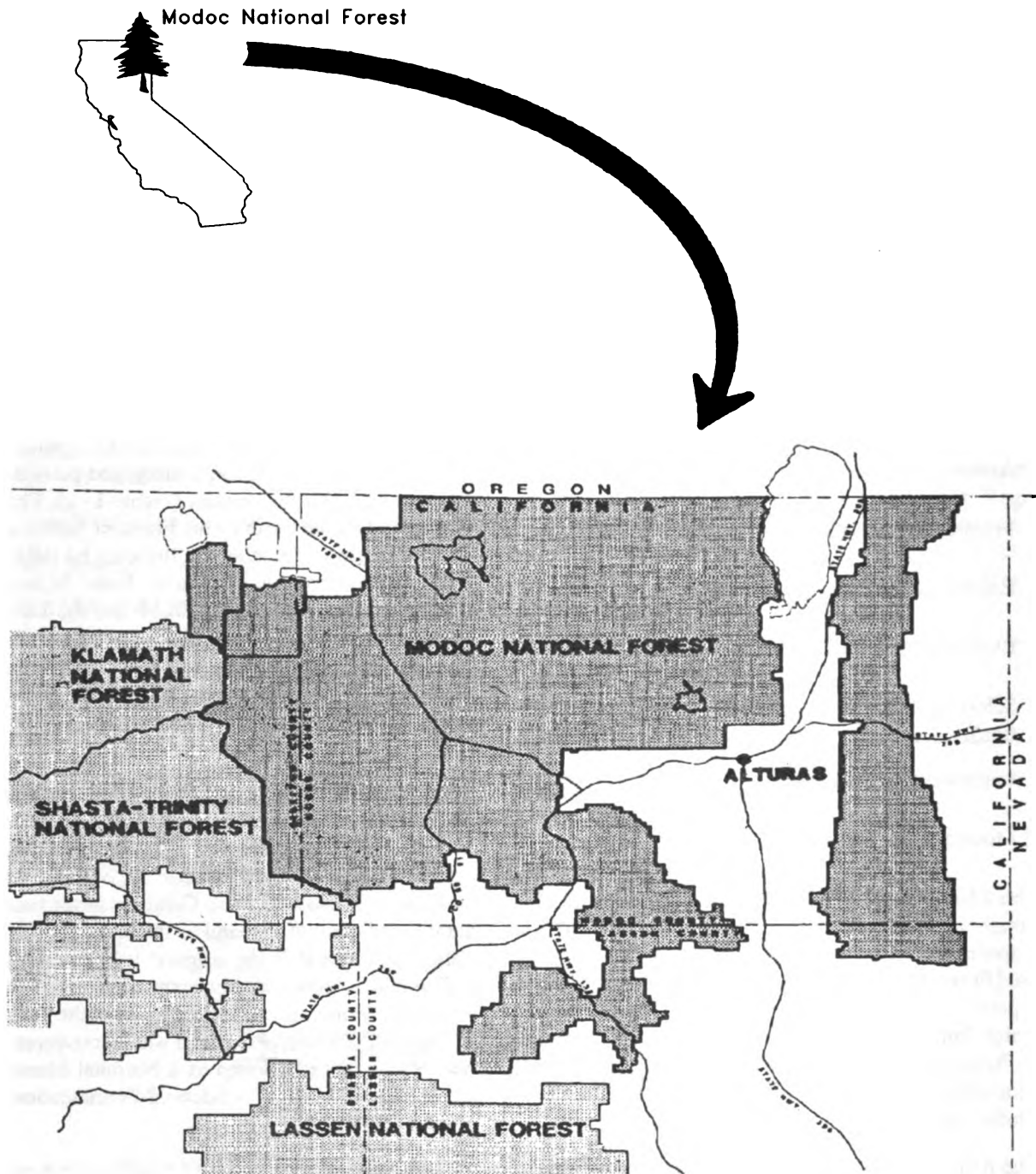
## E. Forest Vicinity

The Modoc National Forest is situated in the extreme northeastern portion of California. Encompassing 1,979,407 acres (including 325,015 acres of private land), it lies mainly within Modoc County, and partially within Lassen and Siskiyou Counties (Figure 1 - 2). The Forest is bounded on the north by the Fremont National Forest and the State of Oregon; on the east by public lands administered by the Bureau of Land Management (BLM); on the south by the BLM and the Lassen National Forest on the west by the Shasta-Trinity and Klamath National Forests; and by private lands on all sides. State Highways 139 and 299, and U.S. Highway 395 are the major travel routes providing access to the Forest.

The Lava Beds National Monument, encompassing 46,238 acres, is located in the northwestern portion of the Forest. The Monument was established in 1925, and administration was transferred to the National Park Service (NPS) in 1933. Because Congress never transferred total jurisdiction of the land to the NPS, the dual reservation established in the original 1925 proclamation is still in effect. However, management direction for lands within the Monument will not be a part of the Forest Plan, because "... any use of the land which interferes with its preservation or protection as a National Monument is hereby forbidden." (Presidential Proclamation of November 21, 1925).

The Forest has a net area of 1.6 million acres which the Plan addresses. For management purposes, the Forest is divided into four Ranger Districts: Warner Mountain to the east (Cedarville), Big Valley to the south (Adin), Devil's Garden to the north (Canby), and Doublehead to the northwest (Tulelake).

**Figure 1 - 2. Modoc National Forest Vicinity Map**



## F. Scope of the Issues to be Addressed

Scoping is the procedure by which the Forest Service determines the extent of analysis necessary for an informed decision on a proposed action. Through scoping the Forest solicited from all interested parties the issues, concerns and opportunities (ICOs) related to the proposed action affecting land and resource management. As a group, ICOs indicate the scope and nature of the analysis needed for the FEIS. They are collectively referred to as issues in this FEIS. The issues represent important reasons for considering changes in current management direction. They are the blueprints for structuring alternatives, and aid in understanding the consequences of implementing any of the alternatives.

In November 1979, a preliminary list of issues was presented at a public meeting at which 26 people attended. The list was sent for comment to local governments, Indian tribal leaders within surrounding counties, adjacent landowners, and individuals and organizations on the Forest mailing list. Using a screening process, the Interdisciplinary (ID) Team extracted issues from the responses which were addressed during the Forest planning process. The scoping and screening processes are explained in more detail in Appendix A.

In January 1981, the Forest and the Alturas Resource Area of the Bureau of Land Management (which was conducting a similar planning process) jointly released a list of Forest- and Area-wide issues for public review to almost 700 agencies, individuals, and organizations. The issues were slightly modified as a result of public comments. In April 1982, BLM issues were dropped from the Forest-wide set of issues because the local agency had accelerated its planning process.

The final set of Forest issues was approved by the Regional Forester in November 1983, and are listed below.

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### Issues, Concerns and Opportunities Identification Process

The first formal public involvement effort began with the filing of a Notice of Intent in the Federal Register, October 10, 1979. To initiate the planning process, a preliminary list of issues and criteria was presented at a public meeting in Alturas, California, on November 15, 1979; 26 people attended.

The following received the list and were invited to identify issues to be addressed in the Forest Plan:

- Local governments
- Indian tribal leaders within Modoc, Siskiyou, Lassen Counties in California, and Lake and Klamath Counties in Oregon
- Adjacent landowners
- Individuals and organizations on the Forest mailing list

Thirty-eight respondents proposed additional issues, identified public demands, and suggested conflict resolutions.

In winter of 1980, the Forest and the Alturas Resource Area of the Susanville District of the Bureau of Land Management (BLM) developed a uniform firewood policy. On March 17 - 24, 1980, four workshops were held; 105 local residents attended one or more sessions. Numerous issues surfaced. Some were resolved by the policy; the remaining were added to the Forest issues for resolution in the Forest Plan.

The Interdisciplinary (ID) Team applied screening criteria to potential issues extracted from the public responses. Issues passing the screening criteria were addressed during the Forest planning process. The screening criteria are listed below:

- 1) The issue can be resolved with existing Forest Supervisor authority.
- 2) The issue affects or is affected by Forest Service activities.
- 3) The issue cannot be readily resolved by other parties.
- 4) The issue cannot be best resolved through other Forest Service programs and actions.
- 5) Within the ten-year life of the Plan, *no action* will result in irreversible effects.
- 6) State-of-the-art knowledge and technology allows for complete or substantial resolution of this issue and/or a positive course of action for full resolution.

In January 1981, the Forest and Alturas Resource Area of the BLM (which was conducting in a similar planning process) jointly released a list of Forest- and Area-wide issues for public review. Almost 700 agencies, individuals, and organizations on Forest and BLM mailing lists were invited to review the issues in depth and check for omissions. The issues were slightly modified as a result of public comments. In April 1982, BLM issues were dropped from the Forest-wide set of issues because the Alturas Resource Area had accelerated its planning process.

Notice of a public hearing on the Big Valley Federal Sustained-Yield Unit was filed in the May 28, 1982 issue of the Federal Register, and subsequent legal notices were published in local newspapers. Nineteen of 100 people attending the Adin hearing on June 24 testified. The Forest received fourteen letters and one petition with 106 signatures during the formal public comment period. All comments were analyzed in the manner previously described.

The final set of Forest issues, as approved by the Regional Forester in November 1983, appears in Chapter 1 of this document. The planning records contain all public comments, hearing documents, and additional data on the process used to summarize public responses.

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### Consultation With Others

In addition to the formal scoping activities, various agencies, Indian tribes, local officials and others were contacted individually by members of the I.D. Team and the Forest Management Staff.

The following were contacted by personal letters or telephone to explain the Forest planning process and invite comment on the issues:

Susanville District, Bureau of Land Management  
US Fish and Wildlife Service  
Lava Beds National Monument  
Modoc Refuge  
Soil Conservation Service  
CA Dept of Forestry  
Modoc Co. Board of Supervisors  
Siskiyou Co. Board of Supervisors  
Klamath Co. Board of Commissioners  
Pit River Tribal Council  
Modoc Co. Chamber of Commerce  
Modoc Co. Road Dept  
Canby 4WD  
Modoc Co. Farm Bureau  
Jefferson Assoc.  
Modoc Co. Cattlemen's Assn  
Modoc Co. Ski Club  
Modoc Co. Gem and Minerals Society  
Modoc Larger Parish (Blue Lake Camp)  
Sierra Pacific Industries  
Surprise Valley Lumber  
NorCalNeva RCD  
CA Dept of Fish & Game  
CA Dept Water Resources  
Lassen Co. Board of Supervisors  
Lake Co. Board of Supervisors  
Lake Co. Board of Commissioners  
Pit River Home and Ag. Coop Assn  
Modoc Co. Ag Commission  
Calandor Pine Corp.  
Edgerton Lumber  
Modoc Co. Garden Club  
Main Industries  
Modoc Co. Historical Society  
Modoc Co. Sportsmen  
Modoc Grazing Advisory Board  
Pacific Power & Light  
Surprise Valley Electric  
Modoc Co. Senior Citizens

In addition, other consultation activities occurred.

BLM, Alturas Resource Area of the Susanville District

*- frequent meetings and telephone contacts between 1980 and 1983 to insure close coordination throughout the planning process.*

California Fish and Game

*- frequent meetings to share information and data on habitat areas, forage production etc.*

Tribal communities consisting of the Ft. Bidwell Indian Community, Pit River Home & Ag Coop Association, Klamath Tribal Council, Pit River Tribal Council

*- letters and telephone contacts between January and March 1984 to seek comments on the document "Cultural Resource Overview: Modoc National Forest," which addresses the Forest cultural resources planning issues. No concern was expressed.*

Northern California County Supervisors Association (NCCSA) consisting of county representatives from nine northern counties

*- meeting June 1981 to provide status information the the Northeastern California Forest plans.*

Northeast Zone Forests consisting of the Lassen, Plumas, Mendocino, Modoc National Forests

*- frequent meetings and telephone contacts between March 1981 and 1984 to provide a consistent approach in dealing with prescriptions, standards and guidelines, etc.*

U.S. Air Force

*- several meetings and telephone contacts between January 1983 and 1985 to discuss the location and impacts on the installation of the Over the Horizon-Backscatter Radar System (OTH-B).*

U.S. Fish and Wildlife Service

*- briefing on the planning process and discussion of issues that would be addressed. At their request, we did not initiate formal consultation with the USFWS. They felt that consultation on programmatic documents such as the EIS and Plan was not appropriate.*

Western Timber Association (WTA)

*- meeting October 1982 to provide an overview of planning process and timber data; meeting April 1983 to review FORPLAN, benchmarks and initial alternatives; field trip to the Long Bell area to discuss sivicultural options on low-yield timber sites.*



## **Mother Lode Chapter, Sierra Club**

*– informal meetings February 1982 and May 1984 to discuss monitoring, juniper management, and Roadless Area Review and Evaluation (RARE) areas.*

## **Fremont National Forest**

*– meeting April 1984 with both planning staff organizations to share similarities and differences in approaches, followed by numerous telephone contacts between resource specialists.*

Initiated with a Notice of Intent to reevaluate roadless areas, the Forest held an open house daily between July 25 and August 12, 1983, in Alturas to discuss and gather information about roadless areas; three people signed the register. A newsletter was mailed to 366 individuals, agencies, and organizations on the Forest mailing list to invite comment; eight letters were received. Issues were extracted and analyzed. Information supplied by individuals was incorporated into the Forest data base.

The Forest released the Draft Environmental Impact Statement (DEIS) and proposed Forest Plan to the public for review on November 2, 1987. We distributed 740 copies of the documents to agencies, organizations and publics on our mailing list. Copies were also available at public libraries. During the 120-day comment period, which ended March 7, 1988, we conducted or participated in 43 public meetings. Forest officials contacted the following to explain the planning process and invite comment on the documents:

Modoc/Washoe Experimental Stewardship Program Steering Committee  
Doublehead livestock permittees  
Modoc County Cattlemen's Association  
Modoc County Farm Bureau  
Rotary Club, Tulelake  
Modoc County Fish and Game Commission  
Devil's Garden livestock permittees  
Surprise Valley publics  
Alturas vicinity publics  
Conservation/Environmental groups, Redding  
Canby publics  
Big Valley publics  
Tulelake Basin publics  
Modoc/Washoe Experimental Stewardship Program Subcommittee  
Warner Mtn. livestock Permittees  
Modoc County Board of Supervisors  
Modoc County Farm Advisors  
Lassen County Farm Advisors  
Rotary Club, Alturas  
Central Valley Water Quality Control Board  
CA Department Fish and Game  
Interest Groups, Reno  
Forest Service retirees

Environmental Protection Agency  
Organized Sportsmen of Modoc County  
North Coast Water Quality Control Board  
CA State Board of Forestry (DTAC)  
Modoc CARES  
Lahonton Water Quality Control Board  
Alturas Tourism Committee  
Bureau of Land Management, Susanville District  
Modoc N.F. Employees  
University of California Extension  
Big Valley Livestock permittees

In addition, a hearing officer conducted public advisory hearings to receive oral testimony on the documents. One hundred five people testified at two hearings, one held in Alturas and the other in Adin.

We received nearly 4,300 written and oral comments from more than 1,400 respondents. Appendix U is a summary of public response.

The planning staff prepared a newspaper providing background information on key issues in non-technical terms and a summary of public comment. March 8, 1989, 1,700 copies were distributed to respondents.

Many people requested an opportunity to work with us in developing the final Forest Plan. We agreed it would be valuable to clarify issues and generate solutions with the people who expressed an interest. We held a public meeting in Alturas to share results of the public involvement process and explain and form issue groups.

Two issue working groups, each representing a variety of interests, organized to discuss and resolve the main issues through consensus. Members of the Rangeland/Riparian Working Group represented:

California Department of Fish and Game  
Water Quality Control Boards  
Fish, Game, and Recreation Commission  
livestock industry  
timber industry  
Sierra Club  
county government  
Forest Service  
fisheries  
county education  
local business

Members of the Timberlands Working Group represented:

California Department of Fish and Game  
livestock industry  
timber industry  
Sierra Club  
county government  
Forest Service  
Modoc County Farm Bureau

county education  
Horsemen's Association  
consulting forester

Groups were initially given broad guidelines, then worked independently to resolve issues. Each reported their findings to Forest Supervisor Doug Smith on May 25, 1989. A copy of the minutes and report is located in the planning records.

The issues considered in the DEIS were reviewed based on the analysis of public comments and the discussions of the two working groups. The review indicated that the issues to be resolved in the FEIS have not changed, although we have much better information to develop alternatives and analyze consequences.

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## The Issues

### Cultural Resources

What direction will be provided for the inventory, management, and interpretation of cultural resources?

### Diversity

How will management provide for diversity of plant and animal communities so that diversity is at least as great as that which presently exists?

### Energy

How will Forest management contribute to the federal policy of achieving national energy self-sufficiency?

### Facilities

How and where will the transportation and communication system be managed and maintained?

### Fire Management

How will fire be managed to protect and improve Forest resources?

### Firewood

How and where will firewood be managed?

### Lands

What will be the priorities for adjustments in land ownership to meet public demand and to support resource management goals and administrative needs?

### Minerals

How will mineral areas be managed?

### Pests

How will Forest pests be controlled?

Under what conditions will pesticides be used?

### Range

What will be the level of range use and development?

### Recreation

What recreation opportunities will be provided?

### Sensitive Plants

How will habitats be maintained or improved for sensitive plant species?

### Socio-economic

How will the effects of management be considered in relation to community stability?

### Timber

What amounts, methods, and locations of timber harvest and other silvicultural activities will be practiced?

### Visual

How will the visual resource be managed to protect the scenic quality of the Forest?

### Water And Soil

How will watersheds be managed to maintain or enhance water quantity, water quality, and soil productivity?

### Wetlands And Riparian Areas

What will be the management direction for wetland and riparian habitats?

### Wildlife And Fish

Where, what kind, and how much habitat will be provided for fish and wildlife species?

How will habitats be maintained or improved for threatened, endangered, and sensitive animal species?

## **G. Relationship to Alternatives and the Forest Plan**

Public issues are the driving force behind the Forest Plan. Chapter 2 presents alternative treatment of the issues listed above. The alternatives are derived from

quantitative and qualitative analyses of Forest resources. Chapter 3 summarizes the elements of environment to be affected by the alternatives. Chapter 4 details the environmental consequences of each alternative. The Plan seeks to resolve issues and concerns through the Preferred Alternative.







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#### A. Introduction

This chapter describes the alternative development process and the alternatives examined during the analysis, and compares the results. Included are:

**Section B.** Alternative Development Process - Describes the alternatives, the regulations applicable to the alternatives, and how the Forest developed the alternatives.

**Section C.** Benchmarks - Describes the function of benchmarks and gives the analysis and conclusions for each.

**Section D.** Alternatives Considered But Eliminated From Detailed Study - Describes alternatives considered and the rationale for eliminating them.

**Section E.** Alternatives Considered in Detail - Describes the alternatives considered in detail, including the preferred alternative. This section includes:

1. Introduction
2. Direction Common to All Alternatives - summarizes Minimum Management Requirements (MMRs), Timber Policy Constraints, Minimum Implementation Requirements (MIRs), Regional Policy for Herbicide Use, and Forest Standards and Guidelines.
3. Management Prescriptions and Management Areas - explains key aspects of management prescriptions and their relationship to Management Areas.
4. Individual Alternative Descriptions - presents six alternatives considered in detail, including the theme, resource program direction, environment to be created, acreage allocation to prescriptions, and outputs for each.
5. Comparison of Alternatives - compares alternatives through narratives, tables, and graphs.

#### B. Alternative Development Process

##### Definition of an Alternative

An alternative is a set of goals and objectives centered around a theme that guides the management of Forest resources from the current condition to a desired future state. Each alternative is a unique combination of management prescriptions and activity schedules applied to the Forest. The results are combinations of resource outputs, land uses, and goods and services for the public. Major considerations in developing alternatives are regulatory requirements; issues, concerns, and opportunities; and net public benefits.

##### Regulatory Requirements

The National Environmental Policy Act (NEPA) regulations (40 Code of Federal Regulations (CFR) 1502.14) require a thorough exploration of all reasonable alternatives and a discussion of alternatives eliminated from detailed study. The main items require us to:

- Rigorously explore and objectively evaluate all reasonable alternatives; and briefly discuss reasons for eliminating certain alternatives from detailed study.
- Devote substantial treatment to each alternative considered in detail, including the preferred alternative, so reviewers may evaluate the comparative merits of each alternative.
- Include reasonable alternatives not within the jurisdiction of the agency.
- Formulate reasonable alternatives which may require a change in existing law or policy to implement, if necessary, to address a major public issue, management concern, or resource opportunity identified during the planning process.
- Include a No Action alternative.
- Identify the Forest's preferred alternative.
- Include appropriate mitigation measures not already included in the preferred alternative or other alternatives.

In addition, the National Forest Management Act (NFMA) regulations (36 CFR 219.12(f) establish criteria for developing alternatives:

- Alternatives shall be distributed between the minimum and maximum resource potentials, to reflect to the extent practicable the full range of major commodity and amenity resources that could be produced from the Forest. Alternatives shall reflect a range of resource outputs and expenditure levels.
- Alternatives shall facilitate analysis of opportunity costs, resource uses, and environmental trade-offs among alternatives and between benchmarks and alternatives.
- Alternatives shall 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 various ways to address the major public issues, management concerns, and resource opportunities identified during the planning process.
- At least one alternative shall incorporate the RPA Program's tentative resource objectives for the Forest as displayed in the Regional Guide.
- At least one alternative shall reflect the current level of goods and services provided by the Forest and the most likely amount of goods and services expected in the future if current management direction continues.
- Each alternative shall represent, to the extent practicable, the most cost-efficient combination of management prescriptions examined that can meet the objectives of the alternative.
- Each alternative shall state at least: the condition and uses that will result from long-term application of the alternative; the goods and services to be produced, the timing and flow of these resource outputs, and the associated costs and benefits; resource management standards and guidelines; and the purpose of the management direction proposed.

### Issues, Concerns, and Opportunities

Themes for each alternative reflect public issues and management concerns. Public issues and management concerns, together with resource opportunities identified in Chapter 3, are also considered in developing management prescriptions. Each prescription is a set of compatible activities and practices for managing certain lands and resources for a particular purpose, such as timber and forage production or visual retention. In combination, a set of management prescriptions is applied to specific areas of land in a unique manner guided by an

alternative theme. Issues and concerns are thus a major driving force behind each alternative.

### Net Public Benefits

According to NFMA, the objective of land and resource management planning is to "provide an adequate basis for identifying the alternative that comes nearest to maximizing net public benefits." Net public benefits is an overall expression of the value to the nation of all outputs and positive effects (benefits) less all associated inputs and negative effects (costs) whether they can be quantitatively valued or not. Net public benefits are measured by both quantitative and qualitative criteria rather than a single measure or index such as present net value (PNV). Although PNV is the measure of cost efficiency used by the Forest Service, alternatives having the highest PNV may not always provide the highest net public benefits when nonpriced benefits and costs are considered. See Appendix C for details.

### Process Used to Develop Alternatives

The formulation of alternatives (planning step 5) is the culmination of planning steps 1 through 4 of the NFMA planning process, and is summarized here. Refer to Appendix B for a detailed discussion of the various components of alternative formulation, including the use of FORPLAN.

1. Major public issues were identified through public involvement efforts. These issues were combined with management concerns to form an integrated list of issues and concerns (found in Chapter 1 and Appendix A). Issues and concerns were screened and those that could be addressed through the land management planning process were used to guide the remaining steps in the process.
2. Based on the issues, criteria were developed for the collection and use of resource data. The Forest land management planning data base was designed, data and information stored, and reports generated. Land units in the Forest data base, called capability areas, were based on physical, biological, and administrative characteristics.
3. The interdisciplinary (ID) team developed an Analysis of the Management Situation (AMS) examining current management, supply, demand, and management opportunities for change, including changes need to resolve Forest conflicts. Where possible, demand levels were determined for Forest resources. (The AMS is available for review in the Forest's planning records.)

4. A comprehensive list of practices and activities that could be applied to the Forest were developed using the AMS and other resource information. These activities, called FORPLAN prescriptions, became an integral part of the linear programming model (FORPLAN). FORPLAN prescriptions are explicit practices, costs, outputs, and timing choices.
5. Using the Forest data base, groups of similar capability areas were aggregated in Analysis Areas to combine homogeneous land units. Analysis Areas were also defined to facilitate control of and reporting for Wilderness and other special areas, less productive timberlands, timber harvest distribution, forage distribution, developed recreation sites, wetlands, and rangelands.
6. For each analysis area, a full range of suitable FORPLAN prescriptions were identified. All possible locations for applying prescriptions were identified by matching them to the capability and suitability of the analysis areas.
7. The FORPLAN model was used to examine Benchmarks (Section C). Benchmarks define the feasible range of outputs for each resource by determining both its minimum or uninduced output level and its maximum potential output level. Output levels for all alternatives were selected from within this range, called the decision space.
8. Alternatives' themes were developed to offer many options for future management based on the limits and opportunities defined in the benchmarks. This step was guided primarily by NFMA planning regulations and RPA direction to resolve issues and concerns, and to reflect a broad range of commodity and amenity resource outputs, values, and funding levels. Large gaps in any of these elements indicated a need for an additional alternative.
9. The ID team used FORPLAN to determine the most cost-efficient combination of prescriptions for each alternative. Minimum management requirements were imposed on each alternative. Projected demand levels for Forest resources were incorporated into FORPLAN as limits. Excess outputs above demand were not valued in the FORPLAN model. Depending on the theme of the alternative, other objectives were added to FORPLAN to meet unique goals. These separate objectives and the rationale for each are discussed in Appendix B. FORPLAN then selected suitable prescriptions for each analysis area based on present net value.
10. The ID team examined the FORPLAN results from each alternative and made adjustments to produce a feasible schedule of outputs and prescriptions to meet the theme and objectives of the alternative.
11. The alternatives were compared in terms of PNV, resource output levels, effects, budget, and the degree to which issues were resolved. The ID team recommended a preferred alternative to the Forest Supervisor and district rangers. Following slight modifications, the final set of alternatives were run and the results displayed in the DEIS.
12. Assigning dollar values to all Forest resource outputs is not possible. Therefore, the final evaluation criterion is net public benefit, which is the present net value plus consideration of the non-priced Forest resource and social benefits. The preferred alternative best fits this criterion.
13. Following public comments, we revised the preferred, industry, and amenity alternatives displayed in the DEIS to more thoroughly respond to the expressed desires of the public.
14. PNV, resource output levels, effects, budget, and the degree to which issues were resolved were reanalysed and updated to reflect the modifications in the three revised alternatives.
15. The ID team compared all alternatives, and recommended a preferred alternative to the Forest Supervisor.

### C. Benchmarks

Benchmarks display the Forest's physical, biological, and technical capabilities. They are not limited by Forest Service policy or budget, discretionary constraints, spatial feasibility, or program and staffing requirements. While benchmarks are physically and technically possible, they are not necessarily operational. Outputs from benchmarks range from maximum levels with no budget limits to minimum levels which include only background outputs and fixed costs associated with maintaining the Forest.

The purpose of the benchmark analysis is to explore not only multiple resource outputs with present net value maximized, but also to find the maximum production levels for individual resources. Since benchmarks portray minimum and maximum levels, they circumscribe the decision space of feasible alternatives. Benchmarks are the basis for comparing alternatives with each other and with other benchmarks. Benchmarks define the range within which change can or must occur. On one hand,

alternatives can be compared to benchmarks yielding maximum outputs, such as timber and livestock forage. On the other hand, alternatives can be compared for the additional outputs they provide beyond minimum levels.

This section describes each benchmark and the results of its analysis. Appendix B explains the modeling process for each benchmark. Table 2-1 displays outputs from benchmarks and Table 2-2 shows acres allocated to management prescriptions. (Management prescriptions are described in Section E of this chapter.)

#### **MLV - Minimum Level of Management**

The Minimum Level Benchmark reflects background outputs and fixed costs associated with maintaining the Forest under public ownership. This benchmark is a base for comparing changes within and between other benchmarks and alternatives. It is not stewardship or custodial management; it is merely an accounting tool. The phase-in period would be ignored if minimum level were actually implemented. The objective function is to minimize cost.

Major management activities include 1) preventing environmental damage to lands in other ownerships; and 2) permitting unavoidable land uses such as utility corridors and private access across national forest system lands. Examples of management activities in this benchmark include fire suppression, insect and disease control, and law enforcement. Other activities include protecting threatened and endangered species, and managing wild horses.

Outputs from timber, livestock grazing, developed recreation, and wildlife habitat improvements are zero. Incidental outputs include 1) dispersed recreation use (people still visit the Forest); 2) water yield (water continues to flow from the Forest); and 3) wildlife and fish populations (they occur naturally). Present net value (PNV) over 12 decades is \$673,900,000.

#### **FLW - Unconstrained Max PNV Assigned Values with Harvest Flow and Long-Term Sustained Yield Requirements**

The outputs from this benchmark reflect the most economically efficient level of resource production with the fewest constraints. Constraints in the run prevent an erratic flow of timber (i.e., harvest flow may not fluctuate more than 15% per decade), and provide for long-term sustained yield. FLW benchmark is the basis for evaluating the effects of minimum management requirements (MMRs).

The results from this benchmark are:

1. PNV for 12 decades is \$1,105,000,000, the highest of all benchmarks.
2. Developed, dispersed and wilderness recreation are managed at standard levels.
3. Visual quality is managed for Modification or Maximum Modification.
4. Bald eagle and goshawk populations decline as eastside pine and mixed conifer are harvested. Harvesting these stands also jeopardizes other old-growth dependent wildlife species.
5. Modoc suckers become extinct in the 4th decade because insufficient stream barriers allow hybridization with the Sacramento sucker. As logging and grazing activities damage riparian areas, stream channel stability, water quality, and other fish populations decline.
6. Mule deer populations increase to nearly twice their present level in response to abundant forage. Less forage is available to livestock, and more than 116,000 acres of timberland are managed to accommodate timber and forage outputs. As deer numbers increase above current levels, so do wildlife and fish user-days (WFUDs) and hunting-related recreation visitor days (RVDs).
7. The value of mule deer forage, derived from WFUD values for big game hunting, is higher than the value for livestock forage.
8. The Forest does not improve habitat for deer.
9. Relative to present levels (122,500 AUMs per year), forage for livestock declines by 16% in the 1st decade. By the 5th decade, forage production supports only 86,000 AUMs per year.
10. Rangeland forage production remains constant or increases while timberland forage decreases over 5 decades. Poorly stocked timberlands currently provide a significant source of forage. As these stands are converted to well-stocked plantations, forage available to both livestock and wildlife decreases.
11. Four of the Forest's 84 range allotments are closed to livestock.
12. About 25% of the range allotments are managed to enhance forage production through non-structural range improvements. The remaining allotments are managed only with structural improvements.

13. Timber harvest increases to 88 MMBF per year in the 1st decade, 75% above the present level. It is composed of 82% mixed conifer, 10% eastside pine, 5% lodgepole pine, and 3% red fir. Harvest steadily increases to a high of 116.4 MMBF per year in the 3rd decade, then drops slightly in the 4th decade to 104.6 MMBF per year. By the 5th decade, harvest is 88.9 MMBF per year, and remains significantly higher than current harvest. Beyond the 5th decade, harvest declines, fluctuating between 50-70 MMBF per year.
14. Timber harvest in the Big Valley Federal Sustained-Yield Unit decreases to 2.4 MMBF per year in the 1st decade, increases to 11.4 MMBF per year in the 2nd decade, and continues upward to 35.8 MMBF per year in the 3rd decade. By decade 5, timber harvest declines to 13.9 MMBF.
15. As a result of the interaction between price trends and timber growth, harvest is delayed for a higher PNV.
16. Non-stocked timberland is not managed.
17. Timberland producing less than 20 cubic feet of wood per acre per year (< 20 land) is managed and harvested.
18. Fire program funding is maintained at the current level.

**MMR - Max PNV Assigned Values with Minimum Management Requirements, Non-Declining Yield and Culmination of Mean Annual Increment**

The outputs from this benchmark reflect the most economically efficient level of resource production with MMRs included. MMRs are outlined in 36 CFR 219.27, and generally represent requirements beyond Forest Service control. MMRs involve selecting suitable timberlands for timber production, protecting threatened and endangered species, maintaining viable populations of other fish and wildlife, maintaining plant and animal community diversity, protecting riparian areas and their dependent resources, and conserving soil and water productivity. Section E of this chapter describes MMRs.

Like the FLW benchmark, the MMR run maintains a long-term sustained timber yield. It applies non-declining yield and a dispersion constraint to prevent harvesting adjacent units.

Unlike FLW, this benchmark shows the collective cost of MMRs. When this benchmark is compared to benchmarks or alternatives with additional constraints, it becomes the basis for evaluating opportunity costs. The objective of the MMR run is to maximize PNV.

The results from this benchmark are:

1. PNV is 11% less than the FLW benchmark, a decline from \$1,105,000,000 to \$986,600,000. A drop in timber harvest accounts for most of the difference. Timber outputs for the first five decades are lower than under FLW. MMRs, especially the snag, dispersion, and old-growth constraints, are responsible for lower timber harvest. In the 1st decade, harvest volume is 64.6 MMBF per year, 35% less than under the FLW benchmark. For the next four decades harvest increases to 66.8 MMBF per year, and then to a sustained yield of 68 MMBF per year in the 9th decade.
2. Developed, dispersed and wilderness recreation are managed at standard levels.
3. Visual quality is managed for Modification or Maximum Modification.
4. Cultural resources are protected.
5. The benchmark provides habitat to maintain viable populations of bald eagles, Modoc sucker, goshawk, snag-dependent species, and other fish and wildlife. Habitat for viable populations of snag-dependent species are fully provided by the 3rd decade. Providing enough suitable habitat by the 1st decade is beyond our operational capability, and costs would increase by \$270,000 per year. Approximately 16,000 acres of timberland capable of producing greater than 20 cubic feet per acre per year (> 20 land) and 9,000 acres of < 20 timberland are managed for wildlife, fish, and riparian benefits.
6. Mule deer populations increase in response to forage availability, as in the FLW benchmark. About 100,700 acres are managed for both forage and timber.
7. Livestock forage is less than the present level, but comparable to FLW levels. Forage produced will support about 104,100 AUMs per year for livestock, 21% less than current. As in FLW, AUMs probably decrease to 85,600 per year by the 5th decade because poorly stocked timber is regenerated.
8. Range allotments are managed as under the FLW benchmark for livestock; that is, about 25% of the allotments are managed to enhance forage production through non-structural range improvements.
9. In addition to non-stocked timberland, 24,600 acres of forested timberland are not managed.

10. Timber harvest in the 1st decade is 64.6 MMBF per year, 14.2 MMBF more than the base year. The harvest consists of 81% mixed conifer, 15% eastside pine, and 4% red fir. In contrast, the base year composition was 52% eastside pine, 23% mixed conifer, and the remainder in red fir and lodgepole pine. Harvest increases to 66.8 MMBF per year and remains relatively constant in the 2nd through 5th decades. Sustained yield is 68 MMBF per year.
11. The Big Valley Federal Sustained-Yield Unit produces 5.9 MMBF per year in the 1st decade; 7.8 MMBF less than the present level. Outputs rise to 16.1 MMBF per year in the 2nd decade, but then fall to 9.6 for decades 3-5.
12. All low-productivity timberlands are managed for timber, raptor habitat, or riparian values.
13. Wetlands used by bald eagles are improved, while all other wetlands with capital investments are maintained.

**MKV - Max PNV Market Values Only with Minimum Management Requirements, Non-Declining Yield, and Culmination of Mean Annual Increment**

The MKV benchmark estimates the mix of resource uses and the schedule of outputs and costs which maximize the present net value of those outputs that have an established market price. Only timber, range, and developed recreation are valued. This run includes minimum management requirements and timber policy constraints described for the MMR benchmark. MKV does not provide for non-market benefits.

Results differing from the MMR benchmark are:

1. PNV is \$896,600,000—the lowest of all benchmarks except MLV. This is 9% less than PNV under the MMR benchmark. PNV decreases because only market outputs are emphasized.
2. Developed recreation is managed at standard levels, while dispersed recreation is managed at minimum levels because it has no market value. As the human population grows, recreation use increases. Unlike MLV, dispersed recreation areas are accessible to the public.
3. The South Warner Wilderness is neither administered nor maintained. Recreation use is included with dispersed recreation.
4. No forage is available for deer because only livestock forage is valued. With livestock and deer numbers in excess of grazing capacity, rangelands become overgrazed. Paradoxically, highly disturbed vegetative conditions provide nutritious herbaceous and shrub regrowth for deer. Deer populations increase over time with the increase in quality forage, and subsequently decline as habitat conditions decline. Hunting and camping recreation associated with deer correspondingly increase and decrease.
5. Outputs for other fish and wildlife recreation are at the minimum level because these outputs are not valued.
6. Livestock AUMs probably increase to 160,600 per year in the 1st decade, 57,000 AUMs (55%) above MMR. The substantial increase in livestock forage shows that the higher non-market wildlife value is a better competitor for forage when both are valued.
7. Compared to the MMR benchmark, which values both market and non-market outputs, MKV reflects some change in the timber harvest level. In fact, considering only market values, harvest is slightly lower (2%) in the 1st decade, showing the additional benefit to timber from non-market outputs. By the 2nd decade, however, harvest is slightly higher than in MMR, suggesting price trends and timber growth become more important factors affecting harvest. Harvest composition in the 1st decade is similar to MMR, with slightly more mixed conifer (85%) and less pine (10%). The remainder is red fir.
8. More land is managed at minimum levels. The Wilderness and special areas are not managed because they have non-market values.
9. Range allotments are managed only for livestock outputs. Forage production is increased through nonstructural improvements on 25% of the allotments.
10. More timberland is managed solely for timber production under this benchmark than under MMR. However, over 40,000 acres are still managed for both timber and livestock forage.
11. Of all benchmarks (except MLV), this is the least expensive in the 1st decade.

**TBR - Maximum Timber Production for One Decade with Minimum Management Requirements, Non-Declining Yield and Culmination of Mean Annual Increment**

TBR benchmark estimates the maximum timber output for one decade, subject to MMRs and non-declining sustained yield described under the MMR benchmark.

Using the 1st decade maximum timber output as a constraint, TBR maximizes present net value for all other resources.

The significant results are:

1. PNV is \$970,400,000, 2% less than the MMR benchmark.
2. Timber harvest is 70.5 MMBF per year in all decades. The harvest is 20.1 MMBF (40%) higher than the present level, and 5.9 MMBF (9%) higher than the MMR benchmark. Species composition of the 1st decade harvest differs markedly from MMR: 62% is mixed conifer, 20% eastside pine, 10% red fir, and 8% lodgepole pine.
3. The Big Valley Federal Sustained-Yield Unit timber harvest starts at 7 MMBF per year in the 1st decade. Harvest increases to 16.7 MMBF in the 2nd decade, drops to 11.5 MMBF in the 3rd decade, and by the 5th decade harvests 10.0 MMBF.
4. Although TBR results in more volume in the short-run, maximizing harvest in the 1st decade is not economically advantageous, resulting in a decrease in PNV.
5. Except for a slight economic disadvantage from maximizing timber in the 1st decade, all outputs and prescription allocations resemble those which maximize PNV.

#### **TBD - Maximum Timber Production for One Decade with Minimum Management Requirements and Cullmination of Mean Annual Increment, but Without Non-Declining Yield**

TBD benchmark is identical to the TBR benchmark, but the constraint for non-declining yield is removed. TBD includes a departure between the 1st and 2nd decades, allowing for an increase in timber in the 1st decade, followed by a drop in the 2nd decade.

The significant results are:

1. PNV is \$972,900,000, only 1% less than MMR and slightly higher than TBR.
2. TBD is the most costly benchmark in the 1st decade, but in the 2nd decade is the least expensive benchmark.
3. Timber harvest increases in the 1st decade (118.3 MMBF), drops to only 12.9 MMBF in the 2nd, and recovers to 65.4 MMBF in the 3rd decade. Long-term sustained yield is 71.2 MMBF per year. In the first decade, 78% of harvest is mixed conifer, 11%

eastside pine, 10% red fir, and the remainder lodgepole pine.

4. Timber harvest from the Big Valley Federal Sustained-Yield Unit is 18.1 MMBF per year in the 1st decade. Harvest drops to 3.1 MMBF in the 2nd decade and fluctuates over the next three decades.
5. Outputs other than timber are similar to MMR outputs.
6. Long-term sustained yield (71.2 MMBF) is lower than MMR and 3.7 MMBF lower than TBR. Removing the non-declining yield requirement results in a notable short-term increase in harvest with a reduction in sustained yield.
7. More acres are managed for timber and forage than in TBR and MMR. More forage is available for livestock.

#### **RNG - Maximum Livestock Forage Production for 5 Decades**

The RNG benchmark displays the maximum capability of the Forest to provide for commercial livestock grazing over the next 50 years, subject to MMRs. This benchmark addresses issues relating to livestock grazing and timber production, but ignores most other issues.

The significant findings are:

1. PNV is \$935,600,000, third lowest after MLV and MKV. It is only 5% lower than PNV for the MMR benchmark.
2. As the third most costly benchmark in the 1st decade, RNG provides 56 of 84 range allotments more than 260,000 acres of nonstructural range improvements. These include prescribed burning, firewood cutting, and farming.
3. Livestock AUMs are projected to increase to 186,400 AUMs per year in the 1st decade, fluctuating between 189,000 and 179,000 AUMs over the next 40 years. Forage production allocated for livestock use is 42% above the present obligation, and exceeds the Forest's RPA target.
4. Water, fencing, and other structural improvements permit full use of available forage.
5. Forage previously available for deer (in the MMR benchmark) and nonstructural range improvements increase livestock AUMs above MMR levels.
6. As in MKV, no forage is available for deer. Because livestock and deer numbers exceed grazing capacity, overgrazing occurs. Highly disturbed

vegetative conditions provide nutritious herbage and shrub regrowth for deer. Deer populations fluctuate with changing habitat conditions. Hunting and camping recreation associated with deer correspondingly increases or decreases.

7. Timber harvest is 15.2 MMBF per year greater than the present level, 1 MMBF per year above MMR. Harvest levels remain constant at 65.6 MMBF per year for the first five decades. Long-term sustained yield is 72.4 MMBF. Harvest species composition in the 1st decade is 70% mixed conifer, 24% eastside pine, and the remainder red fir.
8. The timber-forage management prescription is applied to about 171,700 acres, 70% more acreage than the MMR benchmark.

#### **H2O - Maximum Water Yield for 5 Decades**

The H2O benchmark defines the maximum capability of the Forest to provide water over the next 50 years, subject to MMRs. The significant findings from this benchmark are:

1. Outputs, costs, and PNV are essentially the same as the TBR benchmark when maximizing H2O and maximizing timber.
2. Prescription allocations are also the same for the TBR and H2O benchmarks.

#### **GAM - Maximum Deer Forage for 5 Decades**

This benchmark estimates effects of providing maximum forage for deer for 5 decades, subject to MMRs. The significant results are:

1. PNV is \$984,700,000 — third highest of all benchmarks after MMR and H2O. GAM is \$1,900,000 (< 1%) less than the MMR benchmark.
2. Deer populations reach levels corresponding to long-term biological carrying capacity of the land. Forage is provided to support deer populations which are twice the present level and 16% above

MMR levels in the 1st decade. Populations decrease slightly for the next 30 years as transitory forage diminishes; but by the 5th decade, populations recover. Rising recreational demand for big game hunting is not met after the 2nd decade.

3. Livestock AUMs probably decrease to 96,800 AUMs, 7% below MMR levels in the 1st decade. AUMs are available for deer instead of livestock.
4. Timber harvest is similar to MMR levels, showing no loss in volume or long-term sustained yield by maximizing deer forage outputs. Harvest species composition is also similar to MMR in the 1st decade.
5. Habitat improvement projects are not cost-efficient for deer, although 25% of the range allotments are managed to enhance forage production for livestock. A greater share of the existing forage is allocated to deer, while livestock depend more on additional forage produced from nonstructural range projects.

#### **MMU - Max PNV Assigned Values with Minimum Management Requirements, Non-Declining Yield and Culmination of Mean Annual Increment Applied Separately to the Forest and Big Valley Federal Sustained-Yield Unit**

MMU and MMR are the same benchmarks. However, in MMU long-term sustained yield and the non-declining yield constraints are applied to both the Unit and to the Forest as a whole.

1. The Unit produces 10.2 MMBF per year in the 1st decade, 3.5 MMBF less than the present level. Outputs increase to 11.9 MMBF per year in the 4th decade. The current allowable sale quantity of 13.7 MMBF is above long-term sustained yield (13.3) because MMRs must be met.
2. All other outputs and management prescription allocations do not change between MMU and MMR. PNV decreases by only \$300,000, showing the negligible effect of applying non-declining sustained yield to the Unit.



**Table 2-1. Benchmarks - Average Annual Outputs and Activities.**

Activity	Base Year 1982	Decade <sup>1</sup>	MLV	FLW	MMR	MKV	TBR	TBD	RNG	H <sub>2</sub> O	GAM	MMU
Economics												
PNV (MM\$)			673.9	1105.1	986.6	896.6	970.4	972.9	935.6	970.4	984.7	986.3
Total Cost (MM\$)	11.5	1	3.8	14.4	14.2	13.7	16.9	19.8	16.7	16.9	14.6	14.4
		2	3.7	17.6	15.2	15.1	16.0	10.4	15.0	16.0	15.1	15.1
		3	3.6	23.8	17.9	18.0	18.8	17.7	17.6	18.8	17.9	17.8
		4	3.6	30.4	17.4	17.8	19.3	17.1	17.3	19.3	17.3	17.2
		5	3.6	24.3	23.2	23.0	22.1	22.1	23.7	22.1	22.9	23.0
Range												
Grazing (M AUM)	122.5	1	0.0	102.6	104.1	160.6	104.9	106.9	186.4	104.9	96.8	104.1
		2	0.0	94.9	97.2	158.9	97.5	97.9	189.8	97.5	97.0	96.9
		3	0.0	88.9	89.5	146.6	90.2	88.4	185.3	90.2	89.2	89.1
		4	0.0	94.1	90.2	140.4	91.9	87.4	179.3	91.9	84.4	90.1
		5	0.0	86.3	85.6	139.2	87.2	83.8	184.3	87.2	83.5	85.9
Recreation												
Developed Recreation Public & Private (MRVD)	86.0	1	0.0	101.0	101.0	101.0	101.0	101.0	101.0	101.0	101.0	101.0
		2	0.0	116.0	116.0	116.0	116.0	116.0	116.0	116.0	116.0	116.0
		3	0.0	131.0	131.0	131.0	131.0	131.0	131.0	131.0	131.0	131.0
		4	0.0	146.0	146.0	146.0	146.0	146.0	146.0	146.0	146.0	146.0
		5	0.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0
Dispersed Recreation (M RVD)	102.8	1	49.5	122.4	122.4	49.5	122.4	122.4	122.4	122.4	122.4	122.4
		2	49.5	142.9	142.9	57.8	142.9	142.9	142.9	142.9	142.9	142.9
		3	49.5	163.4	163.4	66.1	163.4	163.4	163.4	163.4	163.4	163.4
		4	49.5	184.0	184.0	74.4	184.0	184.0	184.0	184.0	184.0	184.0
		5	49.5	204.5	204.5	82.7	204.5	204.5	204.5	204.5	204.5	204.5
Hunting-related Dispersed Recreation (M RVD) <sup>2</sup>	98.4	1	44.3	114.4	114.4	72.0	114.4	114.2	73.0	114.4	114.4	114.4
		2	44.3	128.1	126.0	92.8	125.0	125.2	96.7	125.0	128.1	126.4
		3	44.3	122.0	121.3	68.0	115.8	121.8	66.0	115.8	127.4	121.8
		4	44.3	109.2	108.5	50.0	103.5	115.2	46.0	103.5	126.4	108.4
		5	44.3	116.8	120.6	30.0	111.0	124.6	37.0	111.0	130.0	119.4
Wilderness (M RVD)	7.1	1	0.0	9.4	9.4	0.0	9.4	9.4	9.4	9.4	9.4	9.4
		2	0.0	12.4	12.4	0.0	12.4	12.4	12.4	12.4	12.4	12.4
		3	0.0	14.7	14.7	0.0	14.7	14.7	14.7	14.7	14.7	14.7
		4	0.0	17.1	17.1	0.0	17.1	17.1	17.1	17.1	17.1	17.1
		5	0.0	20.1	20.1	0.0	20.1	20.1	20.1	20.1	20.1	20.1

**Table 2-1. Benchmarks - Average Annual Outputs and Activities. (continued)**

Activity	Base Year 1982	Decade <sup>1</sup>	MLV	FLW	MMR	MKV	TBR	TBD	RNG	H <sub>2</sub> O	GAM	MMU
Wilderness (M Acres)	68.4	1	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4
		2	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4
		3	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4
		4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4
		5	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4
Timber												
Allowable Sale Quantity (including BVFSYU) (MMBF)	50.4	1	0.0	88.0	64.6	63.3	70.5	118.3	65.6	70.5	65.9	66.1
		2	0.0	101.2	66.8	67.2	70.5	12.9	65.6	70.5	65.9	66.1
		3	0.0	116.4	66.8	67.2	70.5	65.4	65.6	70.5	65.9	66.1
		4	0.0	104.6	66.8	67.2	70.5	65.4	65.6	70.5	65.9	66.1
		5	0.0	88.9	66.8	67.2	70.5	65.4	65.6	70.5	65.9	66.1
Long Term Sustained -Yield (MMCF)	9.7		0.0	12.4	11.8	12.5	12.2	11.7	11.9	12.2	11.8	11.9
(MMBF)		58.9	0.0	75.8	72.3	76.5	74.9	71.2	72.4	74.9	72.1	72.7
Big Valley Federal Sustained-Yield Unit(MMBF)	13.7	1	0.0	2.4	5.9	5.9	7.0	18.1	5.8	7.0	5.8	10.2
		2	0.0	11.4	16.1	16.1	16.7	3.1	16.0	16.7	16.0	10.3
		3	0.0	35.8	9.6	9.6	11.5	7.6	8.9	11.5	8.9	10.1
		4	0.0	15.8	9.6	9.3	6.9	15.4	10.7	6.9	11.7	11.9
		5	0.0	13.9	9.6	15.2	10.0	6.4	9.6	10.0	10.6	11.9
Water												
Water Yield (M Acre-Feet)	565.8	1	565.8	568.0	567.6	567.6	567.8	568.1	567.9	567.8	567.6	567.7
		2	565.8	568.9	568.3	568.2	568.6	567.9	568.2	568.6	568.3	568.3
		3	565.8	569.5	569.0	568.8	569.2	568.8	568.8	569.2	569.0	569.0
		4	565.8	570.8	568.9	568.9	569.1	568.7	568.9	569.1	568.7	568.9
		5	565.8	571.2	568.9	568.9	569.3	568.9	568.9	569.3	568.8	568.8
Wildlife & Fish												
Bald Eagle (Active Territories)	7.0	1	7.0	7.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
		2	7.0	6.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
		3	7.0	5.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
		4	7.0	4.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
		5	7.0	4.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
Peregrine Falcon (Active Territories)	0.0	1	0.0	0.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
		2	0.0	0.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
		3	0.0	0.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
		4	0.0	0.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
		5	0.0	0.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0

**Table 2-1. Benchmarks - Average Annual Outputs and Activities. (continued)**

Activity	Base Year 1982	Decade <sup>1</sup>	MLV	FLW	MMR	MKV	TBR	TBD	RNG	H <sub>2</sub> O	GAM	MMU
Modoc Sucker (Suitable Stream Miles)	13.4	1	13.4	11.2	19.4	19.4	19.4	19.4	19.4	19.4	19.4	19.4
		2	16.4	7.4	19.4	19.4	19.4	19.4	19.4	19.4	19.4	19.4
		3	19.4	5.2	19.4	19.4	19.4	19.4	19.4	19.4	19.4	19.4
		4	19.4	0.0	19.4	19.4	19.4	19.4	19.4	19.4	19.4	19.4
		5	19.4	0.0	19.4	19.4	19.4	19.4	19.4	19.4	19.4	19.4
Deer (M Individuals)	24.1	1	30.0	39.6	39.6	25.5	39.7	41.1	25.8	39.7	46.1	39.6
		2	33.0	45.5	44.8	32.6	44.4	44.5	34.2	44.4	46.0	44.9
		3	33.0	43.4	43.2	23.7	41.4	43.4	23.2	41.4	45.3	43.3
		4	31.0	39.3	39.1	17.5	37.2	41.3	16.1	37.2	44.9	40.0
		5	31.0	41.7	43.1	10.6	39.8	43.7	12.9	39.8	46.1	41.6
Goshawk (Pairs)	71.0	1	73.0	71.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0
		2	80.0	48.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0
		3	90.0	41.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0
		4	100.0	30.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0
		5	110.0	17.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0
Resident Fish (M Pounds)	116.0	1	116.7	116.0	116.7	116.7	116.7	116.7	116.7	116.7	116.7	116.7
		2	118.8	115.0	117.4	117.4	117.4	117.4	117.4	117.4	117.4	117.4
		3	123.0	114.0	117.4	117.4	117.4	117.4	117.4	117.4	117.4	117.4
		4	125.8	112.0	117.4	117.4	117.4	117.4	117.4	117.4	117.4	117.4
		5	126.5	111.0	117.4	117.4	117.4	117.4	117.4	117.4	117.4	117.4
Total Wildlife & Fish User-Days (M WFUD)	83.1	1	37.5	114.6	114.6	58.3	114.6	114.5	93.9	114.6	122.4	114.6
		2	37.5	131.0	130.4	72.6	129.9	130.0	115.8	129.9	132.2	130.6
		3	37.5	134.9	135.6	63.3	132.9	135.9	108.0	132.9	138.7	135.6
		4	37.5	136.8	136.6	57.3	134.0	139.9	105.3	134.0	145.5	136.5
		5	37.5	147.0	149.0	49.4	144.2	151.0	107.2	144.2	153.7	148.4
(A) Big Game (M WFUD)	32.8	1	14.8	57.2	57.2	36.0	57.2	57.1	36.5	57.2	65.0	57.2
		2	14.8	64.0	63.0	46.4	62.5	62.6	48.4	62.5	64.8	63.2
		3	14.8	61.0	60.6	34.0	57.9	60.9	33.0	57.9	63.7	60.9
		4	14.8	54.6	54.3	25.0	51.7	57.6	23.0	51.7	63.2	54.2
		5	14.8	58.4	60.3	15.0	55.5	62.3	18.5	55.5	65.0	59.7
(B) Upland Game, Waterfowl & Nongame (M WFUD)	24.6	1	11.1	27.9	28.0	10.6	28.0	28.0	28.0	28.0	28.0	28.0
		2	11.1	31.5	31.6	12.0	31.6	31.6	31.6	31.6	31.6	31.6
		3	11.1	34.5	34.6	13.2	34.6	34.6	34.6	34.6	34.6	34.6
		4	11.1	36.9	37.0	14.2	37.0	37.0	37.0	37.0	37.0	37.0
		5	11.1	39.0	39.1	15.3	39.1	39.1	39.1	39.1	39.1	39.1

**Table 2-1. Benchmarks - Average Annual Outputs and Activities. (continued)**

Activity	Base Year 1982	Decade <sup>1</sup>	MLV	FLW	MMR	MKV	TBR	TBD	RNG	H <sub>2</sub> O	GAM	MMU
(C) Resident Fish (M WFUD)	25.7	1	11.6	29.3	29.4	11.7	29.4	29.4	29.4	29.4	29.4	29.4
		2	11.6	35.5	35.8	14.2	35.8	35.8	35.8	35.8	35.8	35.8
		3	11.6	40.4	40.4	16.1	40.4	40.4	40.4	40.4	40.4	40.4
		4	11.6	45.3	45.3	18.1	45.3	45.3	45.3	45.3	45.3	45.3
		5	11.6	49.6	49.6	19.1	49.6	49.6	49.6	49.6	49.6	49.6

- <sup>1</sup> Decade 1 is 1986 through 1995  
Decade 2 is 1996 through 2005  
Decade 3 is 2006 through 2015  
Decade 4 is 2016 through 2025  
Decade 5 is 2026 through 2035

- <sup>2</sup> Hunting-related RVDs are separate from dispersed recreation RVDs.

**Table 2-2. Acreage Allocations by Prescription for each Benchmark.**

Mgt. Rr	Prescription Description <sup>1</sup>	MLV	FLW	MMR	MKV	TBR	TBD	RNG	H2O	GAM	MMU
1	Minimum Level	>20	7,855	24,625	110,006	20,931	23,830	24,622	20,931	24,623	24,622
		<20	1.6 million	0	0	0	0	0	0	0	0
		Range	17,486	15,699	15,498	15,699	15,498	14,354	15,699	15,498	15,498
2	Wilderness - Standard		70,385	70,385	0	70,385	70,385	70,385	70,385	70,385	70,385
3	Wilderness - Low Standard		No acres were selected for any benchmark.								
4	Semi-Primitive Non-Motorized <sup>2</sup>	>20	No acres were selected for any benchmark.								
		<20									
5	Dev. Recreation - Standard		198	198	198	198	198	198	198	198	198
6	Dev. Recreation - Low Standard		No acres were selected for any benchmark.								
7	Visual Retention <sup>2</sup>	>20	No acres were selected for any benchmark.								
		<20									
8	Special Areas		14,588	14,588	0	14,588	14,588	14,588	14,588	14,588	14,588
9	Raptor Management	>20	0	11,885	11,885	11,885	11,885	11,885	11,885	11,885	11,885
		<20	0	6,796	6,796	6,796	6,796	6,796	6,796	6,796	6,796
		Range	0	33,430	33,430	33,430	33,430	33,430	33,430	33,430	33,430
10	Rangeland		527,497	508,965	509,177	508,965	509,177	11,303	508,965	509,177	509,177
11	Range-Forage		414,230	397,482	397,471	397,482	397,471	896,489	397,482	397,471	397,471
12	Even-Aged Timber		311,237	293,335	353,364	301,375	284,241	222,354	301,375	271,174	296,231
13	Timber-Visuals		No acres were selected for any benchmark.								
14	Timber-Forage <sup>2</sup>	PR	0	0							
		MOD	116,137	100,698	40,669	96,351	109,468	171,678	96,351	122,857	97,801
15	Uneven-Aged Timber		0	0	0	0	1,115	0	0	0	0
16	<20 Cu. Ft. Timber		184,304	175,576	175,576	175,575	175,576	175,576	175,576	175,576	175,576
17	Riparian Area	>20		3,882	3,882	3,882	3,882	3,882	3,882	3,882	3,882
		<20	0	1,755	1,755	1,755	1,755	1,755	1,755	1,755	1,755
		Range		3,637	3,637	3,637	3,637	3,637	3,637	3,637	3,637

<sup>1</sup> >20 are timberlands capable of producing greater than 20 cubic feet per acre per year

<20 are timberlands capable of producing less than 20 cubic feet per acre per year

Rangelands are all other lands

PR is partial retention visual quality objective

MOD is modification visual quality objective

<sup>2</sup> Timber acres only; range acres are in Prescriptions 10 and 11

## Benchmark Analysis Conclusions

1. Developed recreation is always managed at standard level, except in MLV where campgrounds are closed.
2. Dispersed and wilderness recreation are managed at standard level whenever non-market values are used. When no funds are used to manage recreation, some dispersed use continues from access roads adjacent to the Forest.
3. Developed, dispersed, and wilderness recreation visitor days increase over time because of increases in human population. Outputs remain the same in all benchmarks, except in MLV and MKV.
4. Hunting-related recreation use is associated with big game hunting. Big game hunting is affected by the forage available to sustain deer populations. Outputs for hunting-related recreation and big game user-days are higher in all benchmarks than current levels except when the Forest does not manage recreation (MLV).
5. Wilderness acres do not change between benchmarks. All five roadless areas recommended for wilderness in the 1984 California Wilderness Act are so designated. The Forest has no further planning areas.
6. Bald eagles, peregrine falcons, and Modoc suckers are managed at recovery levels, except under FLW where no provisions are made for endangered species. Similarly, the status of goshawks and other old-growth dependent species are maintained or improved (MLV only). However, under FLW no provisions are made for viable populations and diversity.
7. Deer populations generally follow the same pattern described for hunting-related recreation and big game hunting (#4). However, under MLV no livestock grazing occurs. Lack of forage competition enhances deer populations.
8. Fisheries improve under most benchmarks. Without livestock grazing and timber harvesting, fisheries improve significantly under MLV. In contrast, without riparian area management, populations decrease under FLW. Except for MLV and FLW, outputs do not change between benchmarks.
9. Total wildlife and fish user-days increase proportionately with big game hunting. They also increase if non-market values are used in the benchmark.
10. Maintaining existing wetlands is cost efficient.
11. Under all benchmarks, the timber-forage prescription is cost efficient. The combined benefits of forage and timber outputs outweigh the cost of implementing the prescription.
12. The even-aged management prescription, which emphasizes production, is the primary management direction for > 20 timberland.
13. Water yield is the major contributor to PNV, followed by timber harvest.
14. Long-term sustained yields range from 71.2 to 76.5 MMBF, the lowest being in TBD and the highest in MKV.
15. Except in benchmarks where timber or water yields are maximized (TBD, TBR, and H2O), the timber harvest is fairly constant over the first five decades, with an ASQ in the mid- to high 60s (MMBF per year). First decade yields range from 63.3 to 66.1.
16. In benchmarks which maximize timber harvest or water yields (TBR, TBD, and H2O), 1st decade yields are 10-54 MMBF higher than the MMR level. Tradeoffs in these benchmarks are higher costs and lower PNV.
17. The species composition of timber harvested in the 1st decade is predominantly mixed conifer (62-85%). Eastside pine ranges from 10-24% of harvest. The base year timber sale was composed of 52% eastside pine, 23% mixed conifer, 19% red fir, and 6% lodgepole pine. Therefore, species mix in the benchmarks differs markedly from that offered in 1982.
18. Benchmarks incorporating non-market values promote slightly higher levels of timber harvest.
19. When managed under non-declining sustained yield, the allowable sale quantity for the Big Valley Federal Sustained-Yield Unit fluctuates between 10 to 12 MMBF per year. This is lower than the currently allowed harvest level.
20. The most cost-efficient level of livestock AUMs is 104,100 AUMs, 20% below the current permitted obligation. Livestock AUMs contribute little to PNV.
21. Water quantity output changes little between benchmarks. Timber harvest minimally increases yields.
22. The current fire budget is the most cost-efficient level of management.

23. None of these benchmarks responds to the full range of issues (see Chapter 1). Each benchmark implies resource management consequences and outputs that are not responsive to several issues and concerns raised by the public and Forest managers. The issues and concerns guide the development of alternatives in this planning process.

#### **Limitations to the Range of Alternatives**

Physical characteristics and statutory or contractual obligations limit the possible range of alternatives. They are summarized below:

Classified Areas are not subject to change through this planning process: South Warner Wilderness (70,385 acres); Burnt Lava Flow, Medicine Lake Glass Flow, and Glass Mountain Glass Flow Special Interest Areas (13,788); and Devil's Garden Research Natural Area (800 acres).

Withdrawals include 88,400 acres of existing withdrawals from mineral entry which will not change.

Resources Needs are limited to activities on 52,111 acres for Threatened and Endangered species; and on 9,274 acres of riparian areas.

Barren/Rocky/Water areas include unproductive land totalling 49,585 acres which will not change.

#### **Range of Alternatives**

As noted, the benchmarks define the range (decision space) within which every alternative must fall. Figure 2-1 illustrates the range (the shaded band) for each of six selected outputs, and shows where each alternative falls within the range. The left end of the range represents the

benchmark that minimizes that resource, and the right end represents the benchmark that maximizes it. For example, the allowable sale quantity in MMBF per year ranges between 0 (as in the MLV benchmark, and 119 MMBF (as in the TBD benchmark). All the alternatives have MMBF outputs within this range.

Roadless areas on the Modoc were reviewed in RARE II and the California Wilderness Bill. Except for those areas incorporated in the South Warner Wilderness (Figure 3-32), none were rated high enough for wilderness designation, and were subsequently released for non-wilderness management. No public issues on the Forest address designating more wilderness. In response to these circumstances, the Forest did not analyze a range of alternatives for wilderness.

Outputs for developed, dispersed, and wilderness recreation do not vary between alternatives because the supply of recreation opportunities exceeds the demand. Each alternative produces recreation up to the demand cutoff. Similarly, outputs for hunting vary little between many alternatives because the demand capacity is reached before the supply is depleted. The number of bald eagles, peregrine falcons, and Modoc suckers remains constant between alternatives. These outputs are limited by suitable habitat available. In this case, the amount of potential suitable habitat supporting the numbers indicated is also the minimum level needed to meet MMRs to which all alternatives are constrained.

Subsequent sections of this chapter explain the alternatives in detail. Acreage allocations by prescription and alternative discussed in Section E.5. of this chapter show the range of alternatives from another perspective.

Figure 2-1. Range of Alternatives (Selected Outputs)

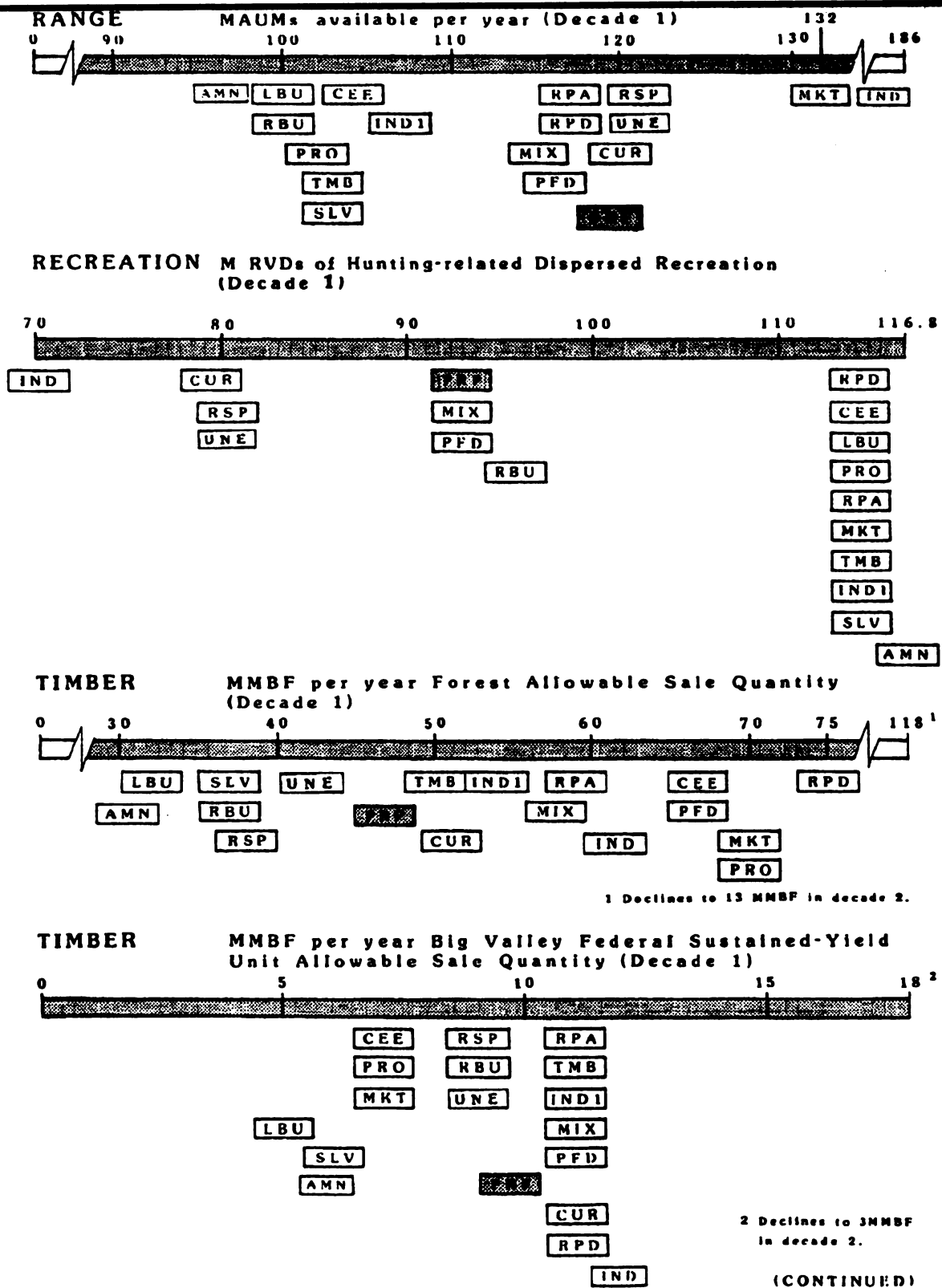
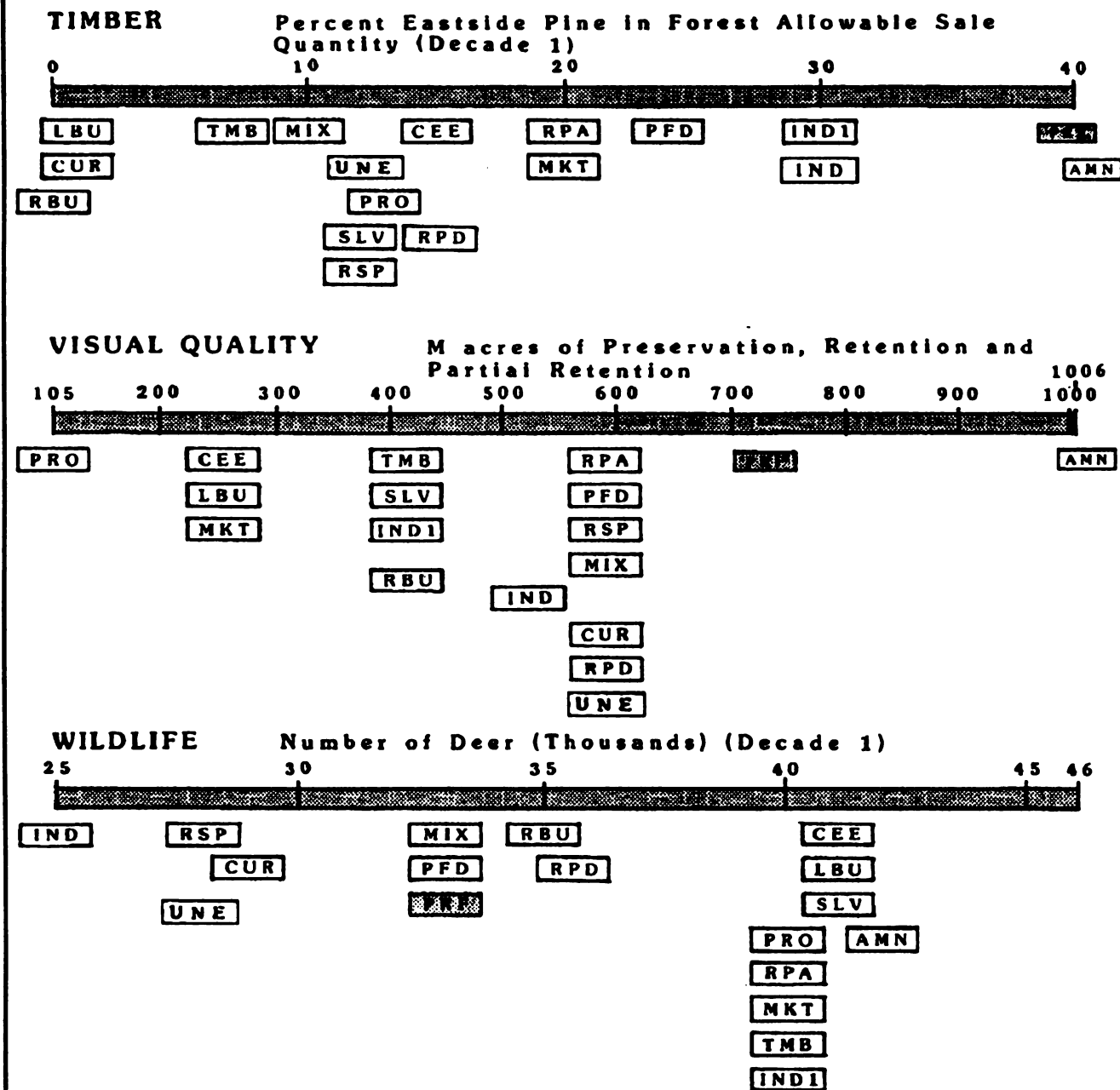




Figure 2-1. Range of Alternatives (Selected Outputs). (cont'd)



## **D. Alternatives Considered but Eliminated from Detailed Study**

Eighteen alternatives were developed in response to issues within the decision space defined by benchmarks.

These alternatives were modeled in FORPLAN; the interdisciplinary (ID) team analyzed the outputs. Six alternatives were selected for detailed study and are described in Section E of this Chapter. The remaining twelve were not studied in detail. They are described here and reasons for elimination from further consideration. Table 2-3 summarizes selected average annual outputs for alternatives eliminated from detailed study.

### **(CEE) Constrained Economic Efficiency**

This alternative is the most economically efficient allocation and scheduling of prescriptions for meeting minimum management and minimum implementation requirements (MMRs and MIRs). It shows the collective opportunity cost of MIRs and is a base run for evaluating constraints and alternatives.

CEE does not respond to issues related to amenity outputs. Semi-primitive recreation is not managed and visuals are at a minimal level (only MIRs). It is, therefore, not considered in detail.

### **(LBU) Low Budget**

This alternative estimates future outputs and services for the 1982 budget reduced by 25%.

Because output targets are not used in this alternative, outputs are produced at economically efficient levels. Because the budget is low, timber yields are 37% below base year levels. Range AUMs are also relatively low, and no acres are managed for semi-primitive recreation. Visual quality is managed at a minimal level. Community stability is eroded due to the decreased timber and range production. Because neither commodity or amenity resources are emphasized, and because of its negative impacts on community stability, this alternative is not considered in detail.

LBU is used in formulating RBU, which is considered in detail. RBU includes additional objectives which respond better to both amenity and commodity resource issues.

### **(PRO) High Productivity**

PRO meets a high timber target. It also produces other market outputs at the highest possible level while meeting the assigned timber target. Non-market outputs are produced only at economically efficient levels, consistent with the production of market resources.

The timber target exceeds 95 MMBF by the 2nd decade, and decreases to 85 MMBF by the 5th decade. To meet this target all MMRs, except statutory requirements (i.e., threatened and endangered species and soil and water productivity), were released. All MIRs were also released. This alternative results in adverse affects to water quality, visual quality, and viable fish and wildlife populations. Because MMRs and MIRs are removed and the environmental consequences severe, this alternative cannot be implemented and so is not considered in detail.

### **(RPA) RPA Base Sale Schedule**

The RPA alternative responds to targets from the 1980 RPA Program by providing commodity and amenity outputs established for the Modoc. Emphasis is placed on meeting range and timber targets set by the Program; completing cultural resource inventories by 1995; maintaining recommended visual quality; managing for semi-primitive recreation; and improving habitat for RPA wildlife and fish species.

The RPA Program directs the Forest to harvest 75 MMBF in the 1st decade and 80 MMBF in the 5th decade. The Forest cannot produce 75 MMBF in the 1st decade without a departure from non-declining yield. Therefore, the RPA alternative was run as a base sale schedule for a departure alternative, RPD. Because the alternative does not meet the timber goals for the RPA Program, it is not considered in detail.

### **(MKT) High Market Emphasis**

MKT emphasizes high output levels of market resources — timber, range, and developed recreation — with non-market outputs at economically efficient levels.

The timber target of this alternative is 70 MMBF in the 1st decade and 80 MMBF in the 5th decade. Because of constraints in MKT, the Forest cannot produce 70 MMBF without a departure. Therefore, timber yields are allowed to decline in the 2nd decade, causing an erratic flow of timber yields and threatening community stability. Because a high level of livestock AUMs (131,600) are emphasized for five decades, water quality is degraded. In order to sustain 131,600 AUMs, many structural and nonstructural range improvements must be implemented. This level of improvements is unrealistic and would adversely affect other resources.

MKT closely resembles RPD; however, RPD provides additional costs for protecting water quality and other amenities. Because MKT would cause adverse environmental impacts and community instability, this alternative is not considered in detail.

### **(TMB) Timber Emphasis**

TMB emphasizes a moderate timber harvest level with intensive regeneration methods. It produces the highest yields possible on the acreage treated. Other resources are produced at low levels, commensurate with a timber-oriented theme.

Timber yields are slightly less than base year levels in decades 1 through 4. Because the timber-forage prescription is limited, deer numbers steadily decrease as do hunting and hunting-related recreation. Semi-primitive recreation and visual quality are managed at low levels. Livestock AUMs are produced at moderate levels. The intent of the alternative was not fully met. Timber yields were lower than anticipated. Because of the emphasis of timber, amenity resources were produced at a low level. Because both market and non-market outputs are low, TMB was eliminated from detailed study.

### **(SLV) Silvicultural**

SLV implements intensive silvicultural systems, and emphasizes thinning. As in TMB, production of other resources in conjunction with timber are at low levels.

SLV resembles TMB, except (1) timber yields are at economically efficient levels and (2) thinning developed outside of FORPLAN is added to yields and costs. Timber harvest levels drop below current levels in decades 1-3. By the 4th decade, timber yields are above those in TMB. Hunting is similar to TMB, but does not decline as quickly. Semi-primitive recreation and visual quality are managed at low levels. Livestock AUMs are produced at moderate levels. As with TMB, the intent of this alternative is not fully met. Timber yields are very low and the amount of additional thinning generated is small. SLV also produces a low level of amenity resources. The low production levels of both market and non-market outputs would have a negative impact on community stability. Because of these problems, this alternative was not considered in detail.

### **(IND1) High Timber Industry**

IND1 emphasizes high production of marketable timber. Like TMB and SLV, other resources are managed at low levels compatible with timber production.

Due to a timber target of 53.6 MMBF in the 1st decade, timber yields are above current levels and remain constant in decades 1 through 5. Another requirement is added ensuring that yields include at least 40% pine (eastside and lodgepole pine). Because of these constraints, IND1 costs \$16.2 million in the 1st decade. Livestock forage is produced at moderate and economically efficient levels. Semi-primitive recreation and visual quality are managed at low levels.

This alternative is similar to IND which is brought forward for detailed study. IND has a greater commodity emphasis. Under IND, timber yields are even higher and livestock AUMs are produced at a level above that which is economically efficient. Because IND and IND1 are similar and because IND generates greater community stability, IND1 was not considered in detail.

### **(RSP) Ranger Special**

After examining the results of several alternatives, each district ranger responded to as many issues as possible. RSP incorporates both commodity and amenity outputs.

Low deer numbers under RSP cause a subsequent decline in hunting and hunting-related recreation. Timber yields are also low, producing 37.9 MMBF in the 1st decade. Livestock forage production is relatively high at 120,000 AUMs in decade 1. Because the local economy would be adversely affected by decreased hunting and timber production, this alternative is not considered in detail.

### **(MIX) Mixture of Commodity and Non-Commodity Outputs**

MIX emphasizes a wide range of commodity and amenity outputs, subject to a budget constraint. MIX draws from all alternatives.

It is not considered in detail because only 10% of the timber harvest consists of eastside pine, which would adversely affect timber industry and community stability (see Chapter 4 Section B). In addition, the timber-forage prescription is allocated to more acres than desired in mixed conifer stratas, increasing the risk of regeneration failure. MIX was used in formulating PRF, which is considered in detail.

### **(PFD) Preferred with Departure**

PFD analyzes the effect of a departure from non-declining yields in the Preferred Alternative (PRF) in decades 1 through 5. As in PRF, PFD emphasizes a mixture of commodity and amenity resources.

This alternative is not considered in detail because multiple-use management objectives are not enhanced. Specifically, (1) high mortality losses are not significantly reduced, (2) timber age or size class distribution does not improve more than in PRF, and (3) RPA Program timber targets are already achieved in RPD. Therefore, the criteria of 36 CFR 219.16 for considering departure are not met. In addition, PFD resembles RPD, which is considered in detail.

### **(UNE) Uneven-aged Emphasis**

UNE emphasizes producing a moderate level of timber volume using uneven-aged management techniques. As in PRF, UNE provides a mixture of commodity and amenity resources.

This alternative was not considered in detail because it is not implementable. The form of uneven-aged management modeled in FORPLAN was group selection (openings no larger than 2.0 acres). The model assigned this treatment to all well-stocked stands on the Forest within the first three decades. Entering this many acres in such a short time period would, in effect, create large-scale openings that violate other dispersion and opening standards. The results of this alternative were used to develop the uneven-aged management strategy in the AMN, which was considered in detail.

### **(SOC) Save Our Community**

SOC emphasizes high production of marketable timber and livestock while reducing clearcutting, maintaining visual quality, and wildlife habitat. This alternative was submitted during comment on the DEIS by Modoc Cares, an organized group of local timber producers, ranger permittees, local businesses, county and local governments, and school boards. The alternative specifies producing 75 MMBF and maintaining current livestock numbers. Clearcutting is only to be used on a site-specific basis.

This alternative is not considered in detail or modeled in FORPLAN. Modoc Cares based this alternative on several assumptions such as increased acres of timber land being available, and higher yield tables that the

Forest Service does not believe to be statistically accurate. Based on the benchmark analysis and evaluation of other alternatives, the Forest does not believe it is feasible to provide 75 MMBF on a sustained basis (see RPA Base Sale Schedule alternative). It would be particularly difficult with the restriction on clearcutting proposed in the SOC alternative. The RPD ASl alternative closely approximates the market production emphasis of the SOC alternative.

### **(CON) Conservation Alternative**

The CON alternative was submitted during comment on the DEIS by the Mother Lode Chapter of the Sierra Club. CON emphasizes the Modoc's amenity values—wilderness, wildlands, scenic beauty, watersheds, wildlife habitat, and recreational opportunities. It provides for producing timber and livestock, but under tight standards and guidelines. A major emphasis of the alternative increases the use of uneven-aged management techniques.

This alternative is not considered in detail or modeled in FORPLAN. As submitted, the alternative is primarily a description of modified standards and guidelines, but does not provide sufficient detail to enter into a FORPLAN modeling effort. The Forest ID Team evaluated the proposed standards and guidelines; their response is displayed in Appendix U. The Sierra Club was also represented on the Timberlands and Rangelands/Riparian workgroups described on page 1-7. The Amenity Alternative was modified to emphasize the use of uneven-aged management in response to the comments from the Sierra Club and other groups.

Output/Activity	Base Year 1982	Decade <sup>1</sup>	CEE	LBU	PRO	RPA	MKT	TMB	SLV	IND1	RSP	MIX	PFD	UNE
ECONOMICS														
PNV (MM\$)	-		986.5	935.4	1077.8	935.9	913.8	899.5	910.5	886.8	892.3	934.4	933.0	892.3
Total Cost (MM\$)	11.5	1	14.4	9.6	13.5	15.6	17.7	13.6	12.3	16.2	12.5	14.1	15.8	12.5
		2	15.1	11.5	13.8	15.2	11.2	15.7	14.7	15.5	14.3	15.1	15.1	14.3
		3	18.0	11.1	20.9	18.5	15.1	16.6	14.0	18.9	14.2	17.8	17.5	14.2
		4	17.4	10.9	28.9	15.9	18.2	18.9	21.0	18.0	17.3	16.5	16.1	17.3
		5	23.0	11.4	23.9	23.1	20.6	20.3	18.9	21.4	20.8	23.0	22.8	20.8
RANGE														
Grazing (M AUM)	122.5	1	104.2	99.8	102.4	117.4	131.6	103.1	102.7	107.0	120.5	114.6	116.4	120.5
		2	97.3	90.5	96.3	113.7	131.6	100.7	98.1	97.4	117.7	107.6	108.9	117.7
		3	89.6	82.2	89.9	122.8	131.6	93.4	95.5	92.1	106.7	100.6	102.0	106.7
		4	89.9	84.0	92.5	122.8	131.6	98.4	100.2	92.6	105.4	98.3	100.4	105.4
		5	85.4	83.9	86.8	123.7	131.6	101.1	100.9	90.5	104.9	97.1	98.4	104.9
RECREATION														
Developed Recreation- Public & Private (M RVD)	86.0	1	101.0	101.0	101.0	101.0	101.0	101.0	101.0	101.0	101.0	101.0	101.0	101.0
		2	116.0	116.0	116.0	116.0	116.0	116.0	116.0	116.0	116.0	116.0	116.0	116.0
		3	131.0	131.0	131.0	131.0	131.0	131.0	131.0	131.0	131.0	131.0	131.0	131.0
		4	146.0	146.0	146.0	146.0	146.0	146.0	146.0	146.0	146.0	146.0	146.0	146.0
		5	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0	162.0

Table 2-3. Alternatives Eliminated from Detailed Study - Average Annual Outputs and Activities. (continued)

Output/Activity	Base Year 1982	Decade <sup>1</sup>	CEE	LBU	PRO	RPA	MKT	TMB	SLV	IND1	RSP	MIX	PFD	UNE
Dispersed Recreation (M RVD)	102.8	1	122.4	122.4	122.4	122.4	122.4	122.4	122.4	122.4	122.4	122.4	122.4	122.4
		2	142.9	142.9	142.9	142.9	142.9	142.9	142.9	142.9	142.9	142.9	142.9	142.9
		3	163.4	163.4	163.4	163.4	163.4	163.4	163.4	163.4	163.4	163.4	163.4	163.4
		4	184.0	184.0	184.0	184.0	184.0	184.0	184.0	184.0	184.0	184.0	184.0	184.0
		5	204.5	204.5	204.5	204.5	204.5	204.5	204.5	204.5	204.5	204.5	204.5	204.5
Hunting-related Dispersed Recreation * (M RVD)	98.4	1	114.4	114.4	114.4	114.4	114.4	114.4	114.4	114.4	80.3	92.9	92.9	80.3
		2	126.1	122.8	127.0	122.4	121.0	115.2	120.2	124.9	85.1	106.0	105.1	85.1
		3	121.3	112.0	120.8	115.4	106.7	102.8	97.4	120.0	84.2	102.2	99.9	84.2
		4	109.4	94.6	111.2	104.6	98.9	81.6	80.0	105.9	78.1	99.2	96.1	78.1
		5	120.9	93.3	113.6	111.4	100.2	68.7	69.2	110.1	79.2	107.1	106.0	79.2
* Hunting-related RVDs are separate from dispersed recreation RVDs														
Wilderness (M RVD)	7.1	1	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4	9.4
		2	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4
		3	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7	14.7
		4	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1
		5	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1	20.1
Wilderness (M Acres)	68.4	1	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4
		2	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4
		3	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4
		4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4
		5	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4	70.4

Table 2-3. Alternatives Eliminated from Detailed Study - Average Annual Outputs and Activities. (continued)

Output/Activity	Base Year 1982	Decade <sup>1</sup>	CEE	LBU	PRO	RPA	MKT	TMB	SLV	IND1	RSP	MIX	PFD	UNE
<b>TIMBER</b>														
Allowable Sale Quantity (including BVFSYU)	50.4	1	66.5	31.6	69.9	58.8	70.0	49.6	37.0	53.6	37.9	57.9	67.0	43.8
		2	66.5	37.8	109.4	58.8	14.7	49.6	46.7	53.6	42.4	57.9	57.8	43.8
		3	66.5	37.8	92.8	58.8	56.1	49.6	46.7	53.6	42.4	57.9	57.8	43.8
		4	66.5	37.8	100.1	58.8	56.1	49.6	60.6	53.6	51.7	57.9	57.8	43.8
		5	66.5	37.8	85.1	58.8	56.1	60.4	61.7	53.6	60.0	57.9	58.2	43.8
Long Term Sustained Yield (MMCF) (MMBF)	9.7		11.6	12.1	12.7	10.2	11.5	8.6	10.7	10.5	10.4	10.1	10.1	10.4
	58.9		70.9	74.0	77.2	62.5	70.3	64.2	65.6	64.3	63.8	61.6	61.9	63.8
Big Valley Federal Sustained-Yield Unit (MMBF)	13.7	1	6.6	5.4	6.6	11.0	6.7	11.0	5.9	11.0	8.5	11.0	11.0	8.0
		2	16.1	3.5	17.3	11.0	2.8	11.0	7.1	11.0	8.5	11.0	11.0	8.0
		3	9.5	1.1	18.3	11.0	3.7	11.0	7.9	11.0	8.5	11.0	11.0	8.0
		4	11.1	9.1	17.8	11.0	6.8	11.0	10.4	11.0	8.5	11.0	11.0	8.0
		5	10.7	3.8	14.5	11.0	17.8	11.0	10.4	11.0	8.5	11.0	11.0	8.0
<b>WATER</b>														
Water Yield (M Acre-Feet)	565.8	1	567.6	567.2	567.3	567.4	568.4	567.3	567.0	567.4	567.4	567.2	567.6	567.4
		2	568.3	567.9	568.2	568.2	568.2	567.9	568.1	568.1	567.6	568.1	568.3	567.6
		3	569.0	568.0	569.1	568.7	568.8	568.5	568.2	569.1	568.3	568.8	568.8	568.3
		4	568.9	567.6	570.2	568.4	568.8	568.2	568.3	568.3	568.0	568.5	568.6	568.0
		5	569.0	567.2	570.2	568.3	568.5	568.3	568.4	568.6	568.0	568.6	568.7	568.0

Table 2-3. Alternatives Eliminated from Detailed Study - Average Annual Outputs and Activities . (continued)														
Output/Activity	Base Year 1982	Decade <sup>1</sup>	CEE	LBU	PRO	RPA	MKT	TMB	SLV	IND1	RSP	MIX	PFD	UNE
<b>WILDLIFE AND FISH</b>														
Bald Eagle (Active Nests)	7.0	1	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
		2	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
		3	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
		4	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
		5	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
Peregrine Falcon (Active Nests)	0.0	1	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
		2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
		3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
		4	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
		5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Modoc Sucker (Suitable Stream Miles)	13.4	1	19.4	19.4	11.2	19.4	19.4	19.4	19.4	19.4	19.4	19.4	19.4	19.4
		2	19.4	19.4	7.4	19.4	19.4	19.4	19.4	19.4	19.4	19.4	19.4	19.4
		3	19.4	19.4	5.2	19.4	19.4	19.4	19.4	19.4	19.4	19.4	19.4	19.4
		4	19.4	19.4	0.0	19.4	19.4	19.4	19.4	19.4	19.4	19.4	19.4	19.4
		5	19.4	19.4	0.0	19.4	19.4	19.4	19.4	19.4	19.4	19.4	19.4	19.4
Deer (M Individuals)	22.8	1	41.2	40.9	39.6	39.9	39.6	39.8	41.4	39.7	28.0	32.6	32.6	28.0
		2	44.8	43.7	45.1	43.6	43.1	41.2	42.8	44.4	30.0	37.1	36.8	30.0
		3	43.2	40.0	43.0	41.3	41.3	37.0	35.1	42.8	29.7	35.8	35.1	29.7
		4	39.3	34.3	40.0	37.8	35.8	29.9	29.4	38.2	27.8	34.9	33.9	27.8
		5	43.2	33.9	41.1	40.1	36.3	25.4	25.9	39.7	28.1	37.4	37.1	28.1



**Table 2-3. Alternatives Eliminated from Detailed Study - Average Annual Outputs and Activities. (continued)**

Output/Activity	Base Year 1982	Decade <sup>1</sup>	CEE	LBU	PRO	RPA	MKT	TMB	SLV	IND1	RSP	MIX	PFD	UNE
Goshawk (Pairs)	71.0	1	73.0	73.0	71.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0
		2	73.0	73.0	48.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0
		3	73.0	73.0	41.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0
		4	73.0	73.0	30.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0
		5	73.0	73.0	17.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0
Resident Fish (M Pounds)	116.0	1	116.7	117.8	116.0	118.8	117.4	118.5	118.5	117.4	118.5	118.8	118.8	118.5
		2	117.4	119.5	115.0	121.5	118.8	120.9	120.9	118.8	121.0	121.5	121.5	121.0
		3	117.4	120.6	114.0	123.6	119.5	122.7	122.7	119.5	122.7	123.6	123.6	122.7
		4	117.4	121.6	112.0	125.6	120.2	124.4	124.4	120.2	124.4	125.6	125.6	124.4
		5	117.4	122.7	111.0	127.7	120.9	126.2	126.2	120.9	126.2	127.7	127.7	126.2
Total Wildlife & Fish User Days (M WFUD)	83.1	1	114.7	114.9	114.5	115.6	114.8	115.2	115.2	115.0	98.6	104.6	104.6	98.6
		2	130.4	129.2	130.4	130.7	128.2	126.2	128.7	130.7	112.0	121.6	121.2	112.0
		3	135.7	132.0	134.6	135.4	133.6	128.4	125.7	136.3	119.9	128.1	127.0	119.9
		4	137.0	130.8	136.7	137.9	132.5	125.5	124.7	136.6	124.6	134.3	132.8	124.6
		5	149.2	136.8	144.1	147.7	139.8	126.6	126.8	145.3	131.8	144.9	144.4	131.8
(A) Big Game (M WFUD)	32.8	1	57.2	57.2	57.2	57.2	57.2	57.2	57.2	57.2	40.2	46.5	46.5	40.2
		2	63.0	61.4	63.5	61.2	60.5	0.0	60.1	62.5	42.6	53.0	52.6	42.6
		3	60.6	56.0	60.4	57.7	57.8	51.4	48.7	60.0	42.1	51.1	50.0	42.1
		4	54.7	47.3	55.6	52.3	49.4	40.8	40.0	53.0	39.1	49.6	48.1	39.1
		5	60.5	46.7	56.8	55.7	50.1	34.4	34.6	55.1	39.6	53.5	53.0	39.6

**Table 2-3. Alternatives Eliminated from Detailed Study - Average Annual Outputs and Activities. (continued)**

Output/Activity	Base Year 1982	Decade <sup>1</sup>	CEE	LBU	PRO	RPA	MKT	TMB	SLV	INDI	RSP	MIX	PFD	UNE
(B) Upland Game, Waterfowl & Nongame (M WFUD)	24.6	1	28.0	28.0	28.0	28.6	28.0	28.2	28.2	28.2	28.6	28.3	28.3	28.6
		2	31.6	31.6	31.6	32.9	31.6	32.1	32.1	32.1	32.9	32.1	32.1	32.9
		3	34.6	34.6	34.6	35.9	34.6	35.1	35.1	35.1	35.9	35.1	35.1	35.9
		4	37.0	37.0	37.0	38.3	37.0	37.5	37.5	37.5	38.3	37.5	37.5	38.3
		5	39.1	39.1	39.1	40.4	39.1	40.4	40.4	39.6	40.4	39.6	39.6	40.4
(C) Resident Fish (M WFUD)	25.7	1	29.5	29.7	29.3	29.8	29.6	29.8	29.8	29.6	29.8	29.8	29.8	29.8
		2	35.8	36.2	35.3	36.6	36.1	36.5	36.5	36.1	36.5	36.5	36.5	36.5
		3	40.5	41.4	39.6	41.8	41.2	41.9	41.9	41.2	41.9	41.9	41.9	41.9
		4	45.3	46.5	44.1	47.3	46.1	47.2	47.2	46.1	47.2	47.2	47.2	47.2
		5	49.6	51.0	48.2	51.6	50.6	51.8	51.8	50.6	51.8	51.8	51.8	51.8

<sup>1</sup> Decade 1 is 1986 through 1995

Decade 2 is 1996 through 2005

Decade 3 is 2006 through 2015

Decade 4 is 2016 through 2025

Decade 5 is 2026 through 2035

Note: Decade 2-5 outputs are shown for long-range comparisons

Table 2-3. Alternatives Eliminated from Detailed Study - Average Annual Outputs and Activities. (continued)														
Output/Activity	Base Year 1982	Decade <sup>1</sup>	CEE	LBU	PRO	RPA	MKT	TMB	SLV	IND1	RSP	MIX	PFD	UNE
(B) Upland Game, Waterfowl & Nongame (M WFUD)	24.6	1	28.0	28.0	28.0	28.6	28.0	28.2	28.2	28.2	28.6	28.3	28.3	28.6
		2	31.6	31.6	31.6	32.9	31.6	32.1	32.1	32.1	32.9	32.1	32.1	32.9
		3	34.6	34.6	34.6	35.9	34.6	35.1	35.1	35.1	35.9	35.1	35.1	35.9
		4	37.0	37.0	37.0	38.3	37.0	37.5	37.5	37.5	38.3	37.5	37.5	38.3
		5	39.1	39.1	39.1	40.4	39.1	40.4	40.4	40.4	39.6	40.4	39.6	40.4
(C) Resident Fish (M WFUD)	25.7	1	29.5	29.7	29.3	29.8	29.6	29.8	29.8	29.6	29.8	29.8	29.8	29.8
		2	35.8	36.2	35.3	36.6	36.1	36.5	36.5	36.1	36.5	36.5	36.5	36.5
		3	40.5	41.4	39.6	41.8	41.2	41.9	41.9	41.2	41.9	41.9	41.9	41.9
		4	45.3	46.5	44.1	47.3	46.1	47.2	47.2	46.1	47.2	47.2	47.2	47.2
		5	49.6	51.0	48.2	51.6	50.6	51.8	51.8	50.6	51.8	51.8	51.8	51.8
<sup>1</sup> Decade 1 is 1986 through 1995 Decade 2 is 1996 through 2005 Decade 3 is 2006 through 2015 Decade 4 is 2016 through 2025 Decade 5 is 2026 through 2035 Note: Decade 2-5 outputs are shown for long-range comparisons														

## E. Alternatives Considered in Detail

### Introduction

This section 1) summarizes direction common to all alternatives; 2) explains management prescriptions and their relationship to management areas; 3) presents each alternative and associated tables showing outputs, costs, and prescription allocations; and 4) compares the alternatives.

### Direction Common to all Alternatives

Six types of constraints are common to all alternatives: 1) Minimum Management Requirements; 2) Timber Policy Constraints; 3) Minimum Implementation Requirements; 4) Regional Herbicide Policy; 5) Forest Standards and Guidelines; and 6) Forest Objectives. Items 1 through 5 are summarized below. Forest Objectives are outlined in the Forest Plan in Chapter 4, Section C. For a more complete description of minimum management requirements, timber policy constraints and minimum implementation requirements, see Appendix B, Modeling and Analysis Process.

### Minimum Management Requirements

Minimum Management Requirements (MMRs) are used to meet basic management requirements or management standards. MMRs come from 36 CFR 219.27 and generally represent requirements beyond the Forest Service's authority to change. They are based on statutes and regulations, in contrast to manual direction or agency policy. MMRs are absolute minimum requirements and are needed for consistency of analysis in all alternatives.

### Suitable Timberlands

National forest lands are classified as: (1) lands suitable for timber production; and (2) lands not suitable for timber production.

#### Suitable lands:

- are forested and currently producing or capable of producing industrial wood;
- are not withdrawn by Congress, the Secretary of Agriculture, or the Chief;
- are capable of timber production without irreversible damage to soils, productivity, or watershed conditions;
- are capable of meeting Regional stocking levels within 5 years after final harvest; and
- offer adequate information to project responses to timber management activities.

### Threatened and Endangered Species

The Forest provides habitat for threatened and endangered (T & E) species: bald eagle, peregrine falcon, northern spotted owl, and Modoc, Lost River, and shortnose suckers. Objectives for the species are:

- to protect and improve habitat in resource management and fire suppression activities;
- to prevent the destruction or degradation of habitat considered critical for T & E species.
- to provide high and medium capability habitat, as defined in habitat capability models, sufficient for recovery of T & E species.

#### Bald Eagle

The Forest provides habitat for 10 active and 11 potential nest territories, and three winter roost areas. All current suitable nesting habitat (both existing and potential) and all winter roosting areas are managed for recovery of the species.

#### Peregrine Falcon

The population recovery level established for the Modoc in September 1980 is 3 pairs. The Forest will begin peregrine falcon reintroduction planning and program implementation in the next decade.

#### Northern Spotted Owl

Until 1989, only one spotted owl had been documented on the Forest, in the Warner Mountains. In 1989, portions of the Big Valley, Doublehead and Warner Mountain Ranger Districts were intensively surveyed for spotted owls.

Spotted owls were documented on the Doublehead Ranger District near the Medicine Lake Highlands. Responses were heard on four occasions. On two of those occasions, a pair was suspected. No nest sites were located, and the birds could not be found during daytime surveys. No birds were located on the Big Valley or Warner Mountain Districts.

The Forest will continue to survey the Medicine Lake area. Our goals are to survey habitats where owls responded in 1989, and expand surveys into areas that are planned for timber harvest activities in the future. Until further data regarding owl occupancy of this area is collected and analyzed, older seral stages will be retained.

#### Modoc Sucker

The current population of the Modoc sucker is estimated at less than 5,000 fish in drainages on the Forest. Recovery objectives for the species are (1) to protect

populations and habitat in the five streams designated as critical habitat; (2) to assess habitat suitability of streams for possible reintroduction of Modoc suckers into two other drainages within their historical range; and (3) to enhance habitat in the five current and two potential streams to achieve medium to high habitat capability.

#### *Lost River and Shortnose Suckers*

The Lost River and Short-nose sucker are two large sucker species that inhabit lakes and reservoirs on the Lost River and Upper Klamath River systems. The Forest provides approximately 35 miles of stream habitat and 400 acres of reservoir habitat. The system probably contains pure Lost River sucker. The purity of shortnose suckers in the system is less certain. Genetic analyses are being conducted in 1990 to determine the species' purity in the Clear Lake drainage. Current population sizes of the species are unknown. A recovery plan and action plan for both species is being developed; when completed, it will define minimum management requirements for both species.

#### **Viable Populations of Fish and Wildlife**

Provide adequate fish and wildlife habitat to maintain viable populations of existing native and desired non-native vertebrate species.

#### *Goshawks*

The minimum number of goshawk pairs needed to maintain population viability is 73. The territory for each pair must contain at least 100 acres of habitat to provide suitable conditions for the nest stand and an alternate nest stand.

#### **Snag-Dependent Wildlife Species**

To sustain snag-dependent wildlife species on > 20 timberlands, an average of 1.5 snags per acre is required with the following specifications:

- 1.2 snags per acre 15-24 inches dbh and > 20 feet high;
- 0.3 snags per acre > 24 inches dbh and > 20 feet high.

On < 20 timberlands, an average of 0.5 snags per acre is required, with all snags at > 24 inches dbh and > 20 feet high.

#### **Wildlife Species Dependent on Dead and Down Material**

In order to maintain habitat for wildlife species dependent on dead and down material, a minimum average of 1 down log per acre (at least 20 inches in diameter at the large end and 10 feet long or longer) is required after timber harvest operations.

#### **Diversity**

Provide a minimum of 5% of each timber type/seral stage combination to ensure that a threshold level of vegetation diversity is provided. The following table specifies amounts of each seral stage by timber type:

Timber Type	Acres	
	> 20 Cu.Ft.	< 20 Cu.Ft.
Ponderosa Pine	13,083	7,499
Mixed Conifer	7,679	2,322
Red Fir	666	2
Lodgepole Pine	804	224

If a timber type/seral stage combination is below 5%, the required amounts are met within the planning horizon.

Distribution of timber types and seral stages provides an appropriate distribution of habitat to support viable populations of all other wildlife and fish species not specifically discussed in MMRs. Diversity of other vegetation communities is based on potential natural communities.

#### **Riparian Areas**

Riparian areas are managed under the principles of multiple-use sustained yield while emphasizing protection of riparian-dependent resources.

No practices or prescriptions are applied to riparian areas that cause detrimental changes to water quality, aquatic flora and fauna, hydrophytic vegetation, and riparian-dependent wildlife species. On suitable timberlands, timber management is permitted, but timber yields are treated as a non-interchangeable component of the allowable sale quantity. On other lands, removing or altering vegetation is restricted to no more than a 30% reduction in the potential ground cover that would naturally occur.

#### **Water and Soil Productivity**

Best Management Practices are used to conserve soil and water resources and prevent significant or permanent impairment of soil productivity. We use cumulative watershed thresholds to limit disturbance in individual watersheds.

#### **Timber Policy Constraints**

On suitable timberland, timber management is permitted, but timber yields are reduced. If planned harvests

are not available from these areas, yields from other suitable lands will not be substituted.

Timber Policy Constraints ensure that timber harvest meets sustained yield, culmination of mean annual increment, and dispersion requirements. Some examples of timber policy constraints are: rotation length and culmination of mean annual increment (CMAI); and requirements for timber harvest scheduling, sustained yield, harvest flow, and dispersion.

#### **Rotation Length and Culmination of Mean Annual Increment**

All even-aged stands scheduled for harvest reach culmination of mean annual increment (CMAI) in utilized cubic feet of merchantable size trees (13-inch dbh and 50 feet high). Regenerated timber stands are regarded as generally culminated in growth at the age corresponding to 95% of the apparent culmination.

Rotations represent the range from CMAI to the end of the planning horizon, that is, 70 years (CMAI) and greater.

#### **Sustained Yield Requirements**

Forests will ensure a perpetual timber harvest at sustained yield level by the end of the planning horizon. That portion of the Forest managed under even-aged regimes should be generally regulated.

#### **Harvest Flow Requirements**

A harvest flow constraint is included to maintain community stability. It prevents wide fluctuations of timber outputs from one decade to another. It is applied only in alternatives that depart from nondeclining, even-flow policy. Timber output after the first decade is not allowed to fluctuate more than 15% from the previous decade.

#### **Dispersion**

The intent of the dispersion rule is to prevent regeneration units which are still openings from being adjacent to each other. Dispersion also strives to leave logical harvest units between openings for future management.

An opening created by timber harvesting using even-aged harvesting methods will no longer be considered an opening when the trees (determined by forest type and site class) are 4.5 feet high and are free to grow.

#### **Minimum Implementation Requirements**

Minimum Implementation Requirements (MIRs) ensure that alternatives are minimally acceptable and implementable on the ground. Procedures for defining MIRs are specified by the Region. They are within agency

control; but little discretionary control exists regarding their application at the Forest level. MIRs do not apply to benchmarks, but are applied to all alternatives.

#### **Sensitive Plants**

Sensitive plant species are managed to ensure that they are not threatened or endangered by Forest activities.

#### **Visual Resource**

Requirements are placed on lands viewed from officially designated California State and County scenic highways, as identified in the 1970 State Scenic Highway Master Plan. This is achieved by maintaining foregrounds and middlegrounds of scenic corridors in partial retention visual quality.

The highways involved on the Modoc include approximately 50 miles of State Highways 299 and 139.

#### **Regional Herbicide Policy**

In February 1989, the Pacific Southwest Region of the USDA Forest Service released a final Environmental Impact Statement for Vegetation Management for Reforestation. It includes detailed discussions and analyses of a preferred alternative (emphasize local management flexibility), alternatives to the preferred (including no vegetation management, no application of herbicides, and no aerial application of herbicides), and the consequences to the environment.

Based on the preferred alternative in the FEIS (hereby incorporated by reference into the Modoc EIS and Forest Plan), all alternatives in the Modoc Forest Plan and EIS are predicated on the continued use of the full range of vegetative treatments. The Forest Plan (see Chapter 4—*Forest Standards and Guidelines for Timber*) directs that 1) the selection of any treatment will be made at the project level based on a site-specific analysis of the relative effectiveness, environmental effects, and costs of the feasible alternatives, and that herbicides will be selected only if their use is essential to meet management objectives; and 2) monitoring and enforcement plans to implement specific measures will be developed for site-specific projects and described in the environmental analyses for these projects.

All alternatives in this EIS assume continued use of the full range of treatments for reforestation and timber stand improvement, including mechanical, biological, chemical, and thermal.

The analysis below describes effects on timber yield, land base and costs if the Region's Vegetation Management for Reforestation EIS alternatives:

- Recommended Alternative (emphasize local management flexibility);
- No Application of Herbicides;
- No Aerial Application of Herbicides are applied to the FEIS alternatives and adapted to the Modoc conditions.

The analysis indicates a reduction in ASQ if no herbicides are used due to the loss of conifer stocking and growth of potential crop trees. This reduction would range by alternative between 15% and 20%. The need for alternate treatments would raise annual costs significantly, between 16% and 23%. There would be no change in the suitable land base for any alternative because all lands are assumed to be regenerable to minimum stocking standards within five years after harvest, using meth-

### The Effect of Various Herbicide Use Policies on LMP Alternatives – Intensively Managed Lands Only<sup>1</sup>

Effect	Herbicide Policy	PRF	CUR	RPD	IND	RBU	AMN
Average Annual ASQ <sup>2</sup>	Recommended Alternative – MMBF	41.0	48.9	71.9	56.7	36.7	27.3
	No herbide use – MMBF	33.6	39.1	57.5	45.4	29.4	23.2
	Percent Change	-18%	-20%	-20%	-20%	-20%	-15%
	No aerial herbicide use – MMBF	41.0	48.9	71.9	56.7	36.7	27.3
	Percent Change	0%	0%	0%	0%	0%	0%
Annual Cost <sup>3</sup>	Recommended Alternative – MM\$	2.6	2.6	4.4	4.6	1.9	2.5
	No herbide use – MM\$	3.1	3.2	5.4	5.6	2.3	2.9
	Percent Change	19%	23%	23%	22%	21%	16%
	No aerial herbicide use – MM\$	2.8	2.9	4.9	5.2	2.1	2.7
	Percent Change	8%	12%	11%	13%	11%	8%
Average Cost per MBF <sup>4</sup>	Recommended Alternative – \$	63	53	61	81	52	92
	No herbide use – \$	92	82	94	123	78	124
	Percent Change	46%	55%	54%	52%	50%	35%
	No aerial herbicide use – \$	68	59	68	92	57	99
	Percent Change	8%	11%	11%	14%	10%	8%

<sup>1</sup> Policies are from R5 "Vegetation Management for Reforestation EIS" alternatives.

<sup>2</sup> Volumes are based on yields from Regulation Class I (Timber Full) and Regulation Class II (Timber Modified) lands.

<sup>3</sup> Includes all reforestation and timber stand improvement costs, except animal damage control.

<sup>4</sup> Average cost of reforestation and timber stand improvement per thousand board feet of timber produced.

ods other than herbicides. Eliminating aerial use of herbicides would not result in a reduction of ASQ but would raise annual costs by alternative between 8% and 13%.

#### **Forest Standards and Guidelines Common To All Alternatives**

Standards and Guidelines are management actions applicable to all lands within the Forest wherever and whenever relevant situations occur. Chapter 4 of the Forest Plan provides the complete text of Forest-wide Standards and Guidelines. They are summarized below.

#### **Air Quality**

- Maintain air quality to meet or exceed legal requirements of all levels of government.

#### **Cultural Resources**

- Inventory to identify cultural resource properties prior to any project, activity or license which may affect significant cultural resources.
- Evaluate cultural resources to determine National Register of Historic Places eligibility.
- Conserve properties that have been designated on, or are eligible for designation to, or that have not yet been evaluated for eligibility to, the National Register of Historic Places.
- Provide for the use and enhancement of cultural resources for educational, scientific, recreational, and other public purposes.
- Protect access and use of sites and locations important to traditional Native American religious and cultural practices.
- Protect cultural resources largely by directing activities or use away from sensitive areas, by maintaining confidentiality, and by informing Forest users of cultural resource protection requirements.

#### **Diversity (see Wildlife and Fish section)**

#### **Energy**

- Provide new energy sources by allowing wind, solar, hydroelectric, and biomass development. Accommodate development of geothermal, gas, and oil resources.
- Encourage firewood for home heating.
- Conserve energy through Forest management activities when using facilities, vehicles, and equipment.

#### **Facilities**

- Plan, design, construct and maintain a Forest transportation system to achieve resource management objectives, while protecting resource values.
- Cooperate with federal, State, and county agencies, and private companies to modify roads under their jurisdictions, if needed.
- Plan for and provide a stable and cost-efficient trail system through construction, reconstruction, and maintenance.
- Develop and manage Forest facilities to promote energy conservation and economic efficiency, and to meet other resource objectives.
- Administratively withdraw sites necessary for the internal Forest communications systems, and limit new electronic uses to existing, approved sites.

#### **Fire and Fuels**

- Protect national forest resources commensurate with values, hazards, risks, and management objectives.
  - Suppression: Confine, contain, or control all wildfires as specified in the applicable management area direction.
  - Prevention: Prevent fires commensurate with resource values at risk.
  - Detection: Maintain 1985 level of detection.
- Treat fuels commensurate with hazards, risks, economics, values, and losses which could be sustained in the project area. Manage fuels to prevent fire and to complement other resource management direction.

#### **Firewood**

Administer the Forest firewood program to provide opportunities for the orderly removal of firewood, increasing slash utilization, protecting resources, and encouraging local energy conservation.

- Provide for personal use first; provide for commercial uses as supplies allow.
- Limit firewood removal as needed to assure viability of cavity-, down log-, and snag-dependent wildlife populations.

#### **Geology**

- Protect resources and investments from geologic hazards.



- Protect the quantity and quality of groundwater. Conduct geologic resources inventories to support project-level assessments.

#### **Lands**

- Initiate land adjustments to achieve a land ownership pattern that facilitates management and reduces administrative costs.
- Issue special use permits in conformance with Management Area direction.
- Avoid proliferation of separate utility rights-of-way. When establishing transportation and utility corridors, give priority to accommodating both existing and planned linear facilities within single corridors.
- Survey, mark, and post all property lines and corners to Forest Service standards prior to implementing National Forest programs adjacent to these property lines.
- Resolve unauthorized occupancies on National Forest lands through removal of occupancy, issuance of special use permits, or land adjustments (including Small Tracts Act).
- Acquire rights-of-ways needed to efficiently manage Forest resources.
- Pursue land withdrawals when needed to protect Forest improvements and areas of special significance.

#### **Law Enforcement**

Enforce laws and regulations on the Forest by ensuring an adequate internal law enforcement program and staff, and by coordinating and cooperating with federal, state, and local law enforcement agencies.

#### **Minerals**

- Encourage exploration and development of mineral resources, subject to valid existing rights or withdrawals.
- Prohibit unnecessary disturbance of the surface and provide for reasonable surface restoration through provisions in permits, leases and operating plans.
- Deny mineral leases within the South Warner Wilderness and those lands which have been temporarily withdrawn from mineral leasing as a result of proposed land exchanges.
- Apply on a site-specific basis mineral lease stipulations (no-surface-occupancy, conditional and no-surface occupancy, and resource notices) as shown in Appendix I of the Forest Plan.

#### **Pests**

Reduce impacts of forest pests on all resources to acceptable levels through integrated pest management.

#### **Range**

- Manage rangeland vegetation to provide for healthy ecosystems; and to make forage available for livestock, wild horses, and wildlife.
  - Maintain or enhance satisfactory ecological condition.
  - Rangeland in unsatisfactory ecological condition will be the highest priority in implementing allotment management plans.
  - Measure forage utilization using key forage plants. As a general rule, allow up to 50% by weight on permanent rangeland in satisfactory ecological condition; allow no more than 30% utilization by weight on rangelands in unsatisfactory ecological condition.
  - Improve water quality, fisheries habitat and riparian areas on those allotments which require such management.
- Manage wild free-roaming horse herds to achieve a Forest population between 275 and 335 (on the average, 305 animals).
- Coordinate resource planning opportunities with BLM, SCS, and individuals to achieve Forest goals, standards and guidelines, and objectives.
- Use the Experimental Stewardship Program to gain understanding of and support for resource management plans; and to experiment with innovative approaches for improved management.
- Coordinate resource management with County, State, and other federal agencies especially in noxious weed control efforts. Control noxious weeds where the need is identified.
- Continue the ecosystem classification program.

#### **Recreation**

- Establish and maintain appropriate recreation facilities and services.
- Provide a variety of developed recreation sites from remote locations to modern facilities.
- Emphasize operating and managing Medicine Lake and Blue Lake campgrounds as major recreation areas.
- Manage a full spectrum of trail opportunities.

- Design resource management activities to complement the Recreation Opportunity Spectrum (ROS) classes.
- Permit dispersed recreation activities in undeveloped areas of the Forest unless otherwise prohibited for resource protection.
- Provide off-highway vehicle (OHV) recreation where OHV activities will not cause resource damage nor conflict with other uses.
- Provide interpretive services which explain the Forest environment and management programs, inform visitors of the availability and locations of recreation opportunities, and encourage public use of the Forest.
- Provide for the needs of physically handicapped persons in facility designs.
- Minimize Forest competition with private-sector recreation-oriented services.
- Evaluate existing and planned exclusive use recreation developments, and provide for removing those on lands needed for higher public purposes.

#### **Research Natural Areas**

Manage the Devil's Garden Research Natural Area to protect the values for which it was established.

#### **Riparian Areas**

- Manage lakes, perennial reservoirs, meadows, seeps, springs, and streamside management zones according to the Riparian Area Management Prescription and Appendices M, N, and T of the Forest Plan.
- Where uses conflict, favor protection of riparian-dependent resources (water, fish, vegetation, wildlife, and aesthetics) over other resources.
- Restore degraded riparian areas through structural and nonstructural improvements. Structural improvements include gully control, stream bank stabilization, and fencing. Nonstructural improvements include modification of timber harvesting within streamside management zones or changes in grazing management.

#### **Sensitive Plants**

- Manage and protect sensitive plant species to prevent listing as threatened or endangered.
- Protect and conserve sensitive plant species through direct and cooperative programs.

#### **Soils**

- Maintain long-term soil productivity by minimizing soil compaction and erosion.
- Treat all degraded watersheds causing active soil degradation in a cost-effective manner and on a priority basis according to beneficial uses. The highest priority beneficial uses are domestic use and fisheries. Design improvement activities to meet management objectives. Completion target is two decades.
- Complete an SRI Order 2 or field-verified SRI Order 3 during the planning phase of each site-disturbing or vegetative manipulation project. Assess impacts of proposed management activities on the soil resource.

#### **Special Interest Areas and National Natural Landmarks**

Manage special interest areas to protect the values for which they were established. Evaluate Dismal Swamp for nomination as a potential botanical SIA. The Forest will also evaluate seven cultural resource sites for SIA designation. Recommend Burnt Lava Flow and Medicine Lake Glass Flow SIAs for nomination as NNLs (Appendix F).

#### **Timber**

- Prepare and offer a sustained yield of sawtimber.
  - Schedule timber harvest only on lands suitable for timber production. Unsuitable lands may not be harvested except for salvage sales, sales to benefit other multiple-use values, or activities to meet other resource objectives.
  - Implement the Timber Sale Planning Process, incorporating interdisciplinary analysis into all timber projects.
  - Reforest suitable land planned for regeneration within 5 years.
  - Allow up to 15% of a clearcut perimeter to open into other clearcuts. Regeneration openings will be considered openings until the minimum number of trees (as specified in the FSH) are 4.5 feet tall. Another regeneration unit may not be cut immediately adjacent to a regeneration opening until this restocking has occurred.
  - Practices will not necessarily be chosen because they give the greatest dollar return or the greatest wood outputs, but treatments will be practical in terms of costs of preparation and administration, transportation systems, cutting methods, and logging requirements.

- Reforestation will consist of planting tree species that reflect the natural forest diversity, where possible, on properly prepared sites.
  - Where vegetation competition will substantially inhibit tree survival and growth, analyze a full range of available vegetation management techniques. Select the best method at the project level through site-specific environmental analysis that considers the relative effectiveness of these techniques and implements the applicable prescription and management area direction.
  - Plantations will receive release treatments before competition from such vegetation as grass, forbs, and shrubs significantly inhibits tree growth or threatens plantation success.
  - The health and vigor of trees will be maintained through integrated pest management and appropriate silvicultural techniques.
- Encourage increased utilization of wood products.
  - Coordinate slash disposal and fuel treatment to ensure regeneration and reduce the risk of wildfires while providing for wildlife needs and soil and water protection.
  - Achieve and maintain, through the interdisciplinary process, quality timber sale layout and associated transportation system planning.

#### **Visual Resources**

- Manage visual resources to prevent unacceptable alteration of landscapes by designing and implementing management activities to meet or exceed adopted Visual Quality Objectives (VQOs).
- Permit temporary departures from adopted VQOs to protect long-term visual values, such as in timbered areas highly susceptible to insect or disease epidemics.
- Give special consideration to visual resources when activities are planned within the foreground zone of State Highways 139 and 299.

#### **Water**

- Implement Best Management Practices (BMPs) to meet water quality objectives and maintain and improve the quality of surface water on the Forest. Identify methods and techniques for applying BMPs during project level environmental assessments and incorporate into the associated project plan and implementation documents (See Appendix N in the

Forest Plan). Monitor for compliance and effectiveness.

- To minimize the cumulative impacts of activities on stream channel conditions and water quality, assess and monitor the effects of each land-disturbing activity on the appropriate second- or third-order watershed prior to undertaking.
- Treat degraded watershed areas affecting water quality in a cost-effective manner and on a priority basis according to the Watershed Needs Improvement inventory. The highest priority beneficial uses are domestic use and fisheries. Design improvement activities to meet management objectives. Completion target is two decades. Monitor for effectiveness.
- Acquire and administer water rights for National Forest uses as required by State laws and regulations.

#### **Wilderness and Roadless Areas**

Maintain wilderness values in the South Warner Wilderness.

#### **Wildlife and Fish**

- Threatened and Endangered Species
  - Within designated bald eagle habitat:
 

Manage all current suitable nesting habitat (both existing and potential) and all winter roosting areas.

The Forest will manage for recovery of the species.
  - Within designated peregrine falcon habitat begin peregrine falcon reintroduction planning and program implementation in the next decade for a minimum of three suitable reintroduction sites.
  - Within designated Modoc sucker habitat, manage all streams containing Modoc suckers as directed in the Riparian Area Management Prescription and the Modoc Sucker Recovery Action Plan.
  - Within designated Lost River and shortnose sucker habitat, manage all streams containing these species as directed in the riparian area management prescription and, when completed and approved, the recovery plans for these species.
  - Within potential northern spotted owl habitat, continue surveying for owls and nest sites where owls or nest sites are found. Consult with the Fish

and Wildlife Service to determine biological significance of these findings.

– Sensitive Species

- Within designated goshawk nest stands:  
Protect all suitable goshawk nest stands (of at least medium habitat capability) - for a minimum of 73 sites Forest-wide.
- Within willow flycatcher habitat (primarily riparian areas), maintain viable populations through application of the Riparian Area Management Prescription.
- Within potential bighorn sheep habitat:  
Manage in accordance with the Environmental Assessment for the California Bighorn Sheep Reintroduction and *California Mountain Sheep Recovery Guidelines for Northeastern California* (when completed).

– Other Management Indicator Species

- Within selected wetlands and riparian areas, manage for sandhill crane nesting habitat.
- Within designated golden eagle, osprey, Swainson's hawk, and prairie falcon habitat manage all currently active nest territories.
- Within designated sage grouse habitat, manage areas with an understory of big sagebrush and low sagebrush within an eight-mile radius of all identified leks (strutting grounds).
- Within mule deer habitat:  
Seasonal forage requirements for deer are:

<b>Spring/ Summer Range</b>	Young, abundant browse ranges - eight pounds of forage per deer per day or four deer per Animal Unit Month (AUM) - decadent or low frequency browse ranges - five pounds of forage per deer per day or six and one-half deer per AUM.
<b>Fall Range</b>	Four pounds of forage per deer per day or eight deer per AUM.
<b>Winter Range</b>	Three pounds of forage per deer per day or eleven deer per AUM.

Include deer seasonal forage requirements in assessment of capacity and stocking levels for all allotments.

- Within pronghorn habitat:

The forage requirement for pronghorn is one pound of herbaceous forage per pronghorn per day, which is equivalent to 30 pronghorn per Animal Unit Month (AUM).

- Within trout and largemouth bass habitat, manage streams, lakes, and reservoirs by applying the Riparian Areas Management Prescription.

– Special Habitats

- Snags

Suitable timber lands (> 20 cu.ft./acre)

Montane Conifer, Riparian and Aspen (includes ponderosa pine, white fir, mixed conifer, lodgepole pine, red fir, subalpine forest, and black oak vegetation types):

Average Density:	
15-24" DBH	1.2 snags/acre
> 24" DBH	0.3 snags/acre
<b>Total</b>	<b>1.5 snags/acre</b>
<b>Location</b>	Preference is around meadows
<b>Acceptable species for snags</b>	Ponderosa pine, Jeffrey pine, western white pine, sugar pine, red fir, white fir, lodgepole pine, black oak, mountain hemlock

Low Productivity Timberlands (< 20 cu.ft./acre)

These lands produce <20 cubic feet per acre per year and include vegetation types described under Montane Conifer. Juniper and other non-commercial species may be present.

Average Density:	
> 24" DBH	0.5 snags/acre
<b>Total</b>	<b>0.5 snags/acre</b>
<b>Location</b>	No preference due to the dispersed nature of trees on these lands.
<b>Acceptable Species</b>	Those species listed under Montane Conifer.

## Snag Recruitment

Timber sales will be regulated to achieve snag densities. Green and salvage sales will provide for snag recruitment by designation, leaving an adequate number of living trees for future snags and treating living trees to produce snags.

### ● Dead and Down Materials

In all coniferous vegetation types (outside marten habitat), leave a minimum average of one down log per acre, at least 20 inches in diameter at the large end and 10 or more feet long. In areas of known or suspected marten habitat, leave a minimum average of ten cull logs per acre, at least 15 inches in diameter and 15 feet long. In ponderosa pine, leave all dead and down pine logs up to the one-log average.

Where possible, leave an average of one slash pile that is  $\leq 15$  feet wide and  $\leq 12$  feet high per acre.

### ● Oaks

On deer intermediate and winter ranges, maintain at least 36 square feet of basal area of oak stands per acre. If oaks do not naturally occur to at least this density, maintain that which exists.

On all other areas where oaks occur, maintain at least 10 square feet of basal area per acre. If oaks do not naturally occur to at least this density, maintain existing stands.

### ● Vegetative Diversity

Maintain a minimum of 5% of each seral stage for eastside pine, mixed conifer, white fir, red fir, and lodgepole pine on lands capable of growing  $> 20$  cubic feet per acre per year.

Maintain a minimum of 5% in seral stages 1, 2, 3a, 4a and 4a-older for each conifer and hardwood vegetation type on lands growing  $< 20$  cubic feet per acre per year. Requirements for high and low productivity lands will not be interchangeable.

Maintain natural diversity of non-timbered vegetation communities.

- Coordinate with the State Fish and Game Departments, other federal and state agencies, private conservation groups, and interested publics to fulfill comprehensive fish and wildlife programs.

## Wild and Scenic Rivers

- Evaluate Willow and Boles creeks for classification and suitability as an inclusion to the Wild and Scenic River System.
- Provide interim protection of outstandingly remarkable values (cultural resources) in the Willow and Boles drainages by applying cultural resource standards and guidelines.

## General

- Provide an efficient public service “HOST” program with the viewpoint of the user, visitor, or client as priority.
- Incorporate energy conservation principles into all management activities.
- Consider all resources in projects, regardless of size or potential impact on the environment. The environmental analysis required by FSM will determine whether a project may proceed under a categorical exclusion, or requires documentation in an Environmental Assessment or Environmental Impact Statement.

## Management Prescriptions and Management Areas

Alternatives are based on management prescriptions, each of which is a strategy for managing the resources of an area of land. Each prescription is a set of compatible management practices that addresses issues or concerns and the requirements of law and policy. Prescriptions describe resource emphases, methods of management, and lands to which they may be applied. Within one management emphasis, a range of management intensities is possible. Prescriptions are the same for all alternatives, but alternatives differ in the number and distribution of acres allocated to each prescription, except for the Raptor and Riparian prescriptions used to meet minimum management requirements. In each alternative, every acre of the Forest is allocated to a management prescription.

Chapter 4 of the Forest Plan carries the full text of all prescriptions. They are summarized below and in Table 2-4.

The ID Team subdivided the Forest into 22 Management Areas (MAs), the boundaries of which are constant in all alternatives. Management goals and objectives may be specified for each MA, and several prescriptions may be applied to different parts within a MA.

### **Minimum Level Management Prescription — 1**

This prescription maintains existing physical characteristics of the land through custodial management. Minimum management and protection and maintenance of environmental values are the objectives.

Off-highway vehicle use is permitted.

Lands under this prescription are not suitable for capital investments. They include areas with steep slopes, water, or no vegetation. Other lands suitable for this prescription include: rangelands uneconomical to manage; non-productive forest lands; productive forest lands uneconomical to manage; tentatively suitable timberlands reserved for late seral stage and furbearer habitat; and lands scheduled for exchange. Firewood cutting is not permitted.

The Forest maintains existing roads and trails that are necessary for access. Others will be obliterated or allowed to revegetate naturally. Utility corridors and other special uses may exist. Activities such as mineral exploration, hunting, fishing, other dispersed types of recreation use, and previous timber harvesting are evident.

Current conditions are maintained and influenced primarily by natural forces.

### **Wilderness Prescription (Standard) — 2**

Manage existing units of the National Wilderness Preservation System in accordance with wilderness values and character. Primitive recreation opportunities are provided. Trails are maintained for hiking and packstock and equestrian use. Mechanized travel and motorized equipment are not permitted. Fish and wildlife species are affected by natural vegetative succession. Livestock grazing is permitted. Timber is not harvested or managed. Firewood cutting is not permitted. Mining is no longer permitted, subject to valid existing rights. Fire protection activities minimize suppression impacts while seeking to maintain or enhance long-term Wilderness values.

### **Wilderness Prescription (Low Standard) — 3**

Manage at low standard maintenance level all existing units of the National Wilderness Preservation System in accordance with wilderness values and character. Primitive recreation opportunities are provided. Trails are maintained for hiking or equestrian use. Mechanized travel and motorized equipment are not permitted. Fish and wildlife species are affected by natural vegetative succession. Livestock grazing is permitted. Timber is not harvested or managed. Firewood cutting is not permitted.

ted. Mining is no longer permitted subject to valid existing rights. Fire protection activities minimize suppression impacts while seeking to maintain or enhance long-term wilderness values. Air pollutants arising from Forest activities are managed to maintain air quality of the Wilderness.

### **Semi-primitive Non-motorized Dispersed Recreation (SPNM) Management Prescription — 4**

Emphasize high-quality semi-primitive non-motorized dispersed recreation in a natural-appearing environment. Permanent roads are not constructed and public access by vehicle is not permitted; off-highway vehicles are not allowed. Generally, fish and wildlife are affected by natural vegetative succession, although habitat improvements are permitted. Livestock grazing is permitted as are range improvement projects. Timber harvest is not scheduled, but may occur to enhance recreational values. Firewood cutting is not permitted. Vegetation treatments maintain a predominantly natural-appearing environment. Mineral exploration and development is permitted with restrictions.

### **Developed Recreation Site Management Prescription (Standard) — 5**

Manage developed recreation sites to maintain or enhance developed recreation values and opportunities on a cost-effective basis, while simultaneously managing riparian area resources. Manage other resources to be compatible with developed recreation management objectives. The character of the landscape appears natural or nearly natural. Off-highway vehicle use is confined to designated roads. Livestock grazing is permitted outside the recreation season on a site-by-site basis. Wildlife and fish habitat improvements are permitted. Timber harvesting may be used to improve sites for recreation or visual purposes, but no scheduled harvest is planned. Firewood cutting is permitted, but restricted. Most sites are closed to mineral entry. Special roads and trails are provided into sites.

### **Developed Recreation Site Management Prescription (Low Standard) — 6**

Manage developed recreation sites to maintain or enhance developed recreation values and opportunities on a cost-effective basis, while simultaneously managing riparian area resources. Manage other resources to be compatible with or complementary to developed recreation management objectives. The character of the landscape appears natural or nearly natural. Off-highway vehicle use is confined to designated roads. Livestock grazing is permitted outside the recreation season on a

site-by-site basis. Timber harvesting may be used to improve sites for recreation or visual purposes, but no scheduled harvest is planned. Firewood cutting is permitted, but restricted. Most sites are closed to mineral entry. Special roads and trails are provided into sites.

#### **Visual Retention Management Prescription – 7**

Manage the foreground zone of the visual corridor to maintain or enhance the visual resource and viewing opportunities through the design and implementation of vegetative management activities. Recreation opportunities are provided in a natural-appearing environment. Off-highway vehicle use is permitted, but with restrictions. Fire management, wildlife, and range improvements are permitted. A scheduled harvest of timber occurs, but with reduced yields. Roads and trails are allowed, but limited. The area is open to mineral entry, but with restrictions.

#### **Special Areas Management Prescription – 8**

Manage selected areas to maintain their special features, generally in an unmodified condition. These areas include Research Natural Areas (RNAs), Special Interest Areas (SIAs) and National Natural Landmarks (NNLs). SIAs and NNLs are of special interest because of unusual scenic, historic, prehistoric, cultural, scientific, natural, or other values, excluding wilderness values. RNAs are designated for research, study, observation, monitoring, and non-destructive, non-manipulative educational activities. They provide for genetic diversity of flora and fauna, and protection of threatened and endangered species and their habitat. They may also include areas of Native American Indian traditional religious or cultural value. They are managed to meet the Visual Quality Objective of Preservation or Retention. Off-highway vehicle use is not permitted. Firewood cutting is not permitted. Most sites are closed to mineral entry.

This prescription is applied to 14,588 acres distributed within 3 management areas. Acreage for the Raider Basin Research Natural Area is included in the Wilderness. Management direction is contained in this prescription. The size and configuration of the areas will vary. Some will be large, contiguous areas, while others may be isolated, small inclusions.

#### **Raptor Management Prescription – 9**

Manage habitat to promote the recovery of the bald eagle and to maintain the viability of goshawks. Dispersed recreation opportunities are in a natural or nearly natural-appearing environment. Off-highway vehicle use has seasonal restrictions. Wildlife management indicator

species are favored in general, particularly the bald eagle and goshawk. Wildlife habitat improvements are permitted. Livestock grazing occurs if forage is available and improvements are allowed. Timber harvesting is one means of managing and improving habitats for meeting the Raptor Management Prescription. Timber harvest in these areas will be done only as a means of meeting prescription objectives. No volume output is planned. Personal use firewood cutting is not permitted. Bald eagle areas are open for mineral leasing with special stipulations. Roads and trails are allowed, but limited.

#### **Rangeland Management Prescription – 10**

The primary emphasis is to manage rangeland vegetation, providing for healthy ecosystems and making forage available for use by livestock, wildlife, and wild horse herds. The vegetation management goal is to provide desired expressions of herbaceous, shrub and forest vegetation according to site potential and resource needs. Resource uses occur to the extent that they do not adversely affect maintenance of the desired vegetation expression. Livestock grazing is permitted and recreation facilities may be located here consistent with Forest-wide Standards and Guidelines.

To achieve vegetation management objectives through livestock grazing, either a maintenance or extensive management level is applied to grazing allotments. To allotments with a maintenance management level, we minimally use structural improvements such as fences and water developments. In extensively managed allotments, we use structural improvements to improve distribution and more fully utilize allotment capacity. Nonstructural range improvement, such as brush control, generally are not used.

The landscape appears nearly natural; if changes are made, they are not distracting to the average Forest visitor. Recreation opportunities are provided in a roaded, natural-appearing environment. Off-highway vehicle use is permitted.

Wildlife management indicator species whose preferred habitat is rangeland are maintained or enhanced.

Firewood harvesting is permitted, as is geothermal and oil and gas leasing, and mineral entry and development. Road construction and reconstruction are allowed.

#### **Rangeland Management with Forage Improvements (Range-Forage) Management Prescription – 11**

The primary emphasis is to manage rangeland vegetation, providing for healthy ecosystems and making forage available for use by livestock, wildlife, and wild horse

herds. These emphases are achieved through structural and nonstructural wildlife and livestock improvement projects. The vegetation management goal is to provide desired expressions of herbaceous, shrub and forest vegetation according to site potential and resource needs. Resource uses occur to the extent that they do not adversely affect maintenance of the desired vegetation expression. Livestock grazing is permitted and recreation facilities may be located here consistent with Forest-wide Standards and Guidelines.

To achieve vegetation management objectives through livestock grazing, either an extensive or intensive management level is applied to grazing allotments. Under extensive management, cultural practices, such as brush control or firewood cutting, are combined with fencing and water developments to better achieve vegetation management objectives. Cultural practices are also applied to ensure proper forage utilization by livestock and wildlife. Cultural practices such as seedings are permitted on allotments under intensive management to increase forage production.

Overall, management activities do not detract from the nearly natural appearance. However, in localized situations changes to the landscape are easily noticed and may attract attention. Recreation opportunities are provided in a roaded, natural-appearing to somewhat modified environment. Off-highway vehicle use is permitted.

Wildlife management indicator species whose preferred habitat is rangeland are maintained or enhanced.

Firewood harvesting is permitted and may be encouraged in some locations. Geothermal, oil and gas, and mineral exploration and development is permitted. Road construction and reconstruction are allowed.

#### **Even-Age Timber Management Prescription -- 12**

Manage timber stands to emphasize a scheduled production of sawlogs and miscellaneous wood products, utilizing state-of-the-art technology. Use even-age silvicultural systems on timberlands growing > 20 cubic feet per acre per year. The landscape appears nearly natural or modified. Dispersed recreation opportunities are in a roaded, natural-appearing, but modified environment. Off-highway vehicle use is permitted. In general, wildlife management indicator species are maintained but none are favored. Livestock grazing is permitted if forage is available and managed in a manner consistent with timber management objectives. Wildlife habitat improvement work is permitted, but subordinate to timber management objectives. Firewood harvesting is permitted. Geothermal, oil, gas, and mineral exploration and

development is also permitted. Road construction and reconstruction occur in support of timber production.

#### **Timber Management with Partial Retention Visual Quality (Timber-Visuals) Management Prescription -- 13**

Manage for a nearly natural-appearing landscape using even-age and uneven-age silvicultural systems on all timberlands growing > 20 cubic feet per acre per year. All management activities are subordinate to maintaining the visual quality objective of partial retention. All aspects of dispersed recreation activities in a roaded, nearly natural-appearing environment are accommodated. Off-highway vehicle use is permitted. Late seral stage wildlife management indicator species are favored under this prescription. Wildlife habitat improvement may occur if compatible with visual and timber management objectives. Livestock grazing is permitted if forage is available. Firewood harvesting may occur. Geothermal, oil, gas, and mineral exploration and development is permitted, but special surface stipulations may be required to ensure that development is compatible with visual objectives. Road construction and reconstruction are permitted.

#### **Timber Management with Forage Production (Timber-Forage) Management Prescription -- 14**

Manage timberlands to provide both sawtimber and forage outputs. Less than full yields of timber are expected under this prescription. Livestock and wildlife forage production is given equal emphasis with timber. Provide suitable habitat for mule deer, balancing forage and cover requirements with seasonal habitat needs. Management activities bring changes to the landscape ranging from nearly natural to modified. Recreation opportunities are provided in a near natural-appearing or modified environment. Off-highway vehicle use is permitted, but seasonally restricted. Wildlife management indicator species preferring early seral stage forest habitat, such as deer, are favored. Wildlife habitat improvement projects are permitted. Livestock grazing is permitted, as are range improvement projects. Even-aged timber management is applied, resulting in a scheduled harvest. Firewood cutting is allowed. Geothermal, oil, gas, and mineral exploration and development are permitted. Road construction and reconstruction occur in support of timber and forage production.

#### **Uneven-aged Timber Management Prescription -- 15**

Manage timber stands to emphasize a scheduled production of sawlogs and miscellaneous wood products, utilizing state-of-the-art technology. Use uneven-age silvicultural systems on timberlands growing > 20 cubic feet



per acre per year. The visual landscape may be modified at some locations. However, this prescription may be applied to achieve a modified, nearly natural, or natural-appearing landscape in special situations. Dispersed recreation opportunities are in a roaded environment. Off-highway vehicle use is permitted. In general, wildlife management indicator species are maintained, but none are favored. Livestock grazing is permitted and managed in a manner consistent with timber management objectives. Wildlife habitat improvement work is permitted, but subordinate to timber management objectives. Firewood harvesting is permitted. Geothermal, oil, gas, and mineral exploration and development are also permitted. Road construction and reconstruction occur in support of timber production.

#### **Timber Management on Low Productivity Lands (< 20 Timber) Prescription — 16**

Manage timber stands on an opportunity basis, rather than for maximum timber production. Silvicultural systems rely on natural regeneration. Dispersed recreation opportunities are in a roaded and modified or nearly natural-appearing environment. Off-highway vehicle use is permitted. In general, wildlife management indicator species are maintained, but none are favored. Livestock grazing is permitted. Wildlife habitat improvement work is permitted, but subordinate to timber management objectives. Firewood harvesting is permitted. Geothermal,

oil, gas, and mineral exploration and development are also permitted.

#### **Riparian Area Management Prescription — 17**

The primary emphasis is to protect and enhance riparian-dependent resources (water, fish, wildlife, and vegetation) while utilizing the habitat for non-dependent resources (timber, range, recreation) when possible. The vegetative management goal is to manage for desired expressions of herbaceous, shrub, and forest riparian vegetation, according to site potential and resource needs. Stream channel stabilization is essential to meeting these objectives. Resource uses and activities in riparian areas will occur to the extent that they do not adversely affect the maintenance of the riparian area-dependent resources. New developed recreation facilities are not located here when viable alternatives exist. Boat ramps, beaches, trails, etc., may be developed when appropriate. Off-highway vehicle use is restricted. All wildlife management indicator species are favored in general, but particularly those dependent on riparian areas. Wildlife and fish habitat improvement is permitted. Livestock grazing is permitted. Timber yields will be reduced under selection harvesting. Firewood cutting is permitted. The area is open to geothermal, oil, gas, and mineral exploration and development with conditional surface occupancy stipulations. Roads and trails are allowed, but limited.

Table 2-4. Summary Comparison of Management Prescriptions.

Resource Element	Minimum Level	Wilderness (STD & Low STD)	Semi-Primitive Non-Motorized (SPNM)	Dev. Recreation (STD & Low STD)	Visual Retention	Special Areas	Raptor Management	Rangeland Management
Visual Quality Objective	Retention, partial retention, modification	Preservation	Retention	Retention, partial retention	Retention	Preservation, retention	Retention, partial retention	Retention, partial retention
Recreation Opportunity Spectrum	SPNM, semi-primitive motorized, roaded natural	Primitive	SPNM	Roaded natural	Roaded natural	SPNM	SPNM, semi-primitive motorized, roaded natural	Semi-primitive motorized, roaded natural
Off-Highway Vehicle Mgmt.	Open	Closed	Closed	Restricted	Restricted	Closed	Restricted	Open
Wildlife Mgmt. Indicator Species Favored	All in general; particularly fish and old growth and riparian-dependent wildlife	All in general; particularly peregrine falcon and Calif. bighorn sheep	All in general	None	All in general	All in general	Bald eagle, goshawks, and late seral stage species	Range species - deer, pronghorn, sage grouse
Wildlife Habitat Improvements	None	None	Yes, but subordinate to SPNM objectives	None	Yes, but subordinate to visual objectives	Yes, but subordinate to RNA & Special Area objectives	Yes - bald eagle	Yes, particularly deer, pronghorn & sage grouse
Livestock Grazing	None	Permitted	Permitted	Permitted on a site-by-site basis	Permitted	None in RNA, permitted elsewhere	Permitted	Permitted
Range Improvements	None	None	Yes, but subordinate to SPNM Objectives	None	Yes, but subordinate to visual objectives	Yes, but subordinate to RNA and Special Area objectives	Yes, but subordinate to raptor management objectives	Structural only
Timber Management	None	None	No scheduled harvest	No scheduled harvest	Scheduled harvest; even-aged or selection	None	Scheduled harvest; thinning or selection harvest	None
Firewood Harvesting	None	None	None	Permitted, but restricted	Limited	None	No personal; limited commercial	Permitted
Mineral Location & Leasing	Open	Closed	Open with stipulations	Locateable - closed Leasable - No surface occupancy	Open with stipulations	Locateable - closed Leasable - No surface occupancy	Locateable - closed Leasable - bald eagle-NSO; goshawk-CSO	Open
Roads	Existing transportation system	None	Administrative use only	Roads and trails	Transportation system modified for prescription objectives	None in RNA; modified for prescription objectives in SIAs	Transportation system modified for prescription objectives	Existing transportation system
Vegetative Diversity	Natural	Natural	Natural	Natural	All stages	Natural	Late seral stages	Natural

Table 2-4. Summary Comparison of Management Prescriptions (continued).

Resource Element	Range-Forage	Even-Aged Timber	Timber-Vegetals	Timber-Forage	Uneven-Aged Timber	<20 Timber Management	Riparian Area Management
Visual Quality Objective	Partial retention, modification	Partial retention, modification	Partial retention	Partial retention, modification	Retention, partial retention, modification	Partial retention, modification	Retention, partial retention, modification
Recreation Opportunity Spectrum	Semi-primitive motorized, roaded natural	Roaded natural	Semi-primitive motorized, roaded natural	Semi-primitive motorized, roaded natural	Semi-primitive motorized, roaded natural	Semi-primitive motorized, roaded natural	Semi-primitive motorized, roaded natural
Off-Highway Vehicle Mgmt.	Open	Open	Open	Restricted	Open	Open	Restricted
Wildlife Mgmt. Indicator Species Favored	Range species, particularly deer and pronghorn	None favored; species maintained	None favored; species maintained	Range and early seral stage species, particularly deer	None favored; species maintained	None favored; species maintained	All in general; riparian-dependent species in particular
Wildlife Habitat Improvement	Yes, particularly deer & pronghorn	Yes, but subordinate to timber objectives	Yes, but subordinate to timber & visual objectives	Yes, particularly deer	Yes, but subordinate to timber objectives	Yes, but subordinate to timber objectives	Yes, for fish and riparian-dependent species
Livestock Grazing	Permitted	Permitted	Permitted	Permitted	Permitted	Permitted	Permitted, but subordinate to riparian objectives
Range Improvement	Structural and non-structural	Yes, but subordinate to timber objectives	Yes, but subordinate to timber & visual objectives	Yes	Yes, but subordinate to timber objectives	Yes, but subordinate to timber objectives	Yes, to remedy or improve riparian condition
Timber Management	None	Regulated and scheduled harvest; full yields; even-aged	Regulated and scheduled harvest; reduced yields; even-aged	Regulated and scheduled harvest; reduced yields; even-aged	Scheduled harvest; group selection	Scheduled harvest; opportunistic cutting	Scheduled harvest; selection cutting
Firewood Harvesting	Permitted	Permitted	Permitted	Permitted	Permitted	Permitted	Permitted
Mineral Location & Leasing	Open	Open	Open with stipulations	Open	Open	Open	Open with stipulations
Roads	Unrestricted transportation system	Unrestricted transportation system	Unrestricted transportation system	Unrestricted transportation system	Unrestricted transportation system	Unrestricted transportation system	Limited transportation system
Vegetative Diversity	Early seral stages	All stages	All stages	All stages	All stages	All stages	Late seral stages

## **Individual Alternative Descriptions**

### **Introduction**

Details provided for each of the six management alternatives include its:

- theme;
- resource program direction;
- environment to be created;
- acreage allocation by prescription; and
- outputs and effects.

Outputs are planned for decade 1, while predicted outputs for decade 2-5 are shown for long-term comparison and disclosure of projected environmental consequences.

Maps for each of the alternatives, including the proposed action, are included in the Map Packet. These maps show the geographic location, by alternative, of management prescriptions and show the differences in emphases between alternatives.

A more complete discussion of how each alternative was modeled is in Appendix B. Appendix D presents tabular displays of acreage allocation by management area and prescription for each alternative.

## Preferred Alternative (PRF)

### Theme

This alternative responds to many resource demands by emphasizing a wide range of commodity and amenity outputs. Emphasis is placed on:

- maintaining as high a sustainable level of timber sale offerings as possible, commensurate with other resource emphases;
- harvesting timber using a mix of silvicultural practices, including uneven-aged management and even-aged management with retention of viable advance regeneration;
- implementing a fire management program at the most cost-efficient level;
- achieving an upward trend in snag numbers for eastside pine; and concentrating snag treatments on acres entered for timber harvest;
- achieving adopted levels of visual quality;
- managing desired areas for semi-primitive recreation;
- protecting and enhancing habitat for a mixture of wildlife species that depend on early and late successional stages;
- meeting objectives in deer herd plans, providing live-stock grazing for community stability, and producing forage in a cost-efficient manner;
- continuing Forest wetland development; and
- restoring degraded riparian habitat in high priority areas.

Other resources will be managed to complement these emphases.

Figure 2-2 displays acre allocations by prescription, and Table 2-5 displays average annual outputs by decade.

### Resource Program Direction

#### Air Quality

Maintain air quality to meet legal requirements. Establish monitoring sites for air quality resource values to characterize Class I airsheds (South Warner Wilderness). Comply with applicable air pollution control district agricultural burning implementation plans.

## Cultural Resources

Continue Native American consultation, inventory and evaluation on a project need basis; sign one site per year for two decades; nominate eligible properties to the NRHP; and evaluate a minimum of 50 backlog sites for NRHP significance per year. Complete cultural resources inventory of the Forest by the year 2050. Significant and unevaluated cultural resource sites are protected primarily by project redesign and avoidance. Interpret significant cultural resources through signing, brochures and self-guided tours. Continue cooperative efforts with local groups such as the Modoc County Historical Society.

### Facilities

Concentrate road investments on completing arterial and collector systems to upgrade access for timber, recreation, range, and wildlife uses. Manage local roads as Level 1 or Level 2, unless resource activity requires higher level. Remove unneeded roads through an obliteration program.

Maintain administrative facilities to current standards and make them energy efficient; or, if cost efficient, replace them. Manage administrative site facilities to meet laws and regulations.

### Fire and Fuels

Use the current fire management program which emphasizes suppression. Apportion the budget to the following programs: suppression 74%, prevention 9%, fuels 14%, and detection 3%. In the 1st decade an average of 6,258 acres burn from wildfires each year. Prescribed fire is used annually on approximately 350 acres for fire-related fuel treatment; and on about 1,798 acres for timber site preparation and range and wildlife habitat improvement. Prescribed fire from unplanned ignition can be used on 70,400 acres of Wilderness.

### Geology

Protect resources and investments from geologic hazards. Conduct geologic resources inventories to support project-level assessments. Protect the quantity and quality of ground water.

### Pests

Manage pests at a level commensurate with moderate levels of vegetation management and resource outputs.

### Range

Revise allotment management plans every 10 years. Manage permitted livestock grazing at about 118,800 AUMs to improve water quality, fisheries, and riparian

areas, increase deer forage allocation, and meet State deer herd goals. Increase forage production in designated allotments through 6,800 acres of nonstructural range improvements, including prescribed burning; and maintain 22,000 acres of seedings in the 1st decade. Improve unsatisfactory ecologic conditions by implementing improved grazing strategies, improving livestock distribution through installation of structural improvements, and ensuring proper forage utilization. Continue managing wild horses.

### Recreation

*Developed Recreation:* Where use is high, expand existing facilities or construct new sites. Reconstruct existing facilities in need of rehabilitation. Manage existing sites at the standard level. Emphasize the interpretive services program. Construct interpretive facilities.

*Dispersed Recreation:* Provide a full range of dispersed recreation opportunities. Manage 78,000 additional acres for semi-primitive non-motorized qualities. Construct 131 miles of new trails over the first 5 decades and maintain 118 miles of existing trails for a total system of 249 miles. Reconstruct 122 miles of trails over the first 5 decades. Maintain these trails at their designed standard. Keep over 60% of the Forest open to OHVs. Provide special management of popular dispersed recreation sites to protect or enhance their values.

### Research Natural Areas

Manage the Devil's Garden Research Natural Area to protect the values for which it was established. Recommend Raider Basin for a Research Natural Area.

### Riparian Areas

Enhance habitat for riparian-dependent resources in grazing allotments where resource conflicts are occurring. Resolve conflicts through improved management systems; where necessary, build structural range improvements. Treatment and restoration of degraded riparian areas occur on a minimum of four allotments per year. Implement the riparian prescription on all allotments by the end of the 4th decade.

### Soil and Water

Restore 2,600 and 2,300 acres in decades 1 and 2, respectively, of primarily actively degrading areas. Restore 850 acres in decades 3, 4, and 5 of priority 2 soils projects from the Watershed Improvement Needs (WIN) inventory. Maintain and improve this inventory.

Conduct Order 2 Soils Resource Inventories (SRIs) on all proposed projects where major ground disturbance is planned on areas of high or very high erosion

hazard rating, or in sensitive watersheds. Field verify Order 3 SRI on other project areas.

Develop soil plans for erosion control and compaction control. Maintain or enhance the nutrient balance for all land disturbing activities including timber harvesting, road building, livestock grazing, recreation activities and wildlife projects and wild fires. Monitor for compliance and effectiveness of these plans, inventories and restoration projects. Continue to collect and monitor soil fertility and timber stand nutrient data as needed. Keep the Forest timber stand nutrient status inventory current.

Combine an SRI Order 2 and interdisciplinary team effort to more accurately determine timber capability, suitability and management options on special non-interchangeable component areas primarily aggregated in SRI 3 map units 174, 222 and 223.

Implement Best Management Practices (BMPs) to meet 100% of the State Water Resource Control Board objectives for beneficial uses by the 4th decade. Monitor water quality to insure that water quality objectives are met.

### Special Interest Areas and National Natural Landmarks

Manage SIAs to protect the values for which they were established. Recommend Burnt Lava Flow and Medicine Lake Glass Flow SIAs for nomination as NNLs. Evaluate Dismal Swamp as a potential botanical SIA.

### Timber

Manage the timber resource in the 1st decade to provide an average annual sale quantity of 45.5 MMBF, of which 9 MMBF will come from the Big Valley Federal Sustained-Yield Unit. Provide a species mix of 40% (17.9 MMBF) eastside pine, 52% (23.6 MMBF) mixed conifer, and the remaining 8% (4.0 MMBF) from red fir and lodgepole pine. In the 1st decade, reforest an average of 3,400 acres per year and an average of 3,600 acres per year in decades two through five. Place initial harvest emphasis on regeneration cutting of poorly-stocked and well-stocked stands at about 29% and 71%, respectively. During regeneration cutting, emphasize retention of viable, advanced regeneration.

Emphasize even-aged management on 322,985 acres. Full timber yields are provided by 145,859 acres, plus 66,835 acres which have longer rotations to meet visual objectives. Modified yields where deer forage and timber are simultaneously provided will occur on 110,291 acres, of which 50,180 acres are managed with longer rotations to meet visual objectives.

Emphasize uneven-aged management on 17,114 acres.

Regulate 178,900 acres of the allowable sale quantity from riparian areas, visual retention areas, and lands producing < 20 cu. ft. of wood per acre which provide 4.5 MMBF per year in the 1st decade.

Accomplish 5,400 acres of timber stand improvements through commercial and precommercial thinning of plantations.

#### Visual Resources

Manage visual quality by using the "medium" visual quality program (See Appendix Q). Manage all distinctive scenery, and all areas adjacent to major roads, and some areas seen at background distances, to a natural or nearly natural-appearing landscape. Rehabilitate 1,500 acres of existing visual resource problems.

#### Wilderness and Roadless Areas

Manage the South Warner Wilderness at the standard level. Manage for a primitive recreation experience. Improve the Wilderness trail system through reconstruction over the next 20 years. Provide visual quality protection for lands adjacent to Wilderness access points.

#### Wildlife and Fish

Provide and maintain habitat for 100 pairs (nest territories) of goshawks.

Develop 13 marten territories and 18 pileated woodpecker territories in accordance with the habitat and spatial parameters displayed in the 1990 Furbearer Regional Literature Review for R-5.

Implement riparian prescription on all identified trout streams and, improve 1.5 miles of trout streams annually by direct habitat improvement.

In the 1st decade, provide for deer forage by using the timber forage prescription on 14,795 acres. Adjust livestock grazing by allotment to provide forage for 34,200 deer, and perform direct habitat improvement on 3,300 acres.

Develop all suitable, undeveloped wetlands (6,500 acres) for waterfowl production by the end of the 2nd decade; maintain these and currently developed wetlands (2,000 acres) to original design standards.

Annually improve 100 acres of habitat for upland game species with emphasis on sage grouse, quail and blue grouse.

Improve 100 acres of reservoir annually for large-mouth bass.

Improve 75 acres per year of habitat for nongame species.

#### Environment to be Created

By the year 2030, about 150,900 acres (29%) of productive timberland are in an even-aged condition, representing a mosaic of stands with trees of uniform size and appearance. In addition, another 10,800 acres (2%) are composed of group selection areas. Reforestation acres are distributed proportionately throughout the Forest. Forty-six percent are pine and 45% are mixed conifer and true fir. Stand size varies from 5 to 40 acres. Approximately 100,300 acres of timberland are relatively unchanged, of which 28,800 acres of old growth remains in stands scattered throughout the Forest. Along major travel routes, old trees are readily visible on 31,000 acres. Timber harvest is commonly seen from some arterial, collector, local and county roads, and trails.

Evidence of large wildfires continue to be obvious to the traveler, although replanted trees soften the scars on the land. Air quality is degraded from time to time following large fires. Because of better use of and increased demand for firewood, prescribed burns in timber harvest are reduced.

The general character of the Wilderness is the same, but the number of recreationists doubles and they use this area more than other parts of the Forest. As the Wilderness reaches capacity, fewer primitive experiences are possible for the visitor. New trails are evident and existing trails reconstructed.

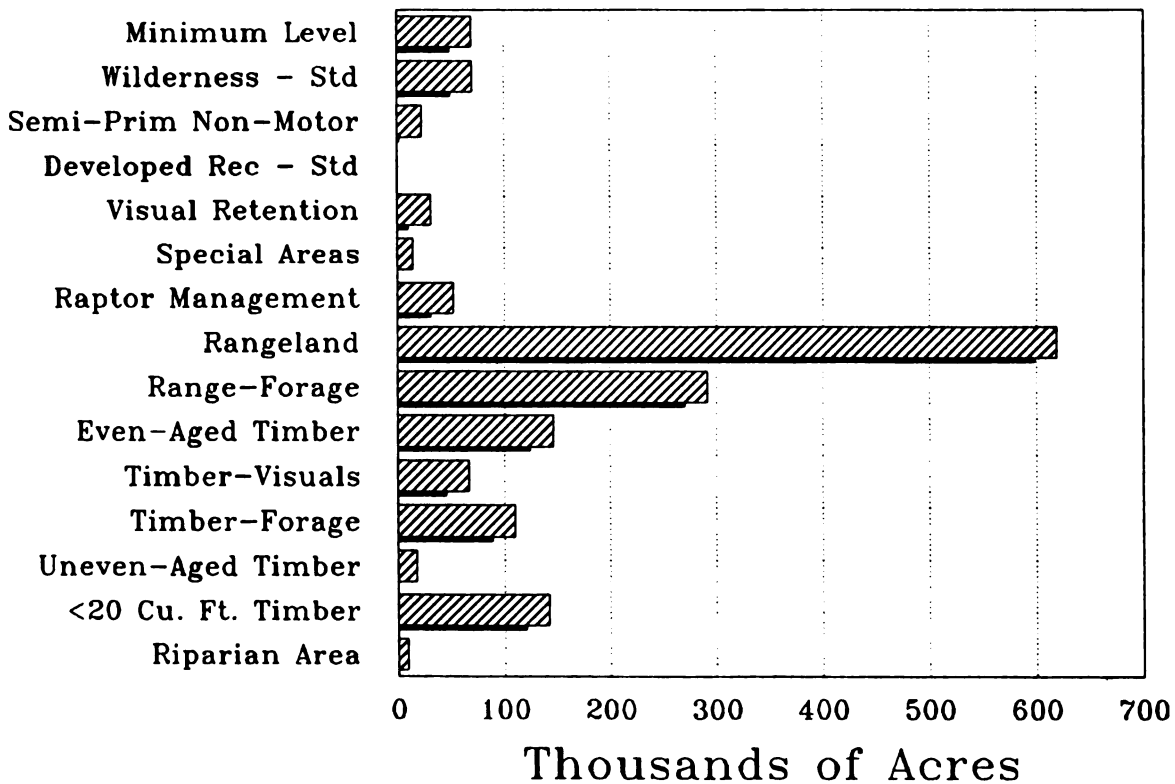
Water quality objectives are met, and riparian areas are close to natural condition. Structures such as fences are visible on rangelands. Fewer livestock are evident and are dispersed to achieve vegetation management objectives. A wide variety of forage flourishes on permanent rangelands. Activities such as prescribed burning are used to sustain vegetation; and introduced seedlings are managed for high forage yields.

Visitors see more bald eagles, peregrine falcons, bighorn sheep, and deer, but fewer old-growth dependent species like martens, pileated woodpeckers, and goshawks. With more snags, other cavity nesters increase. Streams produce more fish. Wetlands scattered throughout the Forest appear the same, but added nesting islands produce more waterfowl.

Recreationists enjoy more and improved campgrounds and trails. New roads access campgrounds and popular dispersed recreation areas used for camping, hunting, and fishing. Maintenance is the major work done on Forest roads. More interpretive signs along highways

provide information to recreationists. Semi-primitive use declines. As deer increase, more people hunt them. Similarly, fishing and upland game hunting opportunities increase.

**Figure 2-2. PRF Alternative - Acreage Allocation by Prescription**





**Table 2-5. PRF Alternative - Average Annual Outputs and Activities**

Output/Activity	Base Year	1980 RPA Goals		Decades				
	1982	1990	2030	1	2	3	4	5
<b>Economics</b>								
Total Budget (MM\$)	9.6	13.2	14.2	12.1	12.4	13.5	12.3	12.6
Total Cost (MM\$)	11.5			14.4	15.2	15.8	14.6	14.9
<b>Facilities</b>								
Trail Construction/ Reconstruction (Miles)	0.0	3.0	3.0	9.7	5.5	4.4	4.5	1.2
Road Construction (Miles)	9.3			11.5	10.0	5.0	5.0	5.0
Road Reconstruction (Miles)	21.7			25.0	25.0	25.0	20.0	20.0
F.S. Road Maintenance (Miles)	3178.4			3167.3	3189.1	3216.2	3278.2	3341.2
<b>Dams and Reservoirs</b>								
Forest Service (Number)	120.0			120.0	120.0	120.0	120.0	120.0
Other Federal (Number)	0.0			0.0	0.0	0.0	0.0	0.0
Other State/Local (Number)	29.0			29.0	29.0	29.0	29.0	29.0
Private (Number)	0.0			0.0	0.0	0.0	0.0	0.0
<b>Administrative Sites</b>								
Forest Service Owned (Number)	12.0			14.0	16.0	16.0	16.0	16.0
Leased (Number)	4.0			2.0	0.0	0.0	0.0	0.0
<b>Fire and Fuels</b>								
Total Fuel Treatment (Acres)	5100.0	1800.0	1600.0	4246.0	3910.0	6328.0	5140.0	5840.0
Fire-related Fuel Treatment (Acres)	250.0			350.0	350.0	350.0	350.0	350.0
Timber-related Fuel Treatment (Acres)	4800.0			3846.0	3510.0	5928.0	4740.0	5440.0
Other Fuel Treatment (Acres)	50.0			50.0	50.0	50.0	50.0	50.0
Expected Acres Burned by Wildfire	8604.8			6236.0	6245.0	6340.0	6340.0	6426.0
Intensity Class 1	2.0			1.0	8.0	59.0	59.0	85.0
Intensity Class 2	139.8			133.0	133.0	133.0	133.0	100.0
Intensity Class 3	838.0			577.0	577.0	577.0	577.0	577.0
Intensity Class 4	7625.0			5525.0	5527.0	5571.0	5571.0	5664.0
Intensity Class 5	0.0			0.0	0.0	0.0	0.0	0.0
Intensity Class 6	0.0			0.0	0.0	0.0	0.0	0.0
<b>Firewood</b>								
Firewood (M Cords)	23.0			25.0	27.8	31.0	34.7	34.7
<b>Human Resources</b>								
Programs (Enrollees)	11.0	0.0	0.0	3.0	3.0	3.0	3.0	3.0

**Table 2-8. IND Alternative — Average Annual Outputs and Activities. (continued)**

Output/Activity	Base Year	1980 RPA Goals		Decades				
	1982	1990	2030	1	2	3	4	5
<b>Lands and Minerals</b>								
Minerals (Operating Plans)	43.0	45.0	57.0	45.0	49.0	53.0	57.0	61.0
Land Acquisition (Acres)	3823.0	0.0	0.0	160.0	160.0	160.0	160.0	160.0
<b>Range</b>								
Grazing (M AUM)	122.5	117.4	123.7	138.4	117.1	89.1	85.5	87.4
<b>Recreation</b>								
Developed Public (M RVD)	81.2	82.8	110.4	92.9	106.7	120.5	134.3	149.0
Developed Private (M RVD)	4.6	7.2	9.6	8.1	9.3	10.5	11.7	13.0
Dispersed (M RVD)	102.8	120.0	158.8	122.4	142.9	163.4	184.0	204.5
Hunting-related Dispersed* (M RVD)	98.4	114.8	152.0	70.1	122.7	115.8	105.9	119.1
Open, Usable OHV Areas Summer (M Acres)	1077.4			1064.0	1064.0	1064.0	1064.0	1064.0
Open, Usable OHV Areas Winter (M Acres)	1092.1			1080.8	1080.8	1080.8	1080.8	1080.8
Roads and Trails Open to OHV Use - Summer (Miles)	2964.4			2999.4	3000.3	3053.1	3086.2	3157.4
Roads and Trails Open to OHV Use - Winter (Miles)	2776.4			2811.4	2807.3	2857.1	2890.2	2961.2
Roads and Trails Closed to OHV Use - Summer (Miles)	332.0			332.0	342.0	352.0	352.0	352.0
Roads and Trails Closed to OHV Use - Winter (Miles)	520.0			520.0	535.0	548.0	548.0	548.0
*Hunting-related RVDs are separate from dispersed recreation RVDs								
<b>Timber</b>								
Allowable Sale Quantity (MMCF)	8.3	12.3	13.2	10.0	10.0	9.9	9.9	9.9
(MMBF)	50.4	75.3	80.3	60.1	60.1	60.1	60.1	60.1
Long Term Sustained Yield								
(MMCF)	9.7			13.2	10.9			
(MMBF)	58.9			80.3	66.3			
Big Valley Federal Sustained- Yield Unit (MMBF)	13.7			11.0	11.0	11.0	12.0	12.0
Reforestation (M Acres)	3.7	2.9	3.1	4.0	4.6	4.6	4.7	5.8
Timber Stand Improvement (M Acres)	3.9	3.8	3.8	6.0	8.6	9.2	9.3	10.5
<b>Visual Resources</b>								
Visual Quality Index	62.6			63.3	64.2	65.2	66.1	67.0

**Table 2-7. RPD Alternative - Average Annual Outputs and Activities. (continued)**

Output/Activity	Base Year	1980 RPA Goals		Decades				
	1982	1990	2030	1	2	3	4	5
<b>Visual Resources</b>								
Visual Quality Index	62.6			64.1	65.9	67.6	61.6	71.1
<b>Water</b>								
Quality (M acre feet meeting objectives)	357.1	792.0*	801.0*	357.7	429.6	510.8	559.4	568.4
Quantity (M acre feet)	565.8			567.7	568.2	568.8	568.5	568.4
Watershed Improvement (Acres)	0.0	180.0	200.0	315.0	285.0	140.0	140.0	140.0
*RPA goals are erroneous because they exceed the Forest's cumulative annual water yield of 565.8 M acre feet. Correct goals are 357.1 and 565.8 M acre-feet for 1990 and 2030, respectively.								
<b>Wilderness</b>								
Wilderness (M RVD)	7.1	8.3	11.0	9.4	12.4	14.8	17.1	20.1
<b>Wildlife and Fish</b>								
Bald Eagle (Territories)	7.0	8.0	21.0	10.0	21.0	21.0	21.0	21.0
(Potential Territories)	14.0	13.0		11.0				
Peregrine Falcon (Active Territories)	0.0	2.0	3.0	3.0	3.0	3.0	3.0	3.0
Modoc Sucker (Suitable Stream Miles)	13.4			19.4	19.4	19.4	19.4	19.4
Bighorn Sheep (Individuals)	20.0			20.0	50.0	100.0	100.0	100.0
Deer (M Individuals)	24.1	27.4	27.4	35.6	35.1	40.8	37.3	39.5
Interstate Deer Herd	8.2			8.4	8.4	13.8	13.8	13.8
Glass Mountain Deer Herd	5.5			15.2	9.6	9.6	6.6	7.3
Warner Mountain Deer Herd	7.2			8.7	8.7	7.5	7.7	8.5
Adin Deer Herd	3.2*			3.3	8.4	9.9	9.2	9.9
*Equal to 72% of deer herd population estimate of 4300 deer.								
Resident Fish (M Pounds)-All	116.0	120.0	170.0	118.8	121.5	123.6	125.6	127.7
Resident Trout (M Pounds)	43.0	47.0	47.0	45.1	46.9	48.0	49.0	50.0
Warmwater Fish (M Pounds)	73.0	73.0	123.0	73.7	74.7	75.6	76.7	77.7
Goshawk (Pairs)	71.0*			73.0	73.0	73.0	73.0	73.0
*Known pairs in 1982.								
Total Wildlife and Fish User Days(M WFUD)	83.1	97.0	128.3	110.5	121.3	134.8	137.1	146.8
(Is not double-counted with dispersed recreation)								
Big Game (M WFUD)	32.8			52.1	51.8	57.1	51.5	54.8
Direct Habitat Improve.				4.8	4.3	4.9	5.1	5.1
Induced Habitat Improve.				34.8	33.7	27.4	21.5	18.8

**Table 2-9. RBU Alternative — Average Annual Outputs and Activities. (continued)**

Output/Activity	Base Year	1980 RPA Goals		Decades				
	1982	1990	2030	1	2	3	4	5
Upland Game, Waterfowl, & Nongame (M WFUD)	24.6			28.0	31.6	34.6	37.0	39.1
Direct Habitat Improve.				1.0	1.1	1.2	1.3	1.4
Resident Fish (M WFUD)	25.7			29.7	36.2	41.4	46.5	51.0
Direct Habitat Improve.				0.2	0.4	0.7	0.9	1.1
Induced Habitat Improve.				0.2	0.3	0.3	0.3	0.3
Acres/Structures of Direct Habitat Improvement								
Deer (Acres)	165.0			0.0	0.0	0.0	0.0	0.0
Wetlands (Acres)	1000.0			79.4	0.0	108.4	0.0	108.4
Upland Game (Acres)	0.0			50.0	50.0	50.0	50.0	50.0
Nongame (Acres)	0.0			25.0	25.0	25.0	25.0	25.0
Snags (Numbers Created)	0.0			6420.0	6270.0	5960.0	2330.0	2800.0
Resident Fish (Stream Miles)	0.0			1.5	1.5	1.5	1.5	1.5

NOTE: Decade 1 is the period 1990-1999. Decade 2-5 outputs are shown for long-range comparisons.

## Current Alternative - No Action (CUR)

### Theme

This alternative continues current management policies and practices subject to maintaining expenses at the current level. Emphasis is placed on:

- maintaining the base year 1982 timber harvest level;
- maintaining forage for livestock as close to the current level as possible;
- achieving adopted levels of visual quality;
- managing desired areas for semi-primitive recreation;
- continuing Forest wetland development; and
- restoring degraded riparian habitat in high priority areas.
- achieving snag standards by the end of the 3rd decade through extensive treatments in eastside pine.

Other resources will be managed to complement these emphases.

Figure 2-3 displays acre allocations by prescription, and Table 2-6 displays average annual outputs by decade.

### Resource Program Direction

#### Air Quality

Maintain air quality to meet legal requirements. Establish monitoring sites for air quality resource values to characterize Class I airsheds (South Warner Wilderness). Comply with applicable air pollution control district agricultural burning implementation plans.

#### Cultural Resources

Continue existing program of Native American consultation, inventory and evaluation on a project needs basis. Complete cultural resources inventory of the Forest by the year 2050. Nominate eligible properties to the NRHP. No formal signing program exists. Protect significant and unevaluated cultural resource sites primarily by project redesign and avoidance. Offer interpretative service through office displays, simple brochures and cooperative efforts with local groups such as the Modoc County Historical Society.

#### Facilities

Concentrate road investments on completing arterial and collector systems to upgrade access for timber, recreation, range, and wildlife uses. Manage local roads as

Level 1 or Level 2, unless resource activity requires a higher level.

Manage administrative site facilities to meet laws and regulations.

#### Fire and Fuels

The fire management program emphasizes prevention. The budget, 20% less than the base year, is apportioned to the following programs: suppression 71%, prevention 11%, fuels 14%, and detection 4%. In the 1st decade, an average of 6,258 acres burn from wildfires each year. Prescribed fire is used annually on approximately 250 acres for fire-related fuel treatment; and on 1,150 acres for timber site preparation and range and wildlife habitat improvement. Prescribed fire from unplanned ignition can be used on 70,400 acres of Wilderness.

#### Geology

Protect resources and investments from geologic hazards. Conduct geologic resources inventories to support project-level assessments. Protect the quality and quantity of ground water.

#### Pests

Manage pests at a level commensurate with moderate vegetation management and resource outputs.

#### Range

Revise allotment management plans as needed. Maintain livestock grazing in existing allotments at an estimated 120,000 AUMs in the 1st decade. Increase forage production in designated allotments through 2,500 acres of nonstructural range improvements, such as prescribed burning, and by maintaining 6,000 acres of seedings. Improve ecologic condition by managing livestock distribution through structural improvements such as fences and watering areas. Adjust livestock grazing after the 1st decade to account for loss in transitory forage, and to provide increased forage available by deer.

#### Recreation

*Developed Recreation:* Where use is high, expand existing facilities or construct new sites. Reconstruct existing facilities in need of rehabilitation. Manage existing sites at the standard level. Expand the interpretive services program. Construct interpretive facilities.

*Dispersed Recreation:* Provide a full range of dispersed recreation opportunities. Manage 78,000 additional acres for Semi-Primitive Non-Motorized qualities. Construct 131 miles of new trails over the first 5 decades and maintain 118 miles of existing trails for a total system

ing 2,700 acres to new seedlings. Improve unsatisfactory ecologic conditions by implementing improved grazing strategies, increasing forage available for use through non-structural improvements, improving livestock distribution through installation of structural improvements, and by ensuring proper forage utilization. Continue managing wild horses.

### Recreation

*Developed Recreation:* Where use is high, expand existing facilities or construct new sites. Reconstruct existing facilities in need of rehabilitation. Manage existing sites at the standard level. Expand the interpretive services program. Construct interpretive facilities.

*Dispersed Recreation:* Provide a full range of dispersed recreation opportunities. Manage 78,000 additional acres for Semi-Primitive Non-Motorized qualities. Construct 131 miles of new trails over the first 5 decades and maintain 118 miles of existing trails for a total system of 249 miles. Reconstruct 15 miles of trails in the 1st decade. Maintain these trails at their designed standard. Keep over 60% of the Forest open to OHVs.

### Research Natural Areas

Manage the Devil's Garden Research Natural Area to protect the values for which it was established. Recommend Raider Basin for a Research Natural Area.

### Riparian Areas

Enhance habitat for riparian-dependent resources in grazing allotments where resource conflicts are occurring. Build structural range improvements to resolve these conflicts. Treatment and restoration of degraded riparian areas occur on a minimum of two allotments per year. Implement the riparian prescription on all allotments by the end of the 5th decade.

### Soil and Water

Restore 3,150 and 2,850 acres in decades 1 and 2, respectively, of primarily actively degrading areas. Restore 1,400 acres in decades 3, 4, and 5 of priority 2 soils projects from the Watershed Improvement Needs (WIN) inventory. Maintain and improve this inventory.

Conduct Order 2 Soils Resource Inventories (SRIs) on all proposed projects where major ground disturbance is planned on areas of high or very high erosion hazard rating, or in sensitive watersheds. Field verify Order 3 SRI on other project areas.

Develop soil plans for erosion control and compaction control. Maintain or enhance the nutrient balance for all land disturbing activities including timber harvesting, road building, livestock grazing, recreation activities and

wildlife projects and wild fires. Monitor for compliance and effectiveness of these plans, inventories and restoration projects. Continue to collect and monitor soil fertility and timber stand nutrient data as needed. Keep the Forest timber stand nutrient status inventory current.

Combine an SRI Order 2 and interdisciplinary team effort to more accurately determine timber capability, suitability and management options on special non-interchangeable component areas primarily aggregated in SRI 3 map units 174, 222 and 223.

Implement Best Management Practices to meet 100% of the State Water Resource Control Board objectives for beneficial uses by the 5th decade. Monitor water quality to insure that State objectives are met.

### Special Interest Areas and National Natural Landmarks

Manage SIAs to protect the values for which they were established. Recommend Burnt Lava Flow and Medicine Lake Glass Flow SIAs for nomination as NNLs.

### Timber

Manage the timber resource in the 1st decade to provide an average annual sale quantity of 74.6 MMBF, of which 11 MMBF will come from the Big Valley Federal Sustained-Yield Unit. Provide a species mix of 15% (10.7 MMBF) eastside pine, 80% (57.7 MMBF) mixed conifer, and the remaining 5% in red fir (3.6 MMBF) and lodgepole pine (0.4 MMBF). Place initial harvest emphasis on regeneration cutting of poorly-stocked and well-stocked stands at about 22% and 78%, respectively. In the 1st decade reforest an average of 4,500 acres per year and approximately 3,500 acres per year in decades two through five.

Emphasize even-aged management on 360,800 acres. Full timber yields are provided by 153,500 acres, plus 60,800 acres which have longer rotations to meet visual objectives. Modified yields where deer forage and timber are simultaneously provided will occur on 146,500 acres, of which 45,400 acres are managed with longer rotations to meet visual objectives.

Emphasize uneven-aged management on 3,500 acres.

Regulate 171,300 acres of the allowable sale quantity from riparian areas, visual retention areas, and lands producing < 20 cu. ft. of wood per acre. Provide 2.7 MMBF per year in the 1st decade.

### Visual Resources

Manage visual quality by using the "medium" visual quality program (See Appendix Q). Manage all distinctive scenery, and all areas adjacent to major roads, and

some areas seen at background distances, to a natural or nearly natural-appearing landscape. Rehabilitate 1,000 acres of existing visual resource problems.

#### **Wilderness and Roadless Areas**

Manage the South Warner Wilderness at the standard level. Improve the Wilderness trail system through reconstruction over the next 20 years. Provide no special visual quality protection for lands adjacent to the Wilderness.

#### **Wildlife and Fish**

Implement the riparian prescription on all identified trout streams, and improve 1.5 miles of trout streams annually by direct habitat improvement.

In the 1st decade, provide for deer forage through the timber forage prescription on 22,100 acres. Adjust live-stock grazing by allotment to provide forage for 35,600 deer, and perform direct habitat improvement on 28,700 acres.

Develop suitable wetlands (6,100 acres) for waterfowl production by the end of the 2nd decade and maintain these and currently developed wetlands to original design standards.

Within pine marten and pileated woodpecker habitat, maintain viable populations of these species by applying other Forest-wide standards and guidelines, particularly for snags, dead and down materials, and vegetative diversity; and by implementing the Riparian Area Management Prescription.

Annually improve 100 acres of habitat for upland game species with emphasis on sage grouse, quail and blue grouse.

Improve 100 acres of reservoirs annually for large-mouth bass.

Improve 75 acres per year of habitat for nongame species.

#### **Environment to be Created**

By the year 2030, 178,000 acres (29%) of productive timberland are even-aged, creating a mosaic of trees of uniform appearance. Reforestation acres are divided

evenly between pine (54%) and mixed conifer and true fir (45%). Stand size varies from 5 to 40 acres. Approximately 89,000 acres of timberland are relatively unchanged, of which 24,800 acres of old-growth remains in stands scattered throughout the Forest. Large trees are visible on 31,000 acres along major travel routes. Visitors commonly see logging activities and hear machinery from some arterial, collector, local and county roads, and trails.

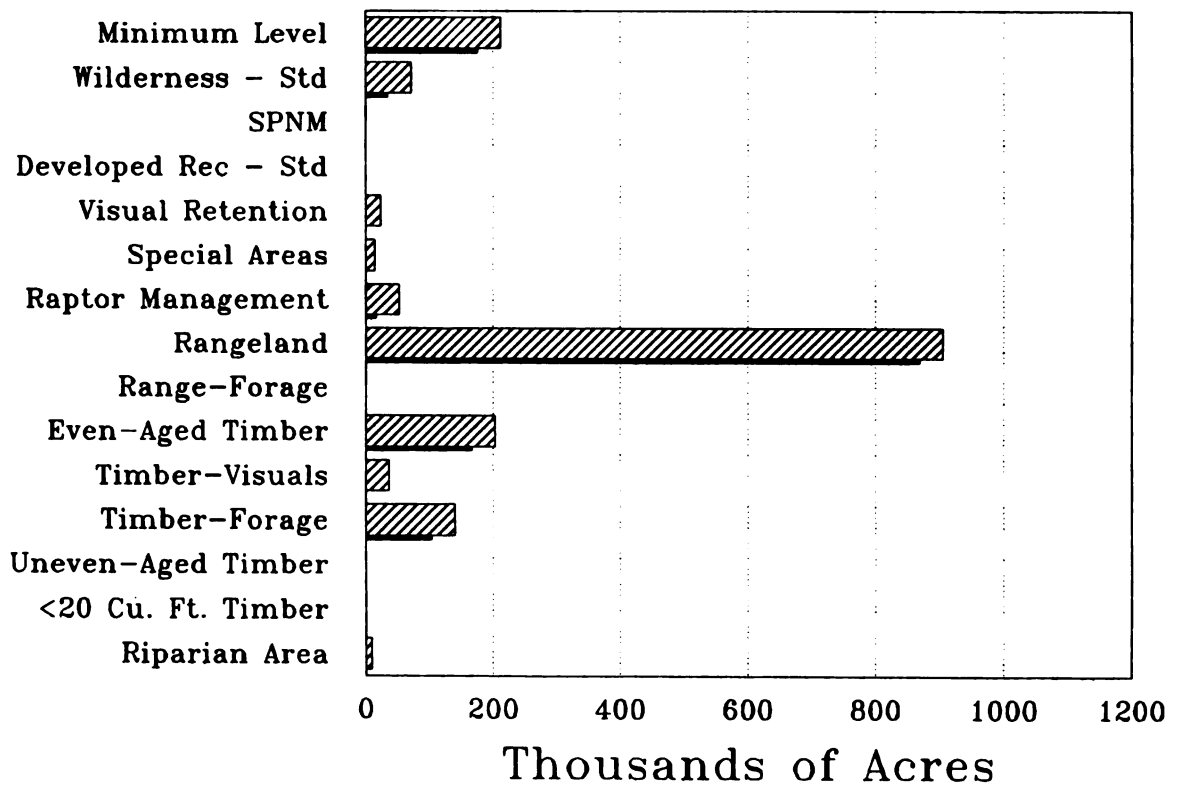
Evidence of large wildfires continue to be obvious to the traveler, although replanted trees soften the scars on the land. Air quality is degraded from time to time following large fires. Because of better use of and increased demand for firewood, prescribed burns in timber harvest are reduced.

The character of the Wilderness and the number of livestock there remain the same, but more people are present. Areas of heavy use are degraded. Water quality standards have improved but sedimentation remains from high levels of logging activity and livestock grazing. Generally, more ground-disturbing activities occur, and more roads are visible. Riparian areas are slightly improved.

Although livestock numbers remain the same, visitors see them concentrated in smaller areas. A significant increase in improvements such as fences, stock ponds, and seedings are visible. The permanent rangeland appears managed rather than natural. Bald eagles, bighorn sheep, and peregrine falcons increase as do cavity nesters. Visitors see more early seral stage species, such as deer, and more fish in streams and reservoirs. Wetlands scattered throughout the Forest appear the same, but added nesting islands produce more waterfowl.

Recreationists enjoy more trails and developed sites, but semi-primitive experiences decrease. More OHV trails are present as are automobile and OHV interpretive signs. New roads access campgrounds and popular dispersed recreation areas used for camping, hunting and fishing. Maintenance is the major work done on Forest roads. Because of increased numbers of deer and fish, hunters and anglers have more opportunities for those activities.

**Figure 2-6. RBU Alternative – Acreage Allocation by Prescription**





**Table 2-6. CUR Alternative – Average Annual Outputs and Activities.**

Output/Activity	Base Year	1980 RPA Goals		Decades				
	1982	1990	2030	1	2	3	4	5
<b>Economics</b>								
Total Budget (MM\$)	9.6	13.2	14.2	10.3	11.9	14.6	12.5	15.5
Total Cost (MM\$)	11.5			12.1	13.8	16.4	14.2	17.3
<b>Facilities</b>								
Trail Construction/ Reconstruction (Miles)	0.0	3.0	3.0	5.0	2.2	2.5	1.9	3.0
Road Construction (Miles)	9.3			8.0	8.3	8.2	8.3	8.3
Road Reconstruction (Miles)	21.7			18.7	19.5	19.1	19.3	19.5
F.S. Road Maintenance (Miles)	3178.4			3167.3	3138.1	3132.2	3162.4	3193.4
<b>Dams and Reservoirs</b>								
Forest Service (Number)	120.0			120.0	120.0	120.0	120.0	120.0
Other Federal (Number)	0.0			0.0	0.0	0.0	0.0	0.0
Other State/Local (Number)	29.0			29.0	29.0	29.0	29.0	29.0
Private (Number)	0.0			0.0	0.0	0.0	0.0	0.0
<b>Administrative Sites</b>								
Forest Service Owned (Number)	12.0			14.0	16.0	16.0	16.0	16.0
Leased (Number)	4.0			2.0	0.0	0.0	0.0	0.0
<b>Fire and Fuels</b>								
Total Fuel Treatment (Acres)	5100.0	1800.0	1600.0	3700.0	7600.0	8400.0	7300.0	4400.0
Fire-related Fuel Treatment (Acres)	250.0			250.0	250.0	250.0	250.0	250.0
Timber-related Fuel Treatment (Acres)	4800.0			3400.0	7300.0	8100.0	7000.0	4100.0
Other Fuel Treatment (Acres)	50.0			50.0	50.0	50.0	50.0	50.0
Expected Acres Burned by Wildfire	8604.8			6258.0	6262.0	6427.0	6399.0	6431.0
Intensity Class 1	2.0			63.0	63.0	64.0	64.0	64.0
Intensity Class 2	139.0			313.0	313.0	321.0	320.0	129.0
Intensity Class 3	838.0			876.0	876.0	836.0	768.0	579.0
Intensity Class 4	7625.0			5006.0	5010.0	5206.0	5247.0	5659.0
Intensity Class 5	0.0			0.0	0.0	0.0	0.0	0.0
Intensity Class 6	0.0			0.0	0.0	0.0	0.0	0.0
<b>Firewood</b>								
Firewood (M Cords)	23.0			25.0	27.8	31.0	34.7	34.7
<b>Human Resources</b>								
Programs (Enrollees)	11.0	0.0	0.0	3.0	3.0	3.0	3.0	3.0

**Table 2-10. AMN Alternative — Average Annual Outputs and Activities. (continued)**

Output/Activity	Base Year	1980 RPA Goals		Decades				
	1982	1990	2030	1	2	3	4	5
<b>Lands and Minerals</b>								
Minerals (Operating Plans)	43.0	45.0	57.0	45.0	49.0	53.0	57.0	61.0
Land Acquisition (Acres)	3823.0	0.0	0.0	160.0	160.0	160.0	160.0	160.0
<b>Range</b>								
Grazing (M AUM)	122.5	117.4	123.7	97.3	102.3	80.6	78.2	80.7
<b>Recreation</b>								
Developed Public (M RVD)	81.2	82.8	110.4	92.9	106.7	120.5	134.3	149.0
Developed Private (M RVD)	4.6	7.2	9.6	8.1	9.3	10.5	11.7	13.0
Dispersed (M RVD)	102.8	120.0	158.8	122.4	142.9	163.4	184.0	204.5
Hunting-related Dispersed* (M RVD)	98.4	114.8	152.0	114.4	122.2	116.2	101.6	110.6
Open, Usable OHV Areas Summer (M Acres)	1077.4			813.3	813.3	813.3	813.3	813.3
Open, Usable OHV Acres Winter (M Acres)	1092.1			944.3	944.3	944.3	944.3	944.3
Roads and Trails Open to OHV Use - Summer (Miles)	2964.4			3019.4	3073.3	3127.1	3182.2	3271.2
Roads and Trails Open to OHV Use - Winter (Miles)	2776.4			2841.4	2895.3	2949.1	3006.2	3095.2
Roads and Trails Closed to OHV Use - Summer (Miles)	332.0			352.0	362.0	374.0	386.0	402.0
Roads and Trails Closed to OHV Use - Winter (Miles)	520.0			530.0	540.0	552.0	562.0	578.0
*Hunting-related RVDs are separate from dispersed recreation RVDs								
<b>Timber</b>								
Allowable Sale Quantity (MMCF)	8.3	12.3	13.2	5.3	5.9	6.0	6.4	6.6
(MMBF)	50.4	75.3	80.3	31.8	36.0	38.3	38.1	40.2
Long Term Sustained Yield								
(MMCF)	9.7		13.2	9.1				
(MMBF)	58.9		80.3	55.8				
Big Valley Federal Sustained- Yield Unit (MMBF)	13.7			5.7	5.8	6.6	7.6	8.8
Reforestation (M Acres)	3.7	2.9	3.1	2.0	2.7	2.8	3.0	2.7
Timber Stand Improvement (M Acres)	3.9	3.8	3.8	4.0	4.7	5.5	5.8	5.7
<b>Visual Resources</b>								
Visual Quality Index	62.6			65.4	68.5	71.6	74.6	77.7

**Table 2-10. AMN Alternative – Average Annual Outputs and Activities. (continued)**

Output/Activity	Base Year	1980 RPA Goals		Decades				
	1982	1990	2030	1	2	3	4	5
<b>Water</b>								
Quality (M acre feet meeting objectives)	357.1	792.0*	801.0*	357.2	530.2	567.8	567.7	567.5
Quantity (M acre feet)	565.8			567.0	567.7	567.8	567.7	567.5
Watershed Improvement (Acres)	0.0	180.0	200.0	315.0	285.0	140.0	0.0	0.0
*RPA goals are erroneous because they exceed the Forest's cumulative annual water yield of 565.8 M acre feet. Correct goals are 357.1 and 565.8 M acre-feet for 1990 and 2030, respectively.								
<b>Wilderness</b>								
Wilderness (M RVD)	7.1	8.3	11.0	9.4	12.4	14.8	17.1	20.1
<b>Wildlife and Fish</b>								
Bald Eagle (Territories)	7.0	8.0	21.0	10.0	21.0	21.0	21.0	21.0
(Potential Territories)	14.0	13.0		11.0				
Peregrine Falcon (Active Territories)	0.0	2.0	3.0	3.0	3.0	3.0	3.0	3.0
Modoc Sucker (Suitable Stream Miles)	13.4			19.4	19.4	19.4	19.4	19.4
Bighorn Sheep (Individuals)	20.0			20.0	50.0	100.0	200.0	300.0
Deer (M Individuals)	24.1	27.4	27.4	42.6	44.8	40.4	39.4	40.4
Interstate Deer Herd	8.2			14.3	14.1	13.4	14.8	14.0
Glass Mountain Deer Herd	5.5			5.7	9.9	9.3	7.3	7.2
Warner Mountain Deer Herd	7.2			12.4	10.6	8.1	8.2	9.1
Adin Deer Herd	3.2*			10.2	10.2	9.6	9.1	10.1
*Equal to 72% of deer herd population estimate of 4300 deer.								
Resident Fish (M Pounds)-All	116.0	120.0	170.0	117.8	119.5	120.6	121.6	122.7
Resident Trout (M Pounds)	43.0	47.0	47.0	45.1	46.9	47.9	49.0	50.0
Warmwater Fish (M Pounds)	73.0	73.0	123.0	72.7	72.7	72.7	72.7	72.7
Goshawk (Pairs)	71.0*			73.0	80.0	90.0	100.0	110.0
*Known pairs in 1982.								
Total Wildlife and Fish User Days (M WFUD)	83.1	97.0	128.3	118.0	132.0	134.0	134.9	148.1
(Is not double-counted with dispersed recreation)								
Big Game (M WFUD)	32.8			59.7	62.7	56.6	55.1	56.6
Direct Habitat Improve.				0.0	0.0	0.0	0.0	0.0
Induced Habitat Improve.				22.7	20.2	19.1	16.5	18.2

**Table 2-10. AMN Alternative — Average Annual Outputs and Activities. (continued)**

Output/Activity	Base Year	1980 RPA Goals		Decades				
	1982	1990	2030	1	2	3	4	5
Upland Game, Waterfowl & Nongame (M WFUD)	24.6			28.6	32.9	35.9	38.3	40.4
Direct Habitat Improve.	0.0			2.0	2.5	2.8	3.0	3.2
Resident Fish (M WFUD)	25.7			29.7	36.4	41.5	46.5	51.1
Direct Habitat Improve.				0.2	0.4	0.7	0.9	1.1
Induced Habitat Improve.				0.2	0.4	0.4	0.4	0.4
<b>Acres/Structures of Direct Habitat Improvement</b>								
Deer (Acres)	165.0			0.0	0.0	0.0	0.0	0.0
Wetlands (Acres)	1000.0			362.5	284.1	563.3	284.1	563.3
Upland Game (Acres)	0.0			50.0	50.0	50.0	50.0	50.0
Nongame (Acres)	0.0			75.0	75.0	75.0	75.0	75.0
Snags (Numbers Created)	0.0			1403.0	1503.0	939.0	839.0	691.0
Resident Fish (Stream Miles)	0.0			1.5	1.5	1.5	1.5	1.5

NOTE: Decade 1 is the period 1990-1999. Decade 2-5 outputs are shown for long-range comparisons.

## Comparison of Alternatives

This section presents a comparison of the alternatives in narrative, tabular, and graphic form. Major differences between alternatives are highlighted in terms of land allocations, outputs, costs, and environmental consequences. Table 2-23 highlights indicators of responsiveness to issues that lead to differences in alternatives. The section is organized as follows:

- Narrative by resource of major differences between alternatives.
- Graphic comparisons between alternatives (Figure 2-8).
- Comparison of outputs by alternative for the 1st and 5th decades (Table 2-11).
- Comparison of acres by prescription (Table 2-12).
- Land classification for timber management (Table 2-13).
- Comparison of suitable timberland allocated to various harvesting methods (Table 2-14).
- Comparison of suitable timberlands managed under three timber management emphases (Table 2-15).
- Comparison of 1st decade regeneration harvest by prescription on > 20 lands (Table 2-16).
- Timber management information by benchmark and alternative (Table 2-17).
- Comparison of economic effects (Table 2-18).
- Present net value: marginal cost of constraints (Table 2-19).
- Income and Employment Affects for Benchmarks (Table 2-20).
- Present net value: comparison of alternatives (Table 2-21).
- Cash flows and non-cash benefits (Table 2-22).
- Responsiveness to major issues and national concerns (Table 2-23).
- Narrative of reasons for change in present net value.
- Narrative summary of key environmental consequences.
- Comparison of the treatment of issues and concerns (Table 2-24).

## Major Differences Between Alternatives

The following narrative highlights major differences by resource element between the alternatives considered in detail. (Also see Figure 2-8, and Tables 2-11 and 2-12.) Chapter 3 discusses current conditions of each resource, and Chapter 4 describes in detail the environmental consequences of alternatives.

### Air Quality

RPD and IND have the highest potential for impairing air quality because of wildfires and number of acres to which prescription burning is applied; AMN has the lowest potential. Considering road construction and reconstruction, RPD, PRF, IND and AMN have the greatest potential for air quality impairment; RBU and CUR have the least potential.

### Cultural Resources

All alternatives meet legal requirements. RBU alternative provides the lowest level cultural resource program of Native American consultation, inventory and evaluation on a project-needs basis. IND, CUR and PRF alternatives are similar to RBU and offer a low level of interpretive services. The cultural resource program and public benefit from interpretive services, such as signing significant cultural resource sites, and simple brochures and displays at Forest Service offices and the County Museum. Under the RPD alternative, the cultural resource program, Native American consultation, and interpretive possibilities dramatically increase. The AMN alternative would also dramatically increase the cultural resource program in those areas, but would allow more interpretive services by developing cultural resource sites for public education and enjoyment.

### Diversity

An objective to provide a minimum of 5% old growth for each conifer type in each management area was set in all alternatives except AMN. The objective was 10% old growth in mixed conifer and red fir in the AMN alternative. Under PRF, CUR, RPD, RBU and IND, closed-canopied old growth declines Forestwide from 12% in the 1st decade to 5-9% in the 5th decade. The AMN alternative produces less timber volume and requires fewer acres of harvest. Old growth is reduced under AMN to 11% by the 5th decade.

The diversity of non-timbered vegetation communities will be maintained in all alternatives. Activities proposed for these vegetation communities are limited and changes are, therefore, expected to be minimal.

## Facilities

Under PRF, RPD, and IND, less road construction and reconstruction for timber activities occur than in the base year. However, new construction for accessing range and recreation sites increases total road construction above the base year. Because existing temporary roads are added to the inventoried road system for management and maintenance purposes, and fewer roads are obliterated than added, road maintenance mileage increases over time.

Under CUR and RBU, road construction and reconstruction are below base year levels. Transportation planning primarily involves timber management activities. In the 5th decade under CUR, road maintenance miles are greater than base year level because more miles are added to the system than obliterated. Conversely, in the same decade under RBU, road maintenance miles are fewer than base year level because fewer miles are constructed than obliterated. Road closures and obliteration increase.

Under AMN, road construction and reconstruction for timber activities are considerably less than in the base year. However, new construction access for recreation use increases total road construction to slightly above the base year. Because more miles are added to the system than obliterated, road maintenance miles increase over time and are higher than base year levels by the 5th decade.

## Fire and Fuels

Under PRF, RPD, IND, and AMN, the fire management budget is equal to the base year's budget; emphasis is on suppression. Under CUR and RBU, the budget is 20% lower than the base year; prevention is emphasized. By the 5th decade the funding level increases to the current level because of increased acres in plantations. Average annual acres burned are essentially the same under all alternatives.

As a result of timber harvesting, the number of acres receiving fuels treatments (both burning and non-burning methods) is highest under RPD and IND in the 1st decade. By the 5th decade fuel treatment acres are highest under RPD, PRF, IND, and AMN, with the latter three alternatives treating essentially the same number. The lowest number of fuel acres are treated under RBU in the 1st and 5th decades.

## Range

In the 1st decade under all alternatives except RPD and IND, livestock AUMs are estimated to decrease from the base level of 122.5 M AUMs. Decreases range from 2% in CUR to 21% in AMN. The estimated de-

crease from base level is attributable to increased forage available for deer. AUMs are estimated to increase by 12% under IND and remain at base year level in RPD.

By the 5th decade AUMs are estimated to decrease in all alternatives (31% in PRF to 43% in RBU), except under RPD which shows a negligible increase. Loss of transitory range and increased deer forage availability accounts for the estimated decrease in livestock AUMs from the 1st to the 5th decades.

Acres of nonstructural improvements vary widely throughout all alternatives, from no acres (RBU) to 191,400 acres (RPD). Similarly, acres of seedings range from no acres to 29,350 acres in the same alternatives. Unsatisfactory ecological condition improves under all alternatives.

## Recreation

*Developed:* Developed recreation has a very low emphasis in RBU, a high emphasis in AMN, and a moderate emphasis in all other alternatives. In RBU new sites are not constructed, existing sites are neither rehabilitated nor fully maintained, and eventually many sites are closed. Demand is not met. In AMN, new opportunities enhance the experience of visitors. Sites are expanded or constructed before serious crowding occurs, and they are well maintained. Interpretive services are emphasized. All other alternatives meet demand through expansion when needed, and provide adequate maintenance and additional interpretive services. The decision to expand is made on a case-by-case basis. Sites may be expanded as early as the 1st decade if an existing site's capacity is reached and additional use cannot be directed to less popular sites. If a popular dispersed recreation site is damaged from overuse, it may be converted to a developed site.

*Dispersed:* Dispersed recreation has a very low emphasis in RBU, a low emphasis in IND, a moderate emphasis in RPD, CUR, and PRF, and a high emphasis in AMN. RBU does not include semi-primitive non-motorized (SPNM) management except in special interest areas and the research natural area. Semi-primitive motorized (SPM) is managed on 380,000 acres. Some trails are abandoned while the rest are minimally maintained. IND also does not include SPNM management, but adds 82 miles of new trails, and provides adequate maintenance. RPD, CUR, and PRF include 78,000 acres of SPNM, 370,000 acres of SPM, add 131 miles of trails, and provide adequate maintenance. AMN includes 198,000 acres of SPNM, 440,000 acres of SPM, adds 375 miles of new trails, and provides adequate trail maintenance. The AMN alternative emphasizes interpretation of the environment, which enhances many dispersed recreation ac-

tivities. Ninety-one percent of the Forest remains open to OHVs in RBU and IND; 87% in CUR, RPD, and PRF; and 70% in AMN. To compensate for loss of OHV opportunities in the AMN alternative, 125 miles of OHV trails are managed.

### Soils

The potential for erosion and sedimentation is greatest under RPD and IND, and least under RBU and CUR. AMN and PRF have only a slightly higher potential for erosion and sedimentation than CUR. The soil erosion and sedimentation index is explained in Chapter 4, Section 18.

Although RPD, IND, PRF and AMN result in more soil disturbing activities, soil erosion and sedimentation are checked because mitigating projects are planned and implemented.

Under all alternatives, soil and water projects are implemented to improve deteriorated watersheds. Over five decades these projects improve 10,200 acres under IND and RPD; 3950 acres under RBU; 4,200 acres under CUR; 7,400 acres under AMN; and 7,450 acres under PRF. In addition, other degraded watershed acres improve naturally over the next two decades primarily because livestock grazing practices are improved. The most rapid improvement is realized under AMN, followed (in descending order) by PRF, RBU, IND, RPA and CUR.

### Timber

RPD yields the highest allowable sale quantity with 75 MMBF per year in the 1st decade, 33% above the base level of 50.4 MMBF. In the 2nd decade, volume decreases to 50 MMBF per year under this alternative and climbs to 59 MMBF per year in the 5th decade. AMN yields the lowest volume at 31.8 MMBF per year. All alternatives except PRF, RBU and AMN provide a sustained yield of 11 MMBF in the Big Valley Federal Sustained-Yield Unit. In the 1st decade, RBU and AMN schedule 8.5 and 5.7 MMBF per year, respectively. PRF schedules 9 MMBF in the 1st decade; by the 5th decade 11 MMBF is reached.

Acres available for timber production range from 406,000 under RBU to 562,500 in IND. The difference is attributable to acreages allocated to Semi-primitive Non-motorized and Minimum Management Level prescriptions which support the retention of late seral stages, but do not provide for timber production. Other acres have visual retention requirements which also reduce timber production.

Except for RBU, all alternatives harvest from <20 lands under low intensity management. Regulated volume from riparian areas, visual retention areas, and lands

producing <20 cubic feet of timber are highest under AMN; moderate under RPD, PRF, IND and CUR; and lowest under RBU.

In the 1st decade, reforested acres range from 45,000 under RPD to 21,000 under AMN and RBU. RBU provides most of the regeneration harvest in existing poorly-stocked stands in the 1st decade. Other alternatives reforest more well-stocked stands.

Acres regenerated under the Timber-Forage prescription in the 1st decade range from a high of 2,200 acres per year in RPD to a low of 250 acres per year under CUR and IND and zero under AMN. Acres regenerated under the Even-Aged Timber prescription in the 1st decade range from a high of 3,520 acres per year in IND to a low of 120 acres in RBU.

### Visual Quality

The existing Inventoried Visual Quality Objectives (Appendix Q) can be used as a standard for comparing alternatives. It emphasizes retaining scenic values in areas of high scenic priority while allowing for visual changes in the landscape where scenic priorities are lower. The AMN alternative emphasizes retaining scenic values above IVQOs and also has the most semi-primitive designations to protect the landscape. PRF, CUR, and RPD are similar to the IVQOs, except slightly more change is allowed in landscapes where scenic priorities are low. RBU and IND reduce visual quality below IVQOs. Although less scenic values are retained, all distinctive scenery adjacent to major travel routes is protected.

### Water and Riparian Areas

Alternatives do not differ significantly in effects on water yield. Water quality and riparian areas improve under all alternatives. The AMN and RBU alternatives are the least land disturbing, meeting 100% of State water quality objectives by the 3rd decade. Riparian areas also recover from past land disturbing activities by the 3rd decade under these alternatives.

Under PRF and CUR, 100% of State water quality objectives are met and riparian areas recover by the 4th decade. The RPD alternative meets State water quality objectives and riparian areas recover by the 5th decade. The IND alternative, the most land disturbing, does not meet State water quality objectives by the 5th decade. Furthermore, riparian areas do not fully recover by the 5th decade under this alternative.

Under all alternatives, projects are implemented to improve deteriorated watersheds. Over five decades, these projects improve 10,200 acres under IND and

RPD; 3,950 acres under RBU; 4,200 acres under CUR; 7,400 acres under AMN, and 7,450 acres under PRF.

#### Wilderness and Roadless Areas

RBU provides for little maintenance of trails and few contacts with users to achieve compliance with Wilderness regulations. All other alternatives provide adequate maintenance and visitor contacts. RBU and IND do not protect views from the Wilderness of adjacent Forest lands. CUR, RPD, and PRF protect views adjacent to the boundary, while AMN extends this protection further. Because RBU and IND do not provide SPNM areas outside the Wilderness, the quality of primitive recreation decreases over time within the Wilderness.

Under RBU's low standard management, concentrated use at popular locations causes resource damage. With standard management, IND improves primitive experiences for the short-term, but eventually use increases and concentration of visitors occurs. RPD, CUR, and PRF maintain present primitive values longer than IND, because SPNM areas are managed outside the Wilderness. Consequently, pressure on Wilderness for a primitive experience is alleviated. The wilderness setting is also maintained by providing additional visual resource protection outside the Wilderness, adjacent to the boundary. The AMN alternative enhances the wilderness setting and provides a higher quality primitive experience than that currently available. The Wilderness appears more natural without livestock grazing. Because other SPNM areas are available on the Forest, visitors are widely dispersed.

#### Wildlife and Fish

Under all alternatives, threatened and endangered species (bald eagle, peregrine falcon, northern spotted owl, Modoc sucker, Lost River sucker, and shortnosed sucker) meet current and future recovery plan objectives. Current and potential habitat is maintained or improved.

Under PRF, IND and AMN, snag densities in eastside pine increase to 1.1 snags per acre by the 5th decade. Under these alternatives, snags are created (and replacement snags designated) as areas are harvested. Under CUR, RPD and RBU, snags are created throughout eastside pine. Snag densities in eastside pine reach 1.5 snags per acre by the 3rd decade.

All alternatives implement watershed and fish habitat improvements and the Riparian Area prescription, which improves fisheries above current conditions.

Major differences in alternatives are the rapidity with which changes occur.

Habitat in streams is improved through changes in grazing management and structural improvements. Riparian habitat improvement objectives are achieved under AMN by the 1st decade, under RBU by the 3rd, under PRF and CUR by the 4th, and under RPD and IND by the 5th.

PRF provides for deer habitat and forage at moderate but stable levels, and meets State Deer Herd Plan goals for the Forest. Old-growth habitat decreases from current levels, but selected areas are specifically managed for old-growth-dependent species. Bighorn sheep are reintroduced and managed according to the *California Mountain Sheep Recovery Guidelines for Northeastern California* for viable populations levels. All wetland areas suitable for development are constructed and maintained. Moderate levels of habitat improvement for upland and nongame are initiated.

CUR provides for wildlife species habitat at a lower level than PRF. Slightly less deer habitat and forage are provided under CUR, except during the 2nd and 3rd decades. Wetlands development is lower, but other habitat improvement is similar to PRF. Old-growth habitat is managed above minimum levels. Bighorn sheep and goshawks are managed at minimum levels.

Habitat provided under IND and RPD are similar. Deer populations are high, while old-growth habitat is at the lowest level of all alternatives. Wetland development under IND and CUR is similar, while RPD emphasizes development of all wetlands. Habitat for other species is managed at minimum levels.

AMN and RBU also have a common emphasis. Deer habitat is provided at relatively high levels due to reductions in livestock AUMs. AMN maintains more old growth than all other alternatives by the 5th decade. Under AMN, bighorn are reintroduced into all suitable habitat in the Warner Mountains, and populations are three times higher than other alternatives. Goshawk habitat is maintained above minimum levels and habitat is improved for upland and nongame species. All wetlands are developed under AMN, but only wetlands needed for bald eagles are developed under RBU.



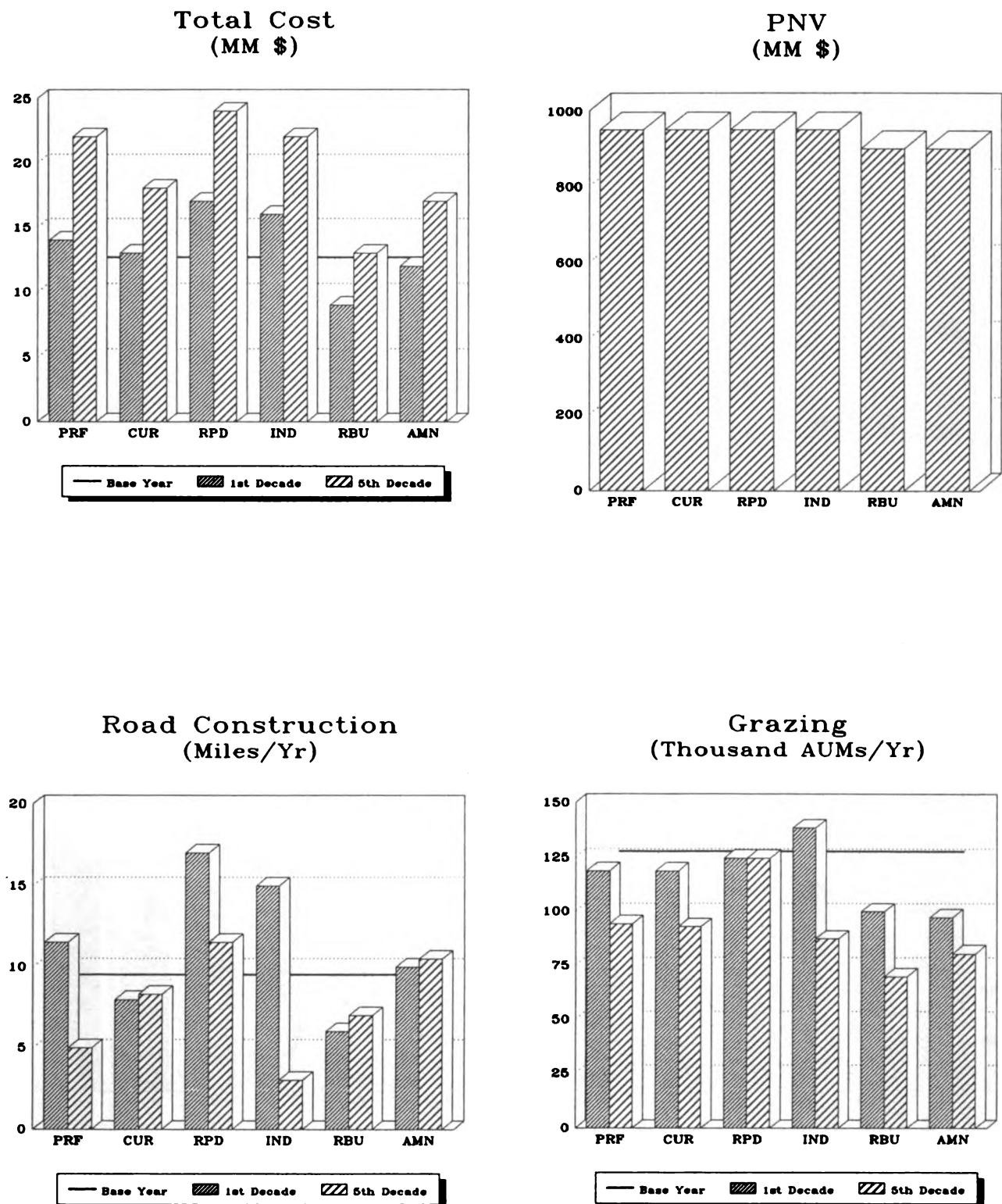
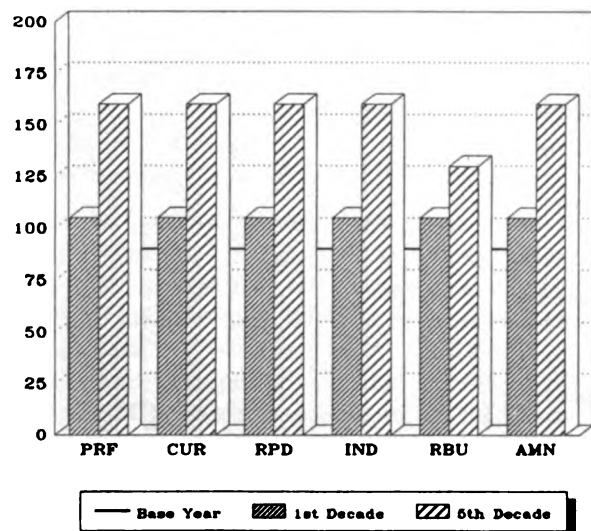
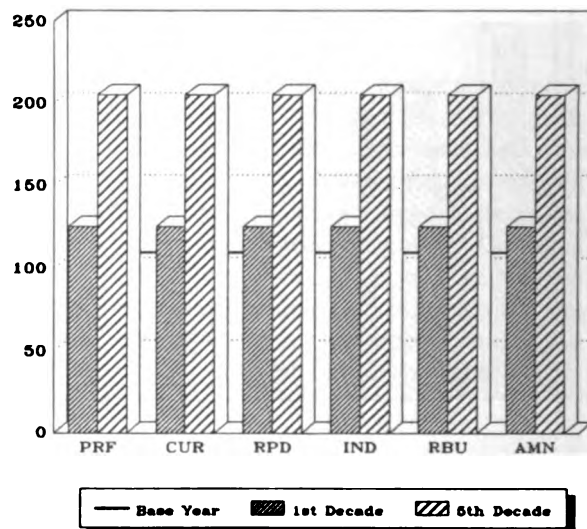
**Figure 2-8. Key Comparisons Between Alternatives.**

Figure 2-8. Key Comparisons Between Alternatives. (continued)

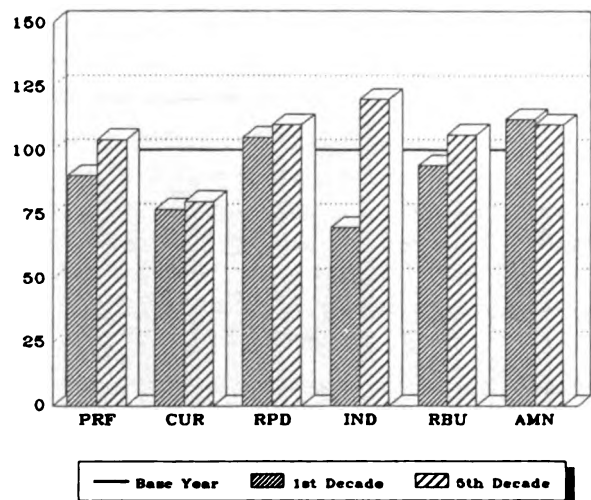
**Developed Recreation  
(Thousand RVDs/Yr)**



**Dispersed Recreation  
(Thousand RVDs/Yr)**



**Hunting-Related  
Dispersed Recreation  
(Thousand RVDs/Yr)**



**Semi-Primitive Recreation  
(Thousand Acres)  
(Does not include Wilderness)**

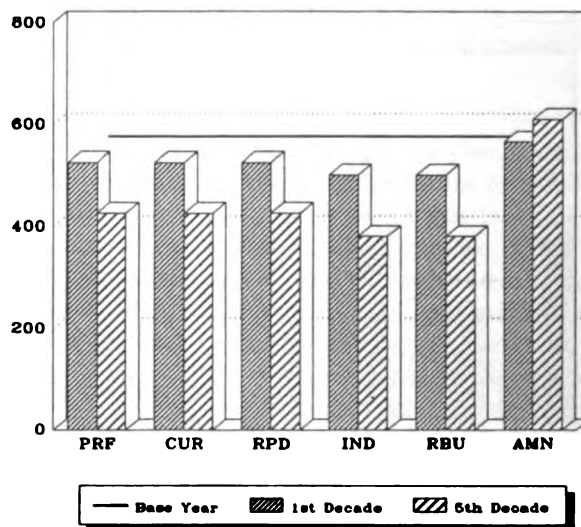
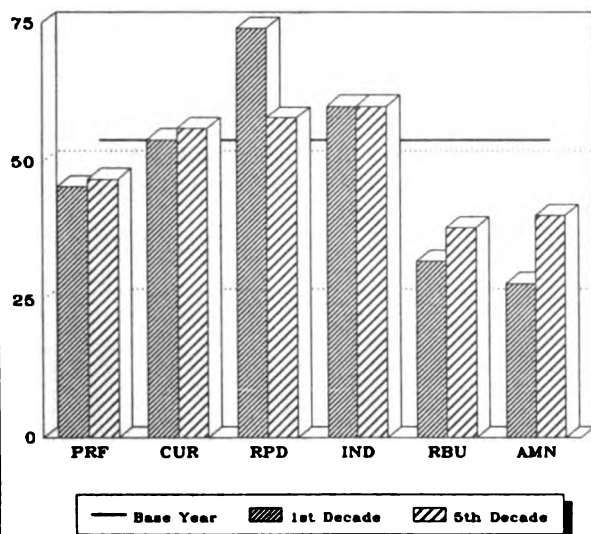
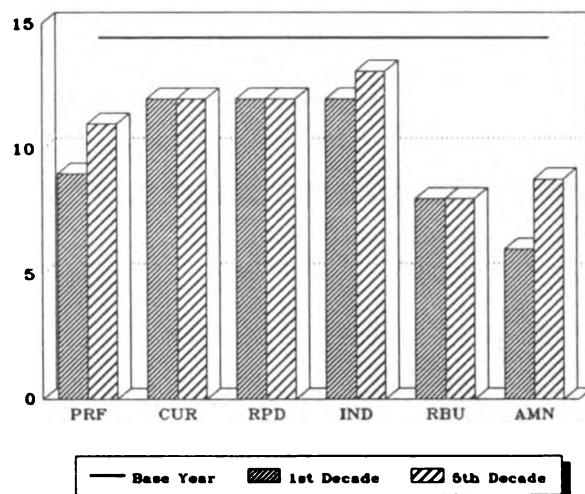


Figure 2-8. Key Comparisons Between Alternatives. (continued)

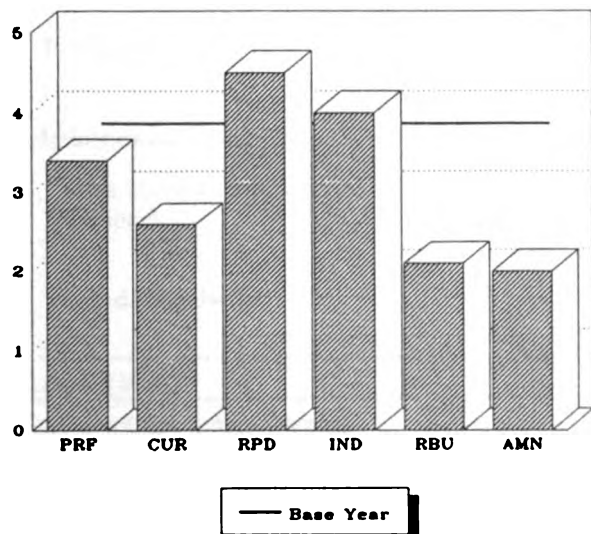
### Allowable Sale Quantity (MMBF/Yr)



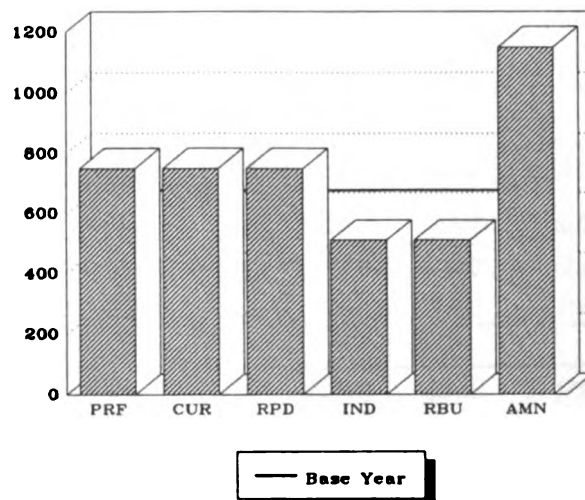
### Big Valley Federal Sustained-Yield Unit (MMBF/Yr)



### Reforestation (Thousand Acres/Yr)



### Preservation, Retention, and Partial Retention (Thousand Acres)



**Figure 2-8. Key Comparisons Between Alternatives. (continued)**

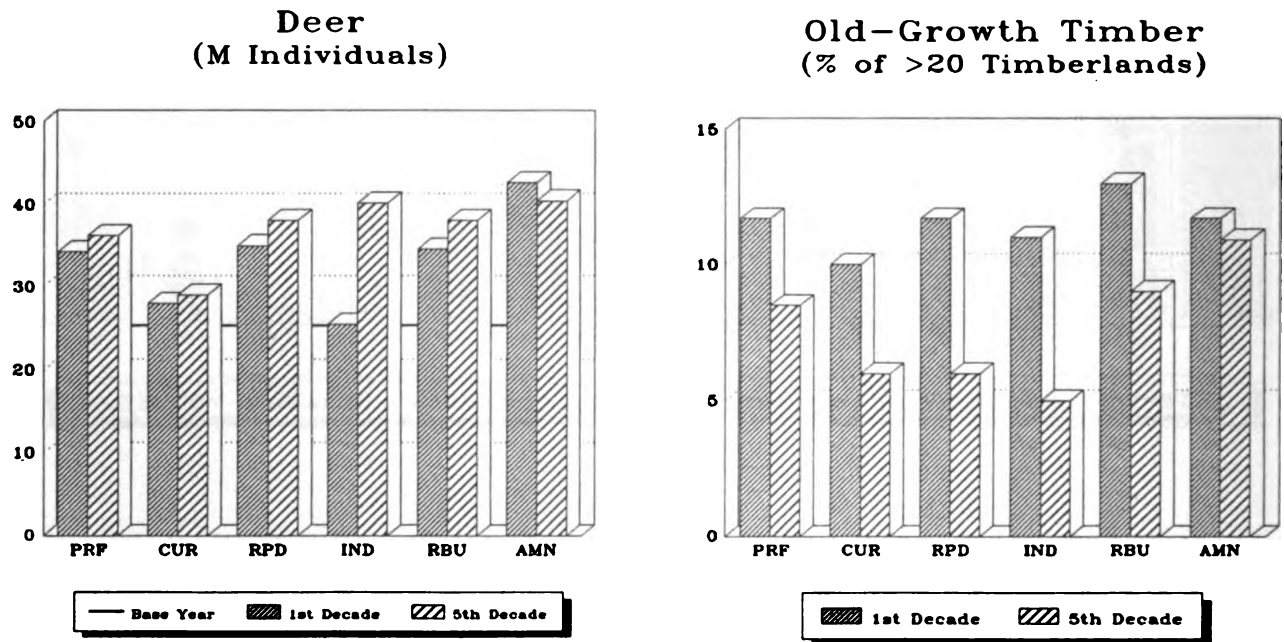


Table 2-11. Average Annual Outputs for the 1st and 5th Decades.

Output/Activity	Base Year 1982	Decade	PRF	CUR	RPD	IND	RBU	AMN
<b>Economics</b>								
Total Budget (MM \$)	9.6	1	12.1	10.3	15.1	14.5	7.8	11.1
		5	12.6	15.5	21.3	15.3	10.1	12.1
Total Cost (MM \$)	11.5	1	14.4	12.1	16.9	16.8	9.7	13.4
		5	14.9	17.3	23.1	17.6	11.8	19.9
PNV (MM \$)			919.1	937.0	933.6	960.6	889.9	880.9
<b>Facilities</b>								
Trail Construction/ Reconstruction (Miles)	0.0	1	9.7	5.0	5.0	7.5	2.5	15.5
		5	1.2	3.0	3.0	1.0	0.0	10.0
Road Construction (Miles)	9.3	1	11.5	8.0	16.6	15.0	5.7	10.0
		5	5.0	8.3	11.6	3.0	6.4	5.0
Road Reconstruction (Miles)	21.7	1	25.0	18.7	27.1	28.0	13.4	21.0
		5	20.0	19.5	21.3	25.0	14.8	15.0
F.S. Road Maintenance (Miles)	3178.4	1	3167.3	3167.3	3167.3	3167.3	3167.3	3167.3
		5	3341.2	3193.4	3359.2	3381.2	3112.2	3211.2
<b>Dams and Reservoirs</b>								
Forest Service (Number)	120.0	1	120.0	120.0	120.0	120.0	120.0	120.0
		5	120.0	120.0	120.0	120.0	120.0	120.0
Other Federal (Number)	0.0	1	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
Other State/Local (Number)	29.0	1	29.0	29.0	29.0	29.0	29.0	29.0
		5	29.0	29.0	29.0	29.0	29.0	29.0
Private (Number)	0.0	1	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
<b>Administrative Sites</b>								
Forest Service Owned (Number)	12.0	1	14.0	14.0	14.0	14.0	14.0	14.0
		5	16.0	16.0	16.0	16.0	16.0	16.0
Leased (Number)	4.0	1	2.0	2.0	2.0	2.0	2.0	2.0
		5	0.0	0.0	0.0	0.0	0.0	0.0
<b>Fire and Fuel</b>								
Total Fuel Treatment (Acres)	5100.0	1	4246.0	3700.0	7800.0	5872.0	3500.0	5107.0
		5	5840.0	4400.0	8300.0	7046.0	3100.0	5636.0

**Table 2-11. Average Annual Outputs for the 1st and 5th Decades. (continued)**

Output/Activity	Base Year 1982	Decade	PRF	CUR	RPD	IND	RBU	AMN
Fire-related Fuel Treatment (Acres)	250.0	1	350.0	250.0	350.0	350.0	250.0	350.0
		5	350.0	250.0	350.0	350.0	250.0	350.0
Timber-related Fuel Treatment (Acres)	4800.0	1	3846.0	3400.0	7400.0	5472.0	3200.0	4743.0
		5	5440.0	4100.0	7900.0	6646.0	2800.0	5236.0
Other Fuel Treatment (Acres)	50.0	1	50.0	50.0	50.0	50.0	50.0	50.0
		5	50.0	50.0	50.0	50.0	50.0	50.0
Expected Acres Burned by Wildfire	8604.7	1	6236.0	6258.0	6236.0	6236.0	6258.0	6236.0
		5	6426.0	6431.0	6426.0	6426.0	6431.0	6426.0
Intensity Class 1	2.0	1	1.0	63.0	1.0	1.0	63.0	1.0
		5	85.0	64.0	85.0	85.0	64.0	85.0
Intensity Class 2	139.8	1	133.0	313.0	133.0	133.0	313.0	133.0
		5	100.0	129.0	100.0	100.0	129.0	100.0
Intensity Class 3	838.0	1	577.0	876.0	577.0	577.0	876.0	577.0
		5	577.0	579.0	577.0	577.0	579.0	577.0
Intensity Class 4	7625.0	1	5525.0	5006.0	5525.0	5525.0	5006.0	5525.0
		5	5664.0	5659.0	5664.0	5664.0	5659.0	5664.0
<b>Firewood</b>								
Firewood (M Cords)	23.0	1	25.0	25.0	25.0	25.0	25.0	25.0
		5	34.7	34.7	34.7	34.7	34.7	34.7
<b>Human Resources</b>								
Programs (Enrollees)	11.0	1	3.0	3.0	3.0	3.0	3.0	3.0
		5	3.0	3.0	3.0	3.0	3.0	3.0
<b>Land and Minerals</b>								
Minerals (Operating Plans)	43.0	1	45.0	45.0	45.0	45.0	45.0	45.0
		5	61.0	61.0	61.0	61.0	61.0	61.0
Withdrawn From Mineral Entry (M Acres)	22.0	1	93.7	93.7	93.7	93.7	93.7	93.7
		5	93.7	93.7	93.7	93.7	93.7	93.7
Land Acquisition (Acres)	3823.0	1	160.0	160.0	160.0	160.0	160.0	160.0
		5	160.0	160.0	160.0	160.0	160.0	160.0

**Table 2-11. Average Annual Outputs for the 1st and 5th Decades. (continued)**

Output/Activity	Base Year 1982	Decade	PRF	CUR	RPD	IND	RBU	AMN
Range								
Grazing (M AUM)	122.5	1	118.8	120.0	122.5	138.4	100.0	97.3
		5	94.2	91.7	123.7	87.4	70.5	80.7
Recreation								
Developed Public (M RVD)	79.1	1	92.9	92.9	92.9	92.9	92.9	92.9
		5	149.0	149.0	149.0	149.0	120.5	149.0
Developed Private (M RVD)	6.9	1	8.1	8.1	8.1	8.1	8.1	8.1
		5	13.0	13.0	13.0	13.0	13.0	13.0
Dispersed (M RVD)	102.8	1	122.4	122.4	122.4	122.4	122.4	122.4
		5	204.5	204.5	204.5	204.5	204.5	204.5
Hunting-related Dispersed (M RVD)	98.4	1	92.9	79.4	104.2	70.1	95.7	114.4
		5	103.7	81.3	109.6	119.1	105.9	110.6
Open, Usable OHV Areas - Summer (M Acres)	1077.4	1	1010.8	1010.8	1010.8	1064.0	1064.0	813.3
		5	1010.8	1010.8	1010.8	1064.0	1064.0	813.3
Open, Usable OHV Areas - Winter (M Acres)	1092.10	1	1034.6	1034.6	1034.6	1080.8	1080.8	944.3
		5	1034.6	1034.6	1034.6	1080.8	1080.8	944.3
Roads and Trails Open to OHV Use - Summer (Miles)	2964	1	3021	2999	2999	2999	2964	3019
		5	3165	3049	3184	3157	2847	3271
Roads and Trails Open to OHV Use - Winter (Miles)	2776	1	2833	2811	2811	2811	2811	2841
		5	2969	2853	2988	2961	2733	3095
Roads and Trails Closed to OHV Use - Summer (Miles)	332	1	332	332	332	332	332	352
		5	362	362	362	352	352	402
Roads and Trails Closed to OHV Use - Winter (Miles)	520	1	520	520	520	520	485	530
		5	558	558	558	548	466	578
ROS Class (M Acres)								
Semi-Primitive Non-Motorized Wilderness	68.4	1	70.4	70.4	70.4	70.4	70.4	70.4
		5	70.4	70.4	70.4	70.4	70.4	70.4

**Table 2-11. Average Annual Outputs for the 1st and 5th Decades. (continued)**

Output/Activity	Base Year 1982	Decade	PRF	CUR	RPD	IND	RBU	AMN
Semi-Primitive Non-Motorized	380.8	1	317.0	317.0	317.0	304.1	304.1	341.0
		5	78.0	78.0	78.0	13.5	13.5	198.0
Semi-Primitive Motorized	183.0	1	219.8	219.8	219.8	222.9	222.9	234.4
		5	367.2	367.2	367.2	382.5	382.5	439.8
Roaded Natural	1031.4	1	1056.4	1056.4	1056.4	1066.2	1066.2	1017.8
		5	1148.0	1148.0	1148.0	1197.2	1197.2	955.4
<b>ROS Class (M RVD Dispersed Rec &amp; Wilderness; no WFUDS)</b>								
Semi-Primitive Non-Motorized Wilderness	12.0	1	14.0	13.4	15.1	12.9	14.2	15.1
		5	25.3	24.2	25.6	26.1	25.4	25.6
Semi-Primitive Non-Motorized	17.7	1	19.0	17.8	20.8	17.0	19.2	20.8
		5	27.3	25.4	27.8	13.5	13.5	27.9
Semi-Primitive Motorized	23.5	1	25.3	23.7	27.7	22.7	25.6	27.7
		5	36.3	33.8	37.0	53.2	50.6	37.1
Roaded Natural	155.1	1	166.4	156.3	182.6	149.3	168.5	182.6
		5	239.4	222.5	243.8	250.9	241.0	244.6
<b>ROS Class (M PAOT)</b>								
Semi-Primitive Non-Motorized	0.4	1	0.5	0.5	0.5	0.5	0.5	0.5
		5	0.5	0.5	0.5	0.5	0.5	0.5
Semi-Primitive Non-Motorized	13.9	1	11.6	11.6	11.6	11.2	11.2	12.5
		5	5.1	5.1	5.1	5.0	5.0	7.3
Semi-Primitive Motorized	12.6	1	15.1	15.1	15.1	15.4	15.4	16.2
		5	25.3	25.3	25.3	26.4	26.4	30.3
Roaded Natural	73.7	1	75.3	75.3	75.3	76.0	76.0	72.6
		5	81.9	81.9	81.9	85.4	85.4	68.1
<b>Research Natural Areas</b>								
Research Natural Areas (Number)	1	1	2	1	2	1	1	2
		5	2	1	2	1	1	2
Research Natural Areas (Acres)	800.0	1	7186.0	800.0	7186.0	800.0	800.0	7186.0
		5	7186.0	800.0	7186.0	800.0	800.0	7186.0



**Table 2-11. Average Annual Outputs for the 1st and 5th Decades. (continued)**

Output/Activity	Base Year 1982	Decade	PRF	CUR	RPD	IND	RBU	AMN
<b>Timber</b>								
Allowable Sale Quantity (MMBF) (including BVFSYU)	50.5	1	45.5	51.4	74.6	60.1	36.9	31.8
		5	46.8	53.8	58.7	60.1	40.9	40.2
(MMCF)		1	7.6	8.4	12.2	9.9	6.0	5.2
		5	7.7	8.8	9.6	9.9	6.7	6.7
Long Term Sustained Yield								
(MMBF)	58.9		56.3	57.4	62.4	66.3	61.9	46.8
(MMCF)	9.7		9.2	9.4	10.2	10.9	10.1	7.6
Big Valley Federal Sustained- Yield Unit (MMBF)	13.7	1	9.0	11.0	11.0	11.0	8.5	5.7
		5	11.0	11.0	11.0	12.1	8.5	8.8
Reforestation (M Acres)	3.7	1	3.4	2.7	4.5	4.0	2.1	2.0
		5	3.7	2.6	4.8	5.8	1.2	2.7
Timber Stand Improvement (M Acres)	3.9	1	5.2	2.8	4.9	6.0	2.2	4.0
		5	6.8	4.6	6.8	10.5	2.4	5.7
<b>Visual Resources</b>								
Visual Quality Index	62.6	1	64.1	64.1	64.1	63.3	63.3	65.4
		5	71.1	71.1	71.1	67.0	67.0	77.7
Visual Quality Objectives (M Acres)								
Preservation	71.2	1	84.7	84.7	84.7	84.7	84.7	84.7
		5	84.7	84.7	84.7	84.7	84.7	84.7
Retention	98.1	1	138.3	138.3	138.3	47.9	47.9	336.3
		5	138.3	138.3	138.3	47.9	47.9	336.3
Partial Retention	447.0	1	531.8	531.8	531.8	397.8	397.8	729.7
		5	531.8	531.8	531.8	397.8	397.8	729.7
Modification	451.0	1	808.7	808.7	808.7	999.8	999.8	492.6
		5	808.7	808.7	808.7	999.8	999.8	492.6
Maximum Modification	596.0	1	99.8	99.8	99.8	133.1	133.1	20.0
		5	99.8	99.8	99.8	133.1	133.1	20.0

Table 2-11. Average Annual Outputs for the 1st and 5th Decades. (continued)

Output/Activity	Base Year 1982	Decade	PRF	CUR	RPD	IND	RBU	AMN
<b>Water</b>								
Quality (M acre-feet meeting objectives)	357.1	1	357.3	357.2	357.7	357.8	357.1	357.2
		5	568.6	568.1	568.4	536.4	567.5	567.5
Quantity (M acre-feet)	565.8	1	567.0	567.0	567.7	567.9	566.9	567.0
		5	568.6	568.1	568.4	568.8	567.5	567.5
Watershed Improvement (Acres)	0.0	1	260.0	195.0	315.0	315.0	190.0	315.0
		5	85.0	20.0	140.0	140.0	15.0	0.0
<b>Wilderness</b>								
Wilderness (M RVD)*	7.1	1	9.4	9.4	9.4	9.4	9.4	9.4
		5	20.1	20.1	20.1	20.1	20.1	20.1
Wilderness (M Acres)	68.4	1	70.4	70.4	70.4	70.4	70.4	70.4
		5	70.4	70.4	70.4	70.4	70.4	70.4
* Does not include hunting-related dispersed recreation								
<b>Wildlife and Fish</b>								
Bald Eagle (Active Territories)	7.0	1	10.0	10.0	10.0	10.0	10.0	10.0
		5	21.0	21.0	21.0	21.0	21.0	21.0
Peregrine Falcon (Active Territories)	0.0	1	3.0	3.0	3.0	3.0	3.0	3.0
		5	3.0	3.0	3.0	3.0	3.0	3.0
Modoc Sucker (Suitable Stream Miles)	13.4	1	19.4	19.4	19.4	19.4	19.4	19.4
		5	19.4	19.4	19.4	19.4	19.4	19.4
Bighorn Sheep (Individuals)	20.0	1	20.0	20.0	20.0	20.0	20.0	20.0
		5	100.0	100.0	100.0	100.0	100.0	300.0
Deer (M Individuals)	24.1	1	34.2	28.9	35.6	25.5	34.5	42.6
		5	36.6	29.7	39.5	40.1	38.1	40.4
Interstate Deer Herd	8.2	1	10.4	10.0	8.4	9.3	13.8	14.3
		5	10.0	13.8	13.8	13.1	13.8	14.0
Glass Mountain Deer Herd	5.5	1	10.0	7.2	15.2	5.6	5.5	5.7
		5	9.6	7.1	7.3	8.6	6.3	7.2
Warner Mountain Deer Herd	7.2	1	9.4	7.8	8.7	7.3	12.0	12.4
		5	10.6	3.5	8.5	9.3	10.0	9.1

Table 2-11. Average Annual Outputs for the 1st and 5th Decades. (continued)

Output/Activity	Base Year 1982	Decade	PRF	CUR	RPD	IND	RBU	AMN
Adin Deer Herd*	3.2	1	4.2	4.0	3.3	3.3	3.2	10.2
		5	6.0	5.3	9.9	9.3	8.0	10.1
* 1982 Base Year population equal to 72% of total herd estimate of 4300 deer.								
Snags (average number per acre) in eastside pine	0.5	1	0.5	1.1	1.1	0.5	1.1	.5
		5	1.1	1.5	1.5	1.1	1.5	1.1
Resident Fish (M Pounds) - All	116.0	1	118.8	118.5	118.8	117.4	117.8	117.8
		5	127.7	126.2	127.7	120.9	122.7	122.7
Resident Trout (M Pounds)	43.0	1	45.1	45.8	45.1	44.8	45.1	45.1
		5	50.0	53.5	50.0	48.3	50.0	50.0
Warmwater Fish (M Pounds)	73.0	1	73.7	72.7	73.7	72.7	72.7	72.7
		5	77.7	72.7	77.7	72.7	72.7	72.7
Goshawk (Pairs)	71.0*	1	100.0	73.0	73.0	73.0	73.0	73.0
		5	100.0	73.0	73.0	73.0	90.0	110.0
*Known pairs in 1982.								
Total Wildlife and Fish User Days (M WFUDs) (Is not double-counted with dispersed recreation)	83.1	1	106.0	97.8	110.5	93.6	105.6	118.0
		5	142.1	132.0	146.8	146.4	143.0	148.1
Big Game (M WFUD)	32.8	1	47.9	39.7	52.1	35.7	47.9	59.7
		5	50.7	40.6	54.8	56.2	52.9	56.6
Direct Habitat Improve.		1	0.5	0.0	4.8	0.0	0.0	0.0
		5	0.5	0.0	5.1	0.0	0.0	0.0
Induced Habitat Improve.		1	16.7	11.7	34.8	16.3	17.7	22.7
		5	17.1	12.6	18.8	19.7	17.2	18.2
Upland Game, Waterfowl, & Nongame (M WFUD)	24.6	1	28.3	28.3	28.6	28.3	28.0	28.6
		5	39.6	39.6	40.4	39.6	39.1	40.4
Direct Habitat Improve.		1	2.5	2.5	2.5	0.4	1.0	2.0
		5	3.7	3.7	3.9	0.8	1.4	3.2

**Table 2-11. Average Annual Outputs for the 1st and 5th Decades. (continued)**

Output/Activity	Base Year 1982	Decade	PRF	CUR	RPD	IND	RBU	AMN
Resident Fish (M WFUD)	25.7	1	29.8	29.8	29.8	29.6	29.7	29.7
		5	51.8	51.8	51.6	50.6	51.0	51.1
Direct Habitat Improve.		1	0.3	0.3	0.3	0.2	0.2	0.2
		5	1.8	1.8	1.6	0.7	1.1	1.1
Induced Habitat Improve.		1	0.2	0.2	0.2	0.1	0.2	0.2
		5	0.4	0.4	0.4	0.2	0.3	0.4
Acres/Structures of Direct Habitat Improvement								
Deer (Acres)	165.0	1	330.2	0.0	2870.5	0.0	0.0	0.0
		5	330.2	0.0	2870.5	0.0	0.0	0.0
Wetlands (Acres)	1000.0	1	362.5	242.6	362.5	242.6	79.4	362.5
		5	563.4	442.6	563.4	442.6	108.4	563.4
Upland Game (Acres)	0.0	1	100.0	100.0	100.0	0.0	50.0	50.0
		5	100.0	100.0	100.0	0.0	50.0	50.0
Nongame (Acres)	0.0	1	75.0	75.0	75.0	0.0	25.0	75.0
		5	75.0	75.0	75.0	0.0	25.0	75.0
Snags (Numbers Created)	0.0	1	2605.0	6420.0	6420.0	2522.0	6420.0	1403.0
		5	981.0	2800.0	2800.0	1637.0	2800.0	691.0
Resident Fish (Stream Miles)	0.0	1	1.5	2.5	1.5	1.0	1.5	1.5
		5	1.5	2.5	1.5	1.0	1.5	1.5

NOTE: Decade 1 is the period 1990-1999. Decade 5 is shown for long-range comparison.

Table 2-12. Acreage Allocations by Prescription for each Alternative.

Management Prescription	Prescription Description <sup>1</sup>	PRF	CUR	RPD	IND	RBU	AMN
1	Minimum Level > 20	45,802	22,871	21,539	38,049	27,646	67,866
	< 20	12,782	33,931	20,137	0	166,933	0
	Range	11,569	15,498	18,721	10,936	17,017	49,452
2	Wilderness Standard	70,385	70,385	70,385	70,385	0	70,385
3	Wilderness Low Standard	0	0	0	0	70,385	0
4 <sup>2</sup>	Semi-Primitive Non-Motorized > 20	10,913	10,913	10,913	0	0	24,452
	< 20	12,100	12,100	12,100	0	0	20,762
5	Developed Recreation Standard	198	198	198	198	0	198
6	Developed Recreation Low Standard	0	0	0	0	198	0
7 <sup>2</sup>	Visual Retention > 20	22,522	22,522	22,522	14,494	14,494	51,449
	< 20	8,605	8,605	8,605	8,359	8,359	21,974
8	Special Areas	14,588	14,588	14,588	14,588	14,588	14,588
9	Raptor Management > 20	11,885	11,885	11,885	11,885	11,885	11,885
	< 20	6,796	6,796	6,796	6,796	6,796	6,796
	Range	33,430	33,430	33,430	33,430	33,430	33,430
10	Rangeland	619,212	727,986	136,044	427,418	905,129	496,253
11	Range-Forage	291,365	178,662	767,381	483,792	0	376,441
12	Even-aged Timber	145,859	228,029	153,494	180,453	202,645	30,793
13	Timber - Visuals	66,835	94,883	60,768	57,411	35,322	73,036
14 <sup>2</sup>	Timber-Forage PR	50,180	12,525	45,395	45,547	64,075	80,530
	MOD	60,111	25,266	101,106	75,449	75,434	54,801
15	Uneven-aged Timber	17,114	2,211	3,459	7,933	0	36,409
16	< 20 Cu. Ft. Timber	142,117	120,704	134,501	167,245	0	132,868
17	Riparian Area > 20	3,882	3,882	3,882	3,882	3,882	3,882
	< 20	1,755	1,755	1,755	1,755	1,755	1,755
	Range	3,637	3,637	3,637	3,637	3,637	3,637

<sup>1</sup> > 20 are timberlands capable of producing greater than 20 cubic feet per acre per year  
 < 20 are timberlands capable of producing less than 20 cubic feet per acre per year  
 Range are all other lands  
 PR is partial retention visual quality objective  
 MOD is modification visual quality objective

<sup>2</sup> Timber acres only; range acres are in Prescriptions 10 and 11

### Timber Management Comparisons

Table 2-13 summarizes the land classification for timber management by alternative. Selection of the suitable timber base depends on management objectives reflecting the theme of each alternative, economic efficiency, and constraints limiting or precluding timber production.

Table 2-14 displays the average annual acreage of timber harvest by methods in the 1st and 5th decades.

Table 2-15 compares suitable timberland managed under three different management emphases for each alternative.

Table 2-16 displays 1st decade regeneration harvest by prescription on > 20 timber lands for each alternative.

Figure 2-9 compares long-term sustained yield capacity (LTSYC) and allowable sale quantity (ASQ) among alternatives.

Table 2-17 shows timber management information by benchmark and alternative.

**Table 2-13. Land Classification for Timber Management. (Thousands of Acres)**

Classification		PRF	CUR	RPD	IND	RBU	AMN
<b>M Acres</b>							
1	Non-Forested Land (includes water)	505.0	505.0	505.0	505.0	505.0	505.0
2	Forested Land	1158.3	1158.3	1158.3	1158.3	1158.3	1158.3
3	Forested Land Currently Withdrawn from timber production <sup>1</sup>	28.6	28.6	28.6	28.6	28.6	28.6
4	Forested Land Not Capable of Producing Industrial Wood <sup>2</sup>	492.6	492.6	492.6	492.6	492.6	492.6
5	Forested Land Physically Unsited						
	Irreversible damage to soils, watershed, or productivity likely to occur	0.0	0.0	0.0	0.0	0.0	0.0
	Unregenerable within 5 years of final harvest	17.8	17.8	17.8	17.8	17.8	17.8
6	Inadequate Information to Project Responses <sup>3</sup>	0.0	0.0	0.0	0.0	0.0	0.0
7	Tentatively Suitable Timber Base (item 2 minus items 3, 4, 5, and 6)	619.3	619.3	619.3	619.3	619.3	619.3
	> 20 cu. ft. lands	435.1	435.1	435.1	435.1	435.1	435.1
	< 20 cu. ft. lands	184.2	184.2	184.2	184.2	184.2	184.2
8	Not Suitable for Timber Under the Alternative <sup>4</sup>	100.3	98.5	83.4	56.8	213.4	131.8
9	Total Unsuitable Acres (sum of items 3, 4, 5, 6, and 8)	639.3	637.3	622.4	595.8	752.4	670.8
10	Total Suitable Acres (Item 2 minus item 9)	519.0	520.4	535.5	562.5	405.9	487.5
	> 20 cu. ft. lands	366.5	389.3	390.6	385.2	395.8	330.9
	< 20 cu. ft. lands	152.5	131.1	144.9	177.3	10.1	156.6
11	Total National Forest Acres (sum of items 1 and 2)	1663.3	1663.3	1663.3	1663.3	1663.3	1663.3

<sup>1</sup> Areas withdrawn by an Act of Congress, the Secretary of Agriculture, or the Chief of the Forest Service.

<sup>2</sup> Includes western juniper, black oak, aspen, and white-bark pine.

<sup>3</sup> Lands for which current information is inadequate to project responses to timber management.

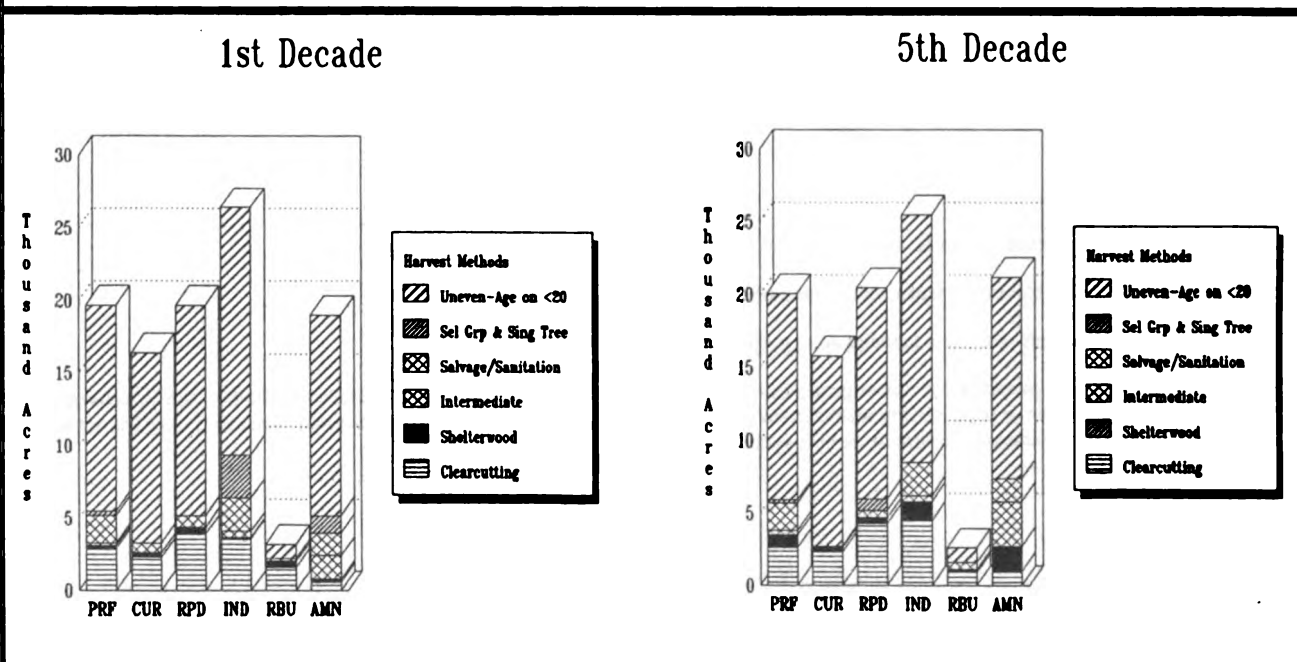
<sup>4</sup> Lands identified as not appropriate for timber production due to (a) assignment to other resource uses to meet Forest plan objectives; (b) management requirements; or (c) not being cost efficient in meeting Forest Plan objectives over the planning horizon. Examples: areas recommended for wilderness; areas where timber production activities are not cost efficient.

Table 2-14. Harvest Method by Alternative. (Average Annual Acres in Thousands)

Harvest Method	Base Year 1982	Decade	(Thousand Acres Per Year)					
			PRF	CUR	RPD	IND	RBU	AMN
Even-aged Mgt:								
Regeneration								
Clearcutting <sup>1</sup>	0.1	1	3.1	2.3	3.9	3.6	1.6	0.6
		5	2.6	2.3	4.3	4.5	0.9	1.0
Shelterwood	4.8	1	0.3	0.3	0.5	0.1	0.4	0.2
		5	0.9	0.3	0.4	1.3	0.2	1.7
Intermediate	0.4	1	0.2	0.7	0.8	0.4	0.2	1.6
		5	0.3	0.1	0.5	0.4	0.5	3.1
Salvage/Sanitation	9.8	1	1.9	0.0	0.0	2.3	0.0	1.6
		5	1.9	0.0	0.0	2.3	0.0	1.6
Uneven-aged Mgt:								
Selection - Group and Single tree	-	1	0.3	0.0	0.0	0.3	0.0	1.2
		5	0.2	0.0	0.8	0.0	0.0	0.0
< 20 Ft <sup>3</sup> Land	-	1	14.2	12.1	13.5	16.7	0.0	13.3
		5	14.2	12.1	13.5	16.7	0.0	13.3
<hr/> 1 Where possible, residual trees will be left.								

<sup>1</sup> Where possible, residual trees will be left.

Harvest Method by Alternative

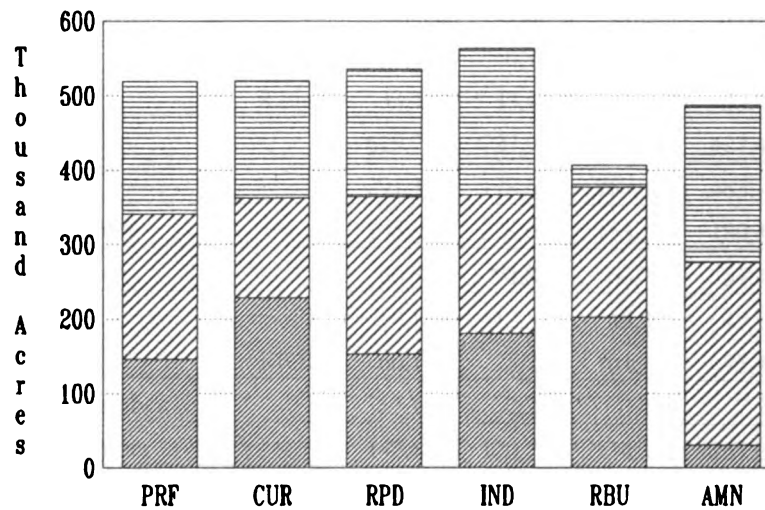




**Table 2-15. Timber Management on Suitable Lands.**

Management	(Thousands Acres)					
	PRF	CUR	RPD	IND	RBU	AMN
Reg. Class I, Full Management	145.9	228.0	153.5	180.5	202.6	30.8
Reg. Class II, Modified Management	194.2	134.9	210.7	186.3	174.8	244.8
Reg. Class III, Limited Management	178.9	157.5	171.3	195.7	28.5	211.9
<b>Total</b>	<b>519.0</b>	<b>520.4</b>	<b>535.5</b>	<b>562.5</b>	<b>405.9</b>	<b>487.5</b>

**Note:** Full timber management includes the Even-aged Prescription. Modified timber management includes the Uneven-aged, Timber-Visuals, and Timber-Forage Prescriptions. Limited timber management includes the Riparian, Visual Retention, and <20 Cu. Ft. Timber Prescriptions. Prescriptions are described earlier in this chapter and in detail in Chapter 4 of the Forest Plan.

**Timber Management on Suitable Lands****Tbr Mgt Methods**

- Reg Class I - Full
- Reg Class II - Mod
- Reg Class III - Lim

**Table 2-16. 1st Decade Regeneration Harvest by Prescription on > 20 Lands.**

<b>Prescription</b>	<b>PRF</b>	<b>CUR</b>	<b>RPD</b>	<b>IND</b>	<b>RBU</b>	<b>AMN</b>
<b>(Acres Per Year)</b>						
<b>Even-aged Timber</b>						
Full Yields <sup>1</sup>	1800	1220	1050	3030	90	760
Partial Yields <sup>2</sup>	130	1120	1160	490	30	20
Subtotal	1930	2340	2210	3520	120	780
<b>Timber-Forage</b>						
Full Yields <sup>1</sup>	1060	250	1840	140	1200	0
Partial Yields <sup>2</sup>	410	0	360	110	690	0
Subtotal	1470	250	2200	250	1890	0
<b>Uneven-aged Timber</b>	340	0	0	240	0	1170
<b>Grand Total</b>	<b>3740</b>	<b>2590</b>	<b>4410</b>	<b>4010</b>	<b>2010</b>	<b>1950</b>
<sup>1</sup> Timber-Visual prescription not applied. <sup>2</sup> Timber-Visual prescription applied.						

**Figure 2-9. Long-Term Sustained-Yield Capacity (LTSYC) and Allowable Sale Quantity. (ASQ)**

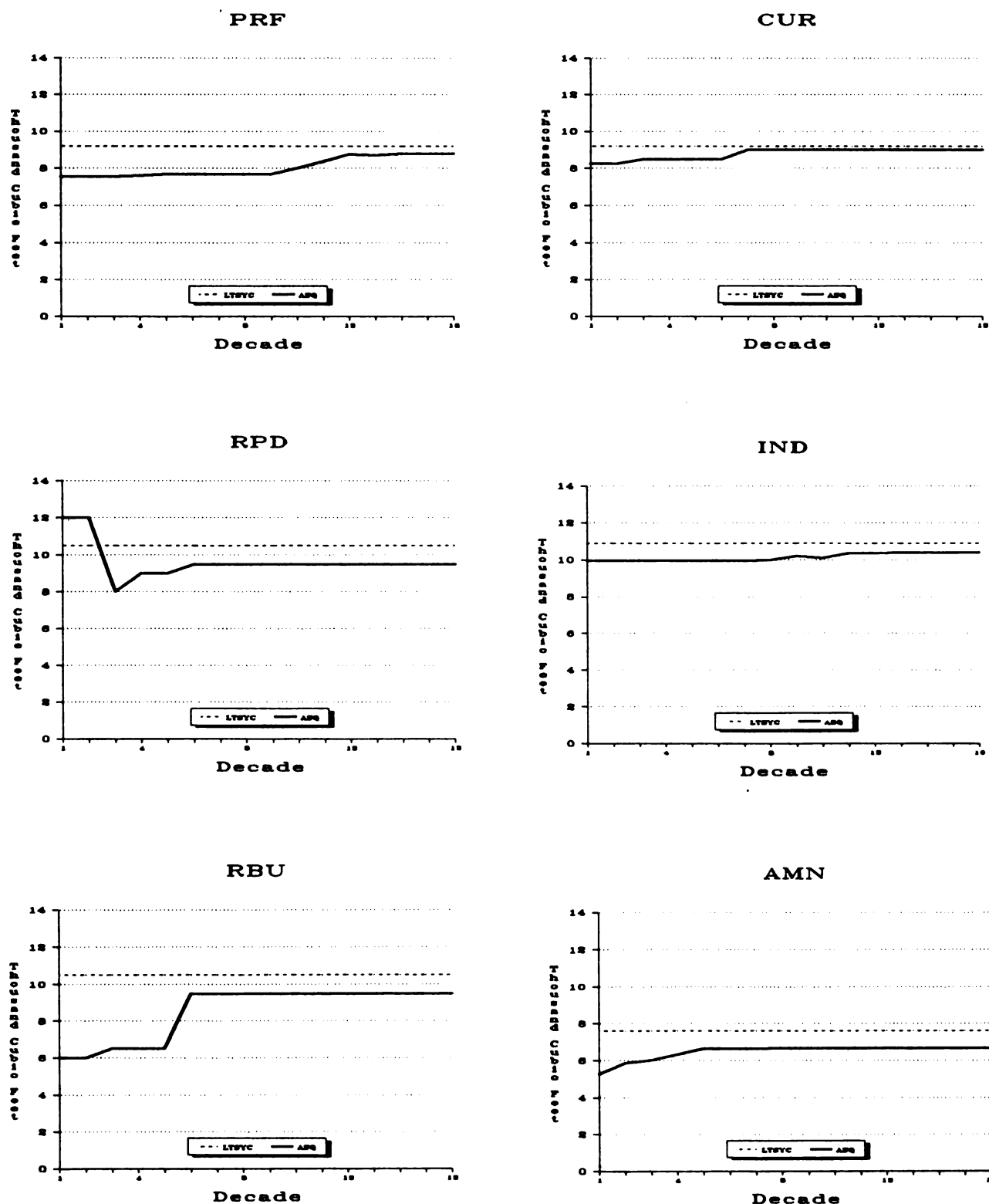


Table 2-17 shows timber management information by benchmark and alternative. Suitable acres displayed in columns (1) through (3) reflect the difference in acreage allocation between alternatives. Acres which are not suitable are those allocated to raptors, minimum level management or semi-primitive non-motorized (SPNM) areas. RBU has the fewest suitable acres because it has the highest number of acres allocated to minimum management. Because of the budget constraint, all < 20 lands which are not managed for visual retention, raptors, or riparian areas are managed at minimum level (166,900 acres). AMN has the third highest suitable land base. This alternative has the fewest acres managed at minimum level and the most allocated to SPNM. Because of this balance, land allocated as suitable is similar to the other alternatives except RBU.

Beginning inventory values, columns (4) and (5), generally vary with the suitable land acres, column (3). An exception is the AMN alternative, which has the third highest suitable acres and the second lowest beginning inventory. This condition occurs because > 20 lands produce a higher inventory than < 20 lands. AMN selects the fewest acres of suitable > 20 land and the most acres of suitable < 20 lands.

The ending inventory (column (6)) reflects suitable acres, ending age class distribution, and management intensity of timber prescriptions. AMN has the highest ending inventory volume because of low harvest rates and high acre allocation to full and partial retention of stands for visual quality. The result is large acreages of existing volume remaining at the end of the planning horizon.

The allowable sale quantity (ASQ) displayed in columns (7) through (9) reflects suitable acres, timber prescriptions and their intensity, and budget constraints. Even though it has a moderate suitable land base, the ASQ under AMN is the lowest of all alternatives. This is because the number of acres of suitable land allocated to the visual retention prescription is very high. This prescription provides little timber production. The ASQ is highest in the 1st decade under RPD because it is a departure alternative.

Long-term sustained yield capacity (LTSYC) displayed in columns (10) and (11) is indicative of suitable acres and management intensities of the timber harvest prescriptions. Although RBU appears to be a contradiction, the relationship remains valid because the bulk of suitable lands which make up the difference between this and other alternatives is classified as < 20 lands. These lands contribute little to LTSYC. The > 20 lands contribute more to LTSYC, and the acreage of these lands is similar in all alternatives. LTSYC is lowest in AMN. This

alternative has the lowest number of acres of > 20 lands in its suitable land base.

Net growth, columns (13) through (15), is generally constant among alternatives. Net growth is a reflection of suitable land base, age class distribution, and harvest levels, especially in the 1st decade. RBU has a very high net growth because most < 20 lands are allocated to the minimum management level. Removing these low volume lands from consideration causes the average volume of the remaining acres to increase. RPD and AMN have very low net growth. These alternatives have the highest number of < 20 acres in their suitable land bases, causing the average volume to decrease. Net growth under RPD increases significantly from the present to the year 2030 because of intensive harvesting, especially in the 1st decade. Most of the net growth occurs as existing stands are harvested and replaced with fast-growing younger timber. Net growth under AMN does not significantly increase from the present to 2030, because the alternative emphasizes amenity resources and has a non-intensive harvest.

Columns (16) through (21), area and percent of suitable land by yield level, display acres by broad timber management output. The number of acres in each category is dependent on the objectives of each alternative. AMN has the fewest acres in full timber yields due to an emphasis on non-commodity resources. CUR has the fewest acres in the 50-90% yield category because the number of acres allocated to the Timber-Forage prescription are constrained. The number of acres producing less than 50% yields is directly related to the amount of < 20 land in the suitable land base.

Regeneration harvest acres, columns (22) through (25), generally vary with the harvest level. Those alternatives which harvest more acres have higher volume outputs. Selection harvest on < 20 lands is directly related to the amount of < 20 land in the suitable land base. Selection harvest on > 20 land is related to the number of acres allocated to visual retention.

Column (26) is derived from the total acreage in columns (22) and (23) divided by the total of columns (16) and (18). Selection harvest (columns (24) and (25)) and acres with less than 50% yields (20) are not included in this calculation because most acres occur on < 20 lands, and these lands will never be regulated.

Column (26) is the percent of suitable land base producing greater than 50% timber yields (columns (16) and (18)) that is regeneration harvested in the 1st decade (columns (22) and (23)). Because of a reduced budget, RBU's timber yields are low in the 1st decade, resulting in a low percentage harvest. Forest land producing

**Table 2-17. Timber Resource Management Information by Benchmark and Alternative.**

Benchmark or Alternative <sup>1</sup>	Suitable Lands			Inventory			1st Decade			LTSYC			Annual Net Growth		
	(Acres)			Begin	Begin/Ac	End	Average Annual ASQ			MMCF	% <sup>2</sup>	MMBF	Present	2030	2030
	>20	<20	Total	MMCF	CF	MMCF	MMCF	% <sup>2</sup>	MMBF				CF/AC	CF/AC	MMCF
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
<b>Benchmark</b>															
TBR	397.7	175.6	573.3	569.6	994	588.0	11.6	2.0	70.5	12.8	2.2	1	17.2	24.4	10.2
MMR	394.0	175.6	569.6	570.7	1002	592.4	10.6	1.9	64.6	11.8	2.0	9	17.4	24.3	13.8
<b>Alternative</b>															
PRF	366.5	152.5	519.0	528.1	1039	832.9	7.6	1.4	45.5	9.2	1.6	11	21.4	22.4	11.4
CUR	389.3	131.1	520.4	525.8	1010	532.8	8.4	1.6	51.4	9.4	1.8	6	17.0	20.3	10.4
RPD	390.6	144.9	535.5	531.9	993	567.0	12.2	2.3	74.6	10.2	1.8	5	16.0	21.6	11.4
IND	385.2	177.3	562.5	589.0	1061	792.5	9.9	1.7	60.0	10.9	1.4	1	21.4	23.2	12.8
RBU	395.8	10.1	405.9	470.1	1158	490.4	6.0	1.5	36.9	10.1	2.1	6	23.0	22.9	9.2
AMN	330.9	156.6	487.5	447.6	955	745.5	5.3	1.2	31.8	7.6	1.0	16	22.5	22.6	10.6

Benchmark  or  Alternative	Area and Percent Suitable Land by Yield Level						Clearcut  M Acres	Shelter- wood/Seed  Tree  M Acres	Selection		Harvest  Total  % <sup>9</sup>	
	Full Yield <sup>5</sup>		50-90% Yield <sup>6</sup>		<50% Yield <sup>7</sup>				>20	<20		
	M Acres	% <sup>8</sup>	M Acres	% <sup>8</sup>	M Acre	% <sup>8</sup>			M Acres	M Acres		
Benchmark	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	
TBR	301.4	52	96.3	17	175.6	31	47.0	0.0	0.0	175.6	11.8	
MMR	293.3	51	100.7	18	175.6	31	37.0	0.0	0.0	175.6	9.4	
Alternative												
PRF	145.9	29	194.2	38	178.9	33	31.0	3.0	3.0	14.2	10.1	
CUR	228.0	44	134.9	26	157.5	30	23.0	3.0	0.0	12.1	7.2	
RPD	153.5	29	210.7	39	171.3	32	39.0	5.0	3.0	13.5	12.1	
IND	180.5	32	186.3	34	195.7	34	36.0	1.0	0.0	16.7	10.1	
RBU	202.6	50	174.8	43	28.5	7	16.0	4.0	0.0	0.0	5.3	
AMN	30.8	7	244.8	52	211.9	41	6.0	2.0	12.0	13.1	3.0	

Data from the 1975 Timber Management Plan (TMP):

Potential Yield: 753.0 MMBF

Average annual chargeable volume sold during years TMP was in effect: 606.3 MMBF.

Total acres of standard, special, and marginal lands used to develop the potential yield: 488,600 acres.

<sup>1</sup> There are 619,300 acres of tentatively suitable lands for all alternatives and a present inventory of 803.5 MMCF.

<sup>2</sup> Relationship of the ASQ in the 1st decade to the beginning inventory (divide col. (7) by col. (4)).

<sup>3</sup> Relationship of the LTSYC to the ending inventory (divide col. (10) by col. (6)).

<sup>4</sup> Decade in which at least 90% of LTSYC is met.

<sup>5</sup> Includes even-aged timber prescriptions.

<sup>6</sup> Includes timber-visuals, timber-forage, and uneven-aged prescriptions.

<sup>7</sup> Includes visual retention and marginal timber (< 20 lands) prescriptions and riparian areas..

<sup>8</sup> Percentage of the suitable land base allocated to each yield level.

<sup>9</sup> Because selection harvest and rotation ages are not related, this column is based on acres in columns (22) and (23) divided by columns (16) and (18).

#### Key

LTSYC = long-term sustained yield capacity

ASQ = allowable sale

CF/AC = cubic feet per acre

MMCF = thousand cubic feet

MMBF = thousand board feet

greater than 50% timber yields would be cut over in 20 decades. RPD and IND have the highest percent harvested because of high yields in the 1st decade. Under these alternatives, Forest land producing greater than 50% timber yields would be cut over in 8 decades. The percentage under RPD is misleading because this alternative has a departure from the base sale schedule, and yields drop in the 2nd decade. The amount of time until the Forest land is cut over would actually be longer under RPD than under IND.

### Economic and Tradeoff Analysis

Economic values and significant tradeoffs are presented in this section through the following tables and their corresponding discussions:

- Comparison of Economic Effects
- Present Net Value: Marginal Cost of Constraints
- Present Net Value: Comparison of Alternatives
- Cash Flows and Noncash Benefits
- Responsiveness to Major Issues and National Concerns
- Reasons for Change in Present Net Value

Appendix B offers a detailed explanation of the economic analysis process including the linkage between the draft and final analysis.

### Comparison of Economic Effects

Table 2-18 summarizes various economic effects of each alternative. Included are basic costs and benefits, local employment and income, and PNV for each alternative. Effects in decade 1 are planned, while projected effects in decades 2 through 5 are shown and discussed for comparing alternatives.

Total benefits increase over Decades 1 through 5 primarily because of the projected real price increase for timber. Total benefits and their increases are highest in those alternatives with the highest timber output. Non-

cash benefits comprise 75-90% of total benefits in the 1st decade, falling to 57-85% by the 5th decade. This is because timber harvest and prices increase over decades 1 through 5, while outputs generating noncash benefits remain relatively constant.

Total costs are highest in those alternatives with high timber volumes. Costs are broken into operation and maintenance (O & M), and capital investments. O & M costs comprise 58-69% of total costs in the 1st decade. Even though these costs increase over time, their proportion of total costs falls to 47-58% (except for RBU) by the 5th decade. This is due to increases in projected real costs for timber as well as timber harvest, all of which cause timber investments to increase. Timber investments account for most of total capital investments. Generally, the differences in timber investments among alternatives and between the decades for each alternative is based on the acres of regeneration harvest and species mix. Eastside pine has a lower volume per acre than mixed conifer. When the volume of pine harvested increases, costs increase because more acres are treated. When most of the volume is mixed conifer, costs are lower because fewer acres are treated to produce the same volume.

Capital investment-other is always highest in the 1st decade and then decreases due to non-structural range, wildlife, and facilities improvements which occur in decade 1. Capital investment for appropriated roads is also high in decade 1 and the subsequently decreases, because the Forest's arterial road system is completed in decade 1. Appendix B contains more information in the cost section.

Income and employment opportunities are primarily linked to timber output. The Forest budget, receipts to counties, and wildlife recreation also have a large effect on income and employment. Range forage and dispersed recreation have a lesser impact. Changes in local employment range from a reduction of 71 jobs to an increase of 212 jobs over base year levels.

**Table 2-18. Summary Comparison of Economic Effects.**

Economic Effect		Base Year 1982	Decade	PRF	CUR	RPD	IND	RBU	AMN
— Millions of 1982 dollars per year —									
1	Total Benefits	39.5	1	46.3	45.1	50.5	48.3	40.7	42.9
			2	48.4	49.9	49.2	51.6	45.4	45.1
			3	49.9	55.9	57.2	53.9	48.6	46.9
			4	52.0	54.6	56.9	56.1	48.6	48.1
			5	54.6	61.3	69.8	58.6	51.4	50.8
2	Returns to the U.S Treasury	3.2	1	9.2	9.1	13.6	11.3	6.5	5.9
			2	10.3	12.6	11.6	13.0	9.7	7.1
			3	11.3	18.3	19.0	15.0	12.8	8.1
			4	13.0	17.0	18.5	16.9	12.7	9.5
			5	14.8	23.0	30.6	18.4	15.0	11.1
3	Non-Cash Benefits	36.3	1	37.1	36.7	37.9	37.0	34.7	37.0
			2	38.1	38.2	38.4	38.6	36.4	38.0
			3	38.6	38.5	39.1	38.9	36.5	38.8
			4	39.0	38.5	39.4	39.2	36.6	38.6
			5	39.8	39.2	40.2	40.2	37.1	39.7
4	Total Costs	11.5	1	14.4	12.1	16.9	16.8	9.7	13.4
			2	15.2	13.8	14.5	16.7	11.4	15.3
			3	15.8	16.4	18.6	17.3	11.9	15.2
			4	14.6	14.2	15.9	16.6	11.1	17.5
			5	14.9	17.3	23.1	17.6	11.8	19.9
<div>1</div> <div>Total benefits include both cash returns to the U.S. Treasury and non-cash benefits. Total benefits are the estimated total amount that consumers would be willing to pay for Forest outputs, whether or not this amount is actually collected by the U.S. Government.</div> <div>2</div> <div>Returns to the U.S. Treasury are the estimated payments by consumers of Forest outputs collected by the federal government. The figure used for the 1982 base year is exceptionally low due to the last timber recession.</div> <div>3</div> <div>Non-cash benefits are the difference between the total estimated amount that consumers would be willing to pay for Forest outputs and actual collections by the federal government. At present it is national policy to provide most Forest outputs either at no charge to consumers or at a charge less than the total willingness to pay value.</div> <div>4</div> <div>Total costs include the federal and non-federal costs needed to produce Forest outputs.</div>									

**Table 2-18. Summary Comparison of Economic Effects. (continued)**

Economic Effect	Base Year 1982	Decade	PRF	CUR	RPD	IND	RBU	AMN
5 Non-Federal Cost	0.1	1	0.51	0.11	0.12	0.51	0.11	0.49
		2	0.51	0.11	0.13	0.51	0.11	0.49
		3	0.51	0.01	0.01	0.51	0.01	0.49
		4	0.51	0.01	0.13	0.51	0.02	0.49
		5	0.51	0.13	0.12	0.51	0.02	0.49
6 Federal Cost	11.4	1	13.9	12.0	16.8	16.3	9.6	12.9
		2	14.7	13.7	14.4	16.2	11.3	14.8
		3	15.3	16.4	18.6	16.8	11.9	14.7
		4	14.1	14.2	15.8	16.1	11.1	17.0
		5	14.4	17.2	23.0	17.1	11.8	19.4
7 Total Budget	9.6	1	12.1	10.3	15.1	14.5	7.8	11.1
		2	12.9	11.9	12.7	14.4	9.5	11.5
		3	13.5	14.6	16.9	15.0	10.2	11.7
		4	12.3	12.5	14.1	14.3	9.3	12.3
		5	12.6	15.5	21.3	15.3	10.1	12.1
8 Operation and Maintenance Cost	5.4	1	9.1	8.0	9.9	9.6	6.7	8.9
		2	9.5	8.5	9.1	10.1	7.3	9.9
		3	9.2	8.8	9.8	9.1	7.4	10.2
		4	10.0	9.1	10.2	10.4	7.7	10.3
		5	10.0	9.8	10.9	11.0	8.1	11.8

5 Non-federal costs include all costs paid by non-federal cooperators (examples include State Fish and Game habitat improvement expenditures, range capital investments made by the permittee, etc). On many Forests non-federal costs will be negligible.

6 Federal costs are all costs borne by the federal government. Includes costs paid from general tax receipts, costs paid from funds set aside from receipts (such as KV) and costs paid by accepting in-kind payments in lieu of cash (such as purchaser road credits). Federal cost also equals total cost less non-federal cooperator cost.

7 Total budget is equal to federal cost less the cost of fighting forest fires (FFF).

8 Operation and maintenance costs include the cost of administration, management, and protection of existing resources and capital assets. Operation and maintenance cost equals total cost less capital investment.



**Table 2-18. Summary Comparison of Economic Effects. (continued)**

Economic Effect		Base Year 1982	Decade	PRF	CUR	RPD	IND	RBU	AMN
9	Capital Investment Cost - Timber	2.6	1	3.4	2.6	4.4	5.1	1.9	2.8
			2	4.2	3.9	3.8	5.2	3.1	4.0
			3	5.3	6.3	6.8	7.0	3.6	3.8
			4	3.5	3.9	4.4	5.0	2.5	6.0
			5	3.7	6.2	10.6	11.1	2.7	6.8
10	Capital Investment Cost - Other	0.6	1	0.84	0.56	1.20	0.90	0.38	0.68
			2	0.61	0.42	0.64	0.43	0.26	0.56
			3	0.42	0.26	0.96	0.25	0.20	0.34
			4	0.24	0.23	0.25	0.21	0.18	0.31
			5	0.34	0.34	0.54	0.51	0.27	0.38
11	Capital Investment Cost - Purchaser Road Credit	0.82	1	0.16	0.70	1.02	0.20	0.50	0.15
			2	0.21	0.88	0.82	0.24	0.67	0.20
			3	0.21	0.86	0.93	0.24	0.66	0.20
			4	0.21	0.87	0.95	0.25	0.67	0.21
			5	0.21	0.89	0.97	0.25	0.67	0.30
12	Capital Investment Cost - Appropriated Roads	0.27	1	0.40	0.23	0.34	0.50	0.17	0.37
			2	0.16	0.09	0.09	0.19	0.07	0.15
			3	0.17	0.09	0.10	0.19	0.07	0.15
			4	0.17	0.09	0.10	0.19	0.07	0.15
			5	0.17	0.09	0.10	0.19	0.07	0.15

<sup>9</sup> Timber capital investment costs are the costs of creating or enhancing timber capital assets. Cost of treatments or activities that generate outputs or benefits over more than one period are capital investment costs.

<sup>10</sup> Other capital investment is all investment cost other than timber capital investment, purchaser road credits and appropriated roads.

<sup>11</sup> Purchaser road credit is the cost of roads built by timber purchasers. These roads are accepted as in-kind payments in lieu of cost from timber purchasers.

<sup>12</sup> Appropriated roads is the cost of roads built by the Forest Service rather than by timber purchasers. Total road cost less purchaser road credits equals appropriated road cost.

Table 2-18. Summary Comparison of Economic Effects. (continued)

	Economic Effect	Base Year 1982	Decade	PRF	CUR	RPD	IND	RBU	AMN
13	25% Receipt Shares	0.8	1	2.3	2.3	3.4	2.8	1.6	1.5
			2	2.6	3.1	2.9	3.3	2.4	1.8
			3	2.8	4.6	4.8	3.8	3.2	2.0
			4	3.3	4.3	4.6	4.2	3.2	2.4
			5	3.7	5.7	7.7	4.6	3.7	2.8
14	County Yield Tax	0.2	1	0.3	0.3	0.4	0.3	0.2	0.2
			2	0.3	0.4	0.3	0.4	0.3	0.2
			3	0.3	0.5	0.6	0.4	0.4	0.2
			4	0.4	0.5	0.5	0.5	0.4	0.3
			5	0.4	0.7	0.9	0.5	0.4	0.3
15	Income, first decade only (\$M)	base year		+ 38.4	+ 706.4	+ 5,856.6	3,020.1	-2,249.7	-2,160.6
16	Employment, first decade change from base year (total jobs)			+ 13	+ 30	+ 212	+ 111	-71	-56
17	Discounted Benefits for 12 Decades			1318.2	1404.3	1468.2	1395.7	1288.7	1238.7
18	Discounted Costs for 12 Decades			399.1	467.3	534.6	435.1	398.8	357.8
19	Present Net Value for 12 Decades			919.1	937.0	933.6	960.6	889.9	880.9
20	Benefit/Cost Ratio for 12 Decades			3.3	2.0	2.7	3.2	3.2	3.5

13 Twenty-five percent of returns to the U.S. Treasury are returned to the counties in proportion to the Modoc National Forest's acreage in the county. The figure used for the 1982 base year is exceptionally low due to the last timber recession. Receipts to the counties for 1979 to 1984 have varied from a high of \$3.7 million (1979) to a low of \$786,000 (1982).

14 Under California law, a yield tax currently equal to 3% of timber harvest value is levied on timber operators.

15 Total personal income (including wages, salaries, proprietor's income, and rents) was estimated for the Forest's zone of influence. See Appendix B for a description of the input-output model used to make estimates.

16 Employment generated by the Forest in the zone of influence was estimated with an input-output model. See Appendix B.

17 Discounted benefits over the planning period.

18 Discounted costs over the planning period.

19 Discounted benefits less total discounted costs.

20 Discounted benefits divided by total discounted costs.

### Present Net Value: Marginal Cost of Constraints

Table 2-19 shows effects of management requirements on PNV. Minimum management requirements (MMRs) are management practices required by laws or regulations. Minimum implementation requirements (MIRs) are management practices which ensure that alternatives are minimally acceptable to the public and implementable on the ground. Because MIRs are under agency control, the Forest has little discretionary control regarding their application. Section E.2 of this chapter and Appendix B describe MMRs and MIRs in detail.

Of all benchmarks, FLW has the fewest constraints, and serves as the basis for comparing all other runs. No MMRs are applied to FLW, and the objective function is to maximize PNV. The MMR benchmark also maximizes PNV, but with all MMRs included in the run. The difference in PNV (\$118,500,000) is the opportunity cost of implementing MMRs collectively. Of this difference, constraints listed in the Table account for \$81,200,000 (69%). Overlap among the constraints accounts for the balance.

Snags, dispersion, and old-growth habitat are constraints most significantly affecting PNV. Providing snags for dependent wildlife species has the most significant impact on PNV. The snag constraint (SNG) accounts for \$34,500,000 (29%) of the change in PNV. This constraint reduces timber harvest by 6.6 MMBF in the 1st decade. It also causes an increase in costs for the creation of snags. The constraint on old-growth habitat has the next most significant impact, accounting for \$17,100,000 (14%) of the change in PNV. This constraint reduces timber harvest by 6.4 MMBF in the 1st decade. The

dispersion (DSP) constraint limits clearcut size and prohibits adjacent openings. Releasing this constraint increases PNV by \$14,100,000 and timber harvest by 7.9 MMBF in the 1st decade.

Protecting bald eagles (TES) decreases PNV by \$6,000,000 (5%). Only a \$100,000 (<1%) difference is attributed to protecting riparian habitat (RIP), while watershed protection (WSD) causes a \$300,000 (<1%) decrease in PNV. The effect of releasing the non-declining yield constraint had an insignificant effect on PNV.

Analyzing the effects of constraints reveals that this Forest is deficient in well-stocked, mature stands. That releasing the non-declining yield constraint does not significantly affect timber yields, further supports this conclusion. The significance of the snag, dispersion, and old-growth habitat constraints on PNV verifies the understocked conditions of many of our Forest's timber stands.

The MIR which protects Scenic Highways 299 and 139 to meet a visual quality objective of partial retention is the only one modeled in FORPLAN. This MIR was used with MMR constraints in the CEE benchmark. PNV decreased by only \$100,000 (<1%), showing the insignificant effect of the VQO constraint. The unexpected result of this MIR is a slightly higher timber yield in the 1st decade. However, timber yields over the planning horizon are greater in MMR than in CEE. Other MIRs protecting sensitive plants and limiting the number of acres clearcut were not needed in FORPLAN. Standards and guidelines protect sensitive plants, and acres clearcut in benchmark runs never reached 18% of the total suitable timber acres available for even-aged management.

Table 2-19. Present Net Value: Marginal Cost of Constraints. (Millions of 1982 Dollars)

							Discounted Benefits by Resource <sup>2</sup>					Discounted Costs by Category <sup>2</sup>			
Base Run	PNV	Change in PNV <sup>1</sup>	Disc Cost	Change in Disc Cost <sup>1</sup>	Disc Bene- fits	Change in Disc Bene- fits	Timber	Recre <sup>3</sup>	Wildlife	Live- stock	Water	Timber	Roads	Other <sup>4</sup>	Fire
FLW PNV w/o MMR (FLW)	431.2		400.6		831.8		654.5	89.7	55.4	27.3	4.9	239.3	106.7	66.6	-12.0
SNG Const		-34.5		-9.0		-43.5									
VPD Const		-17.1		-17.0		-34.1	See text for discussion of individual constraint effects on resource benefit and cost categories.								
DSP Const		-14.1		-22.3		-36.4									
TES Const		-6.0		-6.1		-12.1									
RIP Const		-1.0		-0.3		-1.3									
WSD Const		-0.3		-0.5		0.2									
Balance due to Overlap <sup>5</sup>		-37.3		-27.6		-65.9									
MMR PNV with MMRs (MMR)	312.7	-118.5	324.6	-76.0	637.3	-194.5	460.8	89.7	55.5	27.5	3.8	183.5	83.0	70.1	-12.0
VQO Const	312.6	0.1	325.6	1.0	638.2	-0.9									
CEE Constrained Economic Effic (CEE)	312.6	-0.1	325.6	-1.0	638.2	0.9	461.7	89.7	55.6	27.4	3.8	184.3	83.2	70.1	-12.0
MLV Minimum Lev <sup>6</sup>	673.9		194.4		868.3		0.0	12.4	17.8	0.0	838.1	0.1	9.7	13.1	171.5

<sup>1</sup> All changes are increases to PNV above the MMR benchmark after removing individual constraints.

<sup>2</sup> Direct comparison between individual benefit and cost categories may be misleading because many outputs have common costs of production that cannot be reliably separated and attributed to individual resources.

<sup>3</sup> Recreation includes developed, dispersed, hunting-related dispersed, and wilderness recreation.

<sup>4</sup> Other discounted costs include range, wildlife, recreation, administration, and miscellaneous project costs.

<sup>5</sup> This includes the non-declining yield constraint as well as the overlap of all constraints. CMAI is not a significant constraint on the Modoc National Forest.

<sup>6</sup> The minimum level benchmark shows naturally occurring background benefit and fixed costs associated with maintaining the Forest in federal ownership. In order to display incremental tradeoffs, background benefits and fixed costs have been subtracted from the other benchmarks and alternatives.

#### Key

PNV = Present Net Value

FLW = PNV without MMRs

SNG = Snag Constraint for Viable Populations

VPD = Viable Population and Diversity Constraints

DSP = Dispersion Constraints

PSK = Constraint to harvest Poorly Stocked Stands

WSD = Watershed Constraints

TES = Threatened & Endangered Species Constraints

RIP = Riparian Constraints

VQO = Visual Constraints

Change in income and employment was calculated using MLV as a base. The differences between FLW and MMR are \$3.9 million in income and 139 jobs (Table 2-20). The differences are the opportunity costs of meeting MMRs. MMR and CEE are very similar, indicating little or no impact from MIRs.

**Table 2-20. Income and Employment Affects for Benchmarks - 1st Decade**

Benchmark	Income (MM\$)	Employment (# Jobs)
FLW	23.8	1,056
MMR	19.9	917
CEE	20.3	933
MLV	2.4	162

#### Present Net Value: Comparison of Alternatives

Table 2-21 presents total PNV and the costs and benefits of major contributing resources for each alternative. Timber accounts for 63-72% of the total benefits and 53-57% of the total costs. Wildlife and Recreation also make significant contributions to benefits (22-31%) while their costs remain relatively low (4-9%).

The ranking of PNV is essentially determined by the timber resource. In general, the higher the higher the timber yields over the first 5 decades, the higher the PNV. CUR is the exception. It has very low program funding (costs) for several resources, resulting in higher PNV.

#### Summary Listing of Reasons for Changes in PNV Compared to the Constrained Economic Efficiency Alternative (CEE)<sup>1</sup>

##### CEE Alternative

PNV = \$986.5 million

##### IND Alternative

PNV = \$960.6 million

Change in PNV = -\$25.9 million

PNV drops by 3% under this alternative primarily because of the requirement to maintain a minimum level of visual quality. Longer rotations in visual retention and

partial retention areas reduce timber harvest without generating offsetting quantifiable benefits. This results in a net loss of PNV. In addition, harvests costs are increased by the requirement that pine must comprise 25% of the regulated volume. This constraint acknowledges the historical supply of pine to local markets, although the amount supplied will drop below that of previous years. Because of its relatively lower volume per acre, increasing the pine component of harvest volume requires more acres to be treated. Total costs increase and PNV is reduced.

Maintaining current obligated levels of livestock forage (138,400 AUMs) and limiting nonstructural improvement acres also reduces forage for deer, which leads to a decrease in resident populations. Forage distribution favoring livestock production reduces total benefits and drops PNV because of the lower benefit value assigned to livestock AUMs. Timber harvest and livestock production are sustained at a high level under this alternative. Income and employment opportunities will remain at a high level for these industry groups. Consequently, the trade and service sectors of the local economy will benefit. High receipts also benefit local government and schools. Because markets and sawmills cannot suddenly accommodate a different composition of species, the requirement to harvest pine will help sawmills gradually convert their operations to mixed conifer.

##### CUR Alternative

PNV = \$937 million

Change in PNV = -\$49.5 million

A constrained budget is the primary reason for the change in PNV in CUR. As a result, timber harvest levels are lower, causing a decrease in benefits. A budget constraint limits the amount of timber that can be harvested. Under this alternative, timber is further limited by an increase in management for visual quality and semi-primitive recreation opportunities. Thirty-one thousand acres of timber are allocated to visual retention and 23,000 acres of timber to semi-primitive non-motorized recreation prescriptions. Timber harvest decreases, reducing PNV, but those publics valuing visual quality and recreation benefit from this alternative.

As in IND, fewer deer numbers and less associated recreation use reduces PNV. The same factors as in IND are responsible, except 120,000 AUMs are required for livestock forage, an allocation reflecting actual use versus

<sup>1</sup> Alternatives are in order of decreasing PNV.

Table 2-21. Present Net Value: Comparison of Alternatives. (Millions of 1982 Dollars)

Alternative	PNV <sup>1</sup>	Change in PNV <sup>2</sup>	Disc Cost	Change in Disc Cost	Disc Benefits	Change in Disc Benefits	Discounted Benefits by Resource <sup>2</sup>					Discounted Costs by Category <sup>3</sup>						
							Timber	Rec	Wildlife	Range	Water	Timber	Roads	Rec	Range & Wildlife	S by C & Other <sup>4</sup>	Fire <sup>5</sup>	
CEE	312.6		325.6		638.2		461.7	89.7	55.6	27.4	3.8	184.3	83.2	9.4	7.1	5.0	48.6	-12.0
IND	286.0	-26.6	241.4	-84.2	527.4	-110.8	352.2	87.2	51.4	32.8	3.8	154.8	17.3	9.3	7.5	10.5	50.4	-12.0
CUR	263.1	-49.5	272.9	-52.7	536.0	-102.2	371.9	85.9	46.1	29.0	3.1	150.6	65.9	9.3	6.2	7.1	45.3	-11.5
RPD	259.7	-52.9	340.2	14.6	599.9	-38.3	420.6	89.0	52.2	34.6	3.5	179.2	79.6	15.0	11.8	13.7	52.8	-12.0
PRF	244.5	-68.1	205.4	-120.2	449.9	-188.3	280.4	86.7	48.3	32.0	2.9	122.6	14.6	10.1	6.9	10.4	52.8	-12.0
RBU	216.0	-96.6	204.4	-121.2	420.4	-217.8	299.2	42.8	51.8	23.9	2.7	112.5	53.7	5.2	4.8	5.8	33.9	-11.5
AMN	206.3	-106.3	164.1	-161.5	370.4	-267.8	197.4	89.2	55.8	26.0	2.4	90.2	12.3	14.0	6.9	7.3	45.4	-12.0
MLV Min Level <sup>1</sup>	674.6		193.7		868.3		0.0	12.4	17.8	0.0	838.1	0.1	9.7	0.8	1.3	0.8 <sup>6</sup>	10.2	171.5

Note: Alternatives are listed in order of decreasing PNV.

<sup>1</sup> The minimum level benchmark shows the naturally-occurring benefits and fixed costs of maintaining the Forest in federal ownership. In order to display incremental tradeoffs, background benefits and fixed costs have been subtracted from the alternative.

<sup>2</sup> All changes are measured from CEE (the constrained economic efficiency alternative).

<sup>3</sup> Direct comparison between individual cost and benefit categories may be misleading because many outputs have common costs of production that cannot be reliably separated and attributed to individual resources.

<sup>4</sup> Includes net value change due to fire, which may be thought of as a negative benefit.

<sup>5</sup> Other discounted costs include variable project management costs.

<sup>6</sup> This is the cost of managing wild horses.

permitted levels. This is beneficial to local ranchers and community stability.

#### *RPD Alternative*

PNV = \$933.6 million

Change in PNV = -\$52.9 million

The RPD targets of this alternative reduce PNV. To meet these targets, resources are produced above economically efficient levels. Timber and livestock production levels are higher than CEE in the 1st decade, reducing PNV. Overall costs increase through high levels of funding for cultural resources and watershed management in order to meet RPD direction. As in CUR, visual quality and semi-primitive recreation are managed more intensively than in CEE. Because the benefits generated from these costs are not priced, they are not reflected in PNV.

In the 1st decade, maintaining timber harvest and livestock production levels that are above economically efficient levels lowers PNV. However, timber industry workers and ranchers gain additional income and employment opportunities. Consequently, the local economy benefits in retail, trade, and services. Increased receipts also benefit local government. Beyond decade 1, however, timber harvest is lower than in CEE. Groups that benefited from higher commodity outputs in the 1st decade suffer negative effects from decreased production.

#### *PRF Alternative*

PNV = \$919.1 million

Change in PNV = -\$67.4 million

PNV drops 7% under this alternative primarily because of reduction in the number of acres managed to promote full timber yields. Management actions under this alternative enhance amenity resources at the expense of timber benefits. Enhancements to non-priced amenity resources are not reflected in PNV, hence a change in commodity output levels directly impacts economic efficiency. Thirteen pine marten territories and 5 pileated woodpecker habitat areas are identified and withheld from timber management. A total of 23,000 acres of timber lands are set aside for semi-primitive non-motorized recreation; and 158,000 acres are managed for retention or partial retention visual objectives, consistent with the medium level visual quality program. A restriction on the number of acres regenerated also limits the timber harvest.

Lower PNV results from fewer deer numbers and less associated recreation. The Timber-Forage Prescription is restricted to 250 acres per year in mixed conifer. Lim-

ited use of this prescription results in more acres managed under the Even-Aged Prescription. Intensive site preparation under even-aged practices reduces forage, but lowers the risk of regeneration failure and promotes full timber yields. Forage is slightly increased through nonstructural improvements in the first decade, although these add to overall costs.

Many forest users benefit from the balance between commodity and amenity resource outputs under the PRF alternative. Recreationists enjoy more semi-primitive opportunities, and visual quality is enhanced. Retail trade and government workers benefit from increased income and employment opportunities. Timber industry employment is supported by maintaining a moderate timber harvest volume. Ranchers find less area for grazing livestock in the first decade; but nonstructural range improvements help mitigate the loss.

#### *RBU Alternative*

PNV = \$889.9 million

Change in PNV = -\$96.6 million

A highly constrained budget in decades 1-5 is the primary reason for reduced PNV. Recreation is managed at lower levels than any other alternative, and recreation benefits decrease. Timber harvest decreases dramatically and livestock AUMs drop, but both are maintained above economically efficient levels. Because of the budget, no deer habitat improvement projects occur, and deer numbers consequently decrease.

Because of reduced disturbance on the Forest under RBU, Native Americans with traditional values benefit most under this alternative.

#### *AMN Alternative*

PNV = \$880.9 million

Change in PNV = -\$106.5 million

PNV is the lowest under this alternative, dropping 11% in comparison to CEE. This is primarily because AMN provides for the most acres outside the Wilderness managed for semi-primitive non-motorized experiences, and the greatest number of acres managed for visual resource objectives. These two factors, in conjunction with increased acreage managed for semi-primitive motorized recreation, limit management intensity on 281,000 acres of timber land. Rotation lengths are increased beyond the most economically efficient level to provide for a higher level of visual resource protection. Wider application of the Timber-Forage Prescription increases the risk of regeneration failure and reduces timber yield, but increases benefits by providing additional forage for deer. The 52% reduction in ASQ nega-

tively impacts PNV because fewer positive values are quantified to offset the loss of timber benefits. Because of higher costs per unit volume, a further reduction in PNV results from allocating 36,000 acres to uneven-age management.

Managing for wildlife objectives precludes timber harvest from 13 pine marten territories and five pileated woodpecker habitat areas. This provision, along with a requirement to maintain 10% of the existing acres of old growth in mixed conifer, effectively decreases the amount of suitable timber land available for timber management. The restricted land base is another factor contributing to reduced timber benefits and lower PNV of the AMN Alternative.

Persons valuing visual quality and recreation will obtain the highest level of benefits from this alternative. As wildlife-related recreation increases, retail and service industries benefit. Increased profits are offset by the lower level of timber and livestock production.

#### Average Annual Cash Flows and Non-Cash Benefits

Table 2-22 displays total costs, benefits, and net cash flows by alternative for the 1st and 5th decades. Benefits are subdivided into returns to the Treasury and noncash benefits. CEE is included for comparison.

In the 1st decade, net cash flows are negative in all alternatives. Even though net cash flows are negative in the 1st decade, timber cash flows are positive, indicating a positive return for the timber program. Noncash benefits are high for all alternatives, and remain relatively constant over decades 1-5.

**Table 2-22. Average Annual Cash Flows and Non-Cash Benefits.**

Alternative <sup>1</sup>	Decade 1					Decade 5				
	Net Cash Flow <sup>1</sup>	Total Federal Cost <sup>2</sup>	Returns to Treasury <sup>3</sup>	Non-Cash Benefits <sup>4</sup>	Timber Cash Flow <sup>5</sup>	Net Cash Flow <sup>1</sup>	Total Federal Cost <sup>2</sup>	Returns to Treasury <sup>3</sup>	Non-Cash Benefits <sup>4</sup>	Timber Cash Flow <sup>5</sup>
CEE	-2.0	14.3	12.3	37.6	4.97	10.3	22.9	33.2	40.2	16.99
CUR	-2.9	12.2	9.1	36.7	3.72	5.8	17.2	23.0	39.2	12.21
RBU	-3.1	9.6	6.5	34.7	2.54	3.2	11.8	15.0	37.1	8.93
RPD	-3.2	16.8	13.6	37.9	5.44	7.6	23.0	30.6	40.2	14.82
PRF	-4.7	13.9	9.0	37.1	5.3	0.4	14.4	14.8	39.8	10.62
IND	-5.0	16.3	11.1	37.0	5.3	1.3	17.1	18.4	40.2	6.34
AMN	-7.0	12.9	5.8	37.0	2.48	-8.3	19.4	11.1	39.7	3.75

<sup>1</sup> Alternatives are in order of decreasing net cash flow in the 1st decade. Net cash flow is returns to the Treasury minus federal cost.

<sup>2</sup> Total federal costs are costs borne by the government. It includes costs paid from general tax receipts (such as KV) and costs paid by accepting in-kind payments in lieu of cash (such as purchaser road credits).

<sup>3</sup> Returns to the Treasury are the estimated payments by consumers of Forest outputs collected by the federal government.

<sup>4</sup> See Appendix B for detailed listing of cash and non-cash benefits.

<sup>5</sup> Timber cash flow is timber returns to the Treasury minus timber costs.



Returns to the Treasury are directly correlated to timber yields. Those alternatives with high timber yields generate higher returns to the Treasury than those alternatives with low yields. To a lesser extent, returns to the Treasury are also generated by user fees for developed recreation use and livestock grazing. In all alternatives, timber yields account for most of the returns to the Treasury.

Ranking of alternatives by net cash flow in the 1st decade is different than ranking by PNV. The net cash flow of an alternative depends on the theme of the alternative. RBU and CUR are highly constrained by budgets. Because of this, both alternatives have minimal program dollars for several resources such as watershed, wetlands, visuals, and cultural resources. As a result, costs are relatively low while the alternatives generate as much timber (returns) as possible. This causes net cash flows to be relatively high. RPD has no budget constraint, which raises costs but also generates the largest timber output in the 1st decade. Consequently, returns are high and net cash flow is third highest of alternatives. PRF and IND incur high costs because of the objective to maintain 30-40% pine in the timber volume. Because pine yields less volume per acre than mixed conifer, reforestation costs are high. Even though returns to the Treasury are high, costs are greatly increased and net cash flows are lower. AMN ranks lowest in net cash flow, as well as in PNV. Timber yields are low in the 1st decade and benefits generated from amenity programs do not contribute to the Treasury.

In decade 5, ranking by net cash flow is directly correlated to returns to the Treasury or, in other words, timber yields. Ranking by net cash flow in the 5th decade follows ranking by PNV, except in CUR and RBU. Timber yields in these two alternatives are relatively low because of constrained budgets. However, the relatively low costs of these alternatives increase PNV.

#### **Indicators of Responsiveness to Major Issues and National Concerns**

Table 2-23 displays relationships among key economic values, local economic impacts, and outputs of selected resources. CEE is included for comparison.

PNV is an indicator of efficiency in government and the economic values of Forest management. County receipts, jobs, and local income are very important indicators of the Forest's contribution to the local economy and community stability. Timber harvest level is significant because it is the most valuable commodity produced by the Forest. Of all resources produced, timber has the largest effect on local jobs and income. Livestock forage and deer numbers also affect the local economy and are

important indicators of responsiveness to local, State, and national concerns.

See Appendix C for a full discussion of the relationship between economic values and net public benefits.

#### **Summary Comparison of Key Environmental Consequences**

The following narrative summarizes key environmental consequences which are expected from the six alternatives considered in detail. Chapter 4 is the basis for this summary.

#### *Economics*

PNV, employment, and income are highly correlated to timber yields and the Forest budget. In general, the higher the timber yields and budget, the higher the PNV, employment and income.

PNV is highest under IND, moderate under PRF, CUR and RPD, and low under RBU and AMN. Income and employment are highest under RPD and lowest under RBU. The greatest percentage of eastside pine in the allowable sale quantity is provided under PRF and IND; virtually none is provided under RBU and CUR. RPD provides the highest Forest budget and RBU provides the lowest.

#### *Social*

PRF benefits the most groups. RPD benefits most groups, except for retirees, second home owners and Native American traditionalists who do not always favor increased outputs and activities. Overall, RBU and AMN most negatively impact social groups. RBU and AMN do not benefit groups dependent on the Forest for goods and services. Ranchers and farmers, timber industry workers, retail and service personnel, local, State, and federal employees, and non-traditional Native Americans probably will not prefer these alternatives. On the other hand, many retirees, second home owners, recreationists, and Native American traditionalists find RBU and AMN compatible with their lifestyles, attitudes, beliefs, and values.

#### *Air Quality*

Prescribed burning, wildfires and road construction affect air quality. RPD and IND have the highest potential for impairing air quality because of wildfires, prescribed burning, and road construction and reconstruction activities. AMN and RBU have the least potential.

Table 2-23. Indicators of Responsiveness to Major Issues and National Concerns.

Table 2-23. Indicators of Responsiveness to Major Issues and National Concerns.															
Alternative <sup>1</sup>	PNV (\$MM)	Economic Effects				Community Effects (decade 1)			Timber		Range	Wildlife		Visuals	Recreation
		Net Cash Flow (\$M/Yr)		Non-Cash Benefits (\$MM/Yr)		Receipts to Counties (\$MM/Yr)	Change in Jobs Available	Change in Local Income (\$M/Yr)	Forest Harvest (MMBF/Yr)						
		Dec 1	Dec 5	Dec 1	Dec 5				Dec 1	Dec 5					
CEE	986.5	-2.0	10.3	37.6	40.2	3.1	181	5,414.7	66.5	66.5	104.2	41.2	1,100	146,750	0
IND	960.6	-5.0	1.3	37.0	40.2	2.8	+111	+3,020.1	60.1	60.1	138.4	25.5	6,100	439,600	76,000
CUR	937.0	-2.9	5.8	36.7	39.2	2.3	+30	+706.4	51.4	53.8	120.0	28.9	6,100	477,600	199,000
RPD	933.6	-3.2	7.6	37.9	40.2	3.4	+212	+5,856.6	74.6	58.7	122.5	35.6	8,500	477,600	199,000
PRF	919.1	-4.7	0.4	37.1	39.8	2.3	+13	+38.4	45.5	46.8	118.8	34.2	8,500	477,600	199,000
RBU	889.9	-3.1	3.2	34.7	37.1	1.6	-71	-2,249.7	36.9	40.9	100.0	34.5	2,800	439,600	76,000
AMN	880.9	-7.0	-8.3	37.0	39.7	1.5	-56	-2,160.6	31.8	40.2	97.3	42.6	8,500	524,000	533,000

<sup>1</sup> Alternatives are listed in order of decreasing PNV.

<sup>2</sup> Management for visuals includes retention, partial retention, and preservation.

<sup>1</sup> Alternatives are listed in order of decreasing PNV.<sup>2</sup> Management for visuals includes retention, partial retention, and preservation.

## *Cultural Resources*

All alternatives provide various levels of identifying, evaluating, protecting, and interpreting cultural resources. Human activities and natural factors continue to disturb, destroy, and deteriorate sites. To minimize human activities, all alternatives meet minimum requirements outlined in Forest Standards and Guidelines. Prior to any project, cultural resources are identified. As a result of other resource activities, in combination with the cultural resource program provided in each alternative, RPD and IND have the highest potential for resource conflicts. PRF and CUR pose moderate potential for conflict with cultural resources, while RBU and AMN have the lowest potential.

## *Diversity*

All alternatives result in declines in old-growth and mature, dense-canopied Forest stands. Under all alternatives except RBU, old-growth stands in eastside pine are reduced below the minimum 5% in the 2nd decade, and remain so until at least the 7th decade when large sawtimber stands mature to old-growth status. Old-growth mixed conifer and red fir remain above 5%. Forestwide, 4B/C stands are also reduced below the minimum 5% retention for all alternatives, because regenerated stands are harvested well before trees reach this seral stage.

Diversity of non-timber vegetation communities will be maintained under all alternatives. Activities proposed for these communities are minor, and changes are expected to be negligible.

Species dependent on early seral stage will increase as a greater proportion of forested habitats are harvested. Reduced old-growth and closed-canopy stands cause declines in wildlife which are dependent on this habitat. Species affected include goshawk, marten and pileated woodpecker.

## *Facilities*

Timber production and recreation use place the heaviest demands on the Forest transportation system. New construction in the 1st decade is highest under RPD and lowest under RBU. Reconstruction is highest under IND and lowest under RBU. Construction and reconstruction are below base year levels in CUR, RBU, and AMN. Miles of recreation trail construction and reconstruction are highest under AMN and PRF, and lowest under RBU.

## *Pests*

IND and RPD offer the best opportunity to manage vegetation and implement pest prevention practices with the lowest tree mortality and growth loss. Under AMN and RBU, the greatest timber losses to pests occur.

Under all alternatives, control predators when public health and safety is threatened; or when damage to wildlife, sensitive plants, or livestock is likely.

## *Range*

Although total forage production is estimated to be above base level in all alternatives, transitory range falls below base level throughout all alternatives in decades 1 and 5. Nonstructural improvements for livestock (highest in RPD, lowest in RBU) account for the same relative difference in permanent range forage. Generally, the higher the timber volume harvest, the more transitory forage produced in the 1st decade. Thereafter, the transition to well-stocked timber and low-forage producing stands occurs under all alternatives.

Estimated forage available for livestock is below base level in all alternatives except RPD and IND (highest), and is lowest in AMN because allotments are closed for bighorn sheep expansion. Forage available for deer is above base level in all alternatives with the highest in RPD and AMN, and the lowest in IND.

## *Recreation*

Under AMN, developed and dispersed areas are managed at standard levels, and interpretive services are emphasized. This management, along with less timber volume harvested, offers more primitive and unroaded opportunities. Of all alternatives, AMN provides the most miles of new trails, the most acres outside the Wilderness managed for semi-primitive non-motorized (SPNM) experiences, and the greatest number of acres managed for visual protection.

PRF, CUR, RPD, and IND also manage developed and dispersed areas at standard levels, but with more timber harvested under these alternatives, fewer unroaded areas and opportunities for primitive recreational experiences occur. These alternatives develop 131 miles of new trails, except IND which constructs 82 miles. PRF, CUR, and RPD manage 78,000 acres for SPNM experiences; under IND 13,500 acres are so managed.

Under RBU, developed and dispersed areas are managed at low standard levels with few opportunities for interpretive services. Only 13,500 acres are managed for SPNM.

## *Sensitive Plants*

Potential for harm to sensitive plants is low. Under all alternatives, surveys are conducted prior to all land-disturbing activities. Consequently, the chances of disturbing unknown populations of sensitive plants are reduced. A low probability of unintentional disturbance exists with any land-disturbing activity; but alternatives with much land disturbance have higher probabilities of adversely affecting sensitive plants. RPD alternative has the highest probability of disturbance. Risk of disturbance is low in PRF, CUR, and IND alternatives, and lowest in RBU and AMN alternatives.

## *Soils*

Livestock grazing, timber harvest activities, and watershed improvements have the greatest potential to affect the soil and erosion sedimentation index (ESI). Higher grazing and harvest levels normally result in a higher ESI. Watershed improvements can offset the effects of grazing and harvesting depending on how many acres are affected by each component. A detailed discussion of ESI accompanies Table 4-13 in Chapter 4.

RPD and IND produce the highest ESIs because both emphasize livestock grazing and timber production. Watershed improvements are high, but not enough to completely offset the negative impacts from grazing and timber.

PRF and CUR produce moderate ESIs as grazing decreases and timber harvest increases. Effects from harvesting are moderately offset by watershed improvements.

RBU and AMN produce the lowest ESIs because grazing and timber activities decrease. Less emphasis on these components, in combination with watershed improvements, enhances overall watershed condition and soil productivity.

## *Timber*

CUR, RPD, and IND provide an ASQ above base level (50 MMBF) with RPD the highest at 74.6 MMBF. PRF, RBU and AMN have ASQs below the base level. PRF, CUR, RPD, and IND manage 65-70% of the suitable timber lands under full or modified management. PRF, RPD, and IND manage about 30% under full management and CUR is about 44%. All four alternatives use limited (< 20) management on 25-30% of the lands. RBU has little management of < 20 lands, splitting management almost in half between full and modified. AMN has the fewest acres with full management.

By the 5th decade, regenerated timber stands exist on almost one-half of the > 20 timberlands in PRF, RPD, and IND; CUR and AMN have about one-third; and RBU about one-fourth.

Timber harvest is mostly mixed conifer under all alternatives. Under PRF, RPD, and IND, however, eastside pine makes up 13-19 MMBF of the ASQ, depending on the alternative.

## *Visual Resources*

Major effects to visual quality are timber, range, fire and recreation management and the land-disturbing activities accompanying them. As more acres are managed for land-disturbing activities, fewer acres are retained for a natural or nearly natural appearing forest. Under AMN, over two-thirds of the Forest is managed for visual quality; 45% under PRF, CUR, and RPD; and about one-third under IND and RBU.

If all lands were altered to the maximum extent allowable under each alternative, 28% of the lands that now appear natural would appear disturbed under AMN; 52% under PRF, CUR, and RPD; and 66% under IND and RBU. AMN provides the most acres outside the Wilderness of semi-primitive management for recreation (570,000), and IND and RBU the fewest (78,000).

## *Water and Riparian Areas*

Livestock grazing, timber harvest activities, and associated road construction have the greatest potential to increase sedimentation and reduce water quality. Riparian areas are primarily affected by livestock grazing. The higher the level of activity, the slower the recovery of water quality and ecological condition. Water quality and riparian areas improve under all alternatives, but the rate and extent to which recovery is achieved differs. Water quality and riparian areas improve fastest under RBU and AMN: 100% of the Forest's runoff meets State water quality objectives by the 3rd decade. RBU and AMN provide riparian area improvement in 17 and 23 allotments, respectively.

Under PRF and CUR, 100% of the Forest's runoff meets water quality objectives by the 4th decade. PRF and CUR provide riparian area improvement in 15 and 14 allotments, respectively.

Under RPD 100% of the Forest runoff meets State water quality objectives by the 5th decade; under IND, 94%. RPD provides additional riparian area improvement in 17 allotments.

### *Wilderness and Roadless Areas*

Recreation, range management, and changes to the visual resource have major effects on the Wilderness. How the Forest is managed outside Wilderness boundaries has a significant effect on the quality of experiences afforded within. As more SPNM acres are managed and more miles of new trails are constructed outside the Wilderness, recreation pressure is diverted to other areas. AMN provides the most SPNM acres and new trails, while RBU has few SPNM acres and new trails.

PRF, CUR, RPD, and IND maintain the Wilderness setting and experience, but the quality of experience declines over time as use increases. Under RBU, setting and experience deteriorate from combined effects of increased use and low standard management. Standard management maintains Wilderness values under PRF, CUR, RPD, and IND.

### *Wildlife and Fish*

All alternatives maintain and enhance existing and potential habitat for Threatened and Endangered Species to meet recovery goals. Ten active and 11 potential bald eagle nests are managed to achieve nesting in all areas by the 2nd decade. Bald eagle winter roosts are actively managed to maintain suitable habitat. Three peregrine falcon eyries are established and all habitat for the Modoc sucker is managed under the Action Plan for the species. Habitat for the Lost River and shortnosed suckers will be managed under the forthcoming Recovery Plans for the species. The Forest will continue to survey for northern spotted owls, and coordinate with the U.S. Fish and Wildlife Service.

Sensitive species will be managed to contribute to population viability requirements for these species.

Because old growth decreases from current levels in all alternatives, species dependent on old growth will also decrease. The PRF and AMN alternatives maintain 13 marten territories and five pileated woodpecker territories. Under all other alternatives, these species are man-

aged using only diversity guidelines to maintain late seral stage habitats. Goshawks are managed at the highest levels in the PRF alternative (100 pairs). Under all other alternatives, goshawks are managed at minimum levels (73 pairs).

AMN provides for levels above minimum for bighorn sheep.

Deer populations exceed current populations in all alternatives, with RPD, RBU and AMN producing the most forage. CUR and IND do not meet CDFG goals during the 1st decade, but meet them in succeeding decades. PRF approximates forage production and habitat improvements necessary to meet herd goals for five decades. Pronghorn habitat is consistent with current herd goals in all alternatives. Full wetlands development occurs under PRF, RPD, and AMN. Upland game habitat improves under all alternatives except IND. Diversity requirements for vegetation types, and other Standards and Guidelines, assure viable populations of Forest game species, such as blue grouse and western gray squirrel.

Fish habitat and populations improve above current conditions in all alternatives as water quality and habitat improve. These improvements are accomplished through watershed management, implementation of the Riparian Area prescription, and instream fish habitat projects. All alternatives provide for these activities, but AMN and RBU achieve improvements in fisheries habitat and populations most rapidly due to reduced livestock grazing and logging. PRF and CUR are a decade slower in achieving water quality objectives; RPD meets water quality objectives in the 5th decade; and IND does not fully meet all objectives for water quality and fish by the 5th decade. Warmwater fish habitat improves only under PRF and RPD.

Nongame species are managed at or above viable populations through S&Gs and MMRs. All alternatives except IND directly improve habitat for these species. Forestwide, cavity-dependent species' habitat and populations improve under all alternatives.

Table 2-24. Summary Treatment of Issues and Concerns.

Table 2-24. Summary Treatment of Issues and Concerns.								
Issue	Output or Effect to be Measured	Units	PRF	CUR	RPD	IND	RBU	AMN
Cultural Resources								
What direction will be provided for the inventory, management, and interpretation of cultural resources?	Protection	All alternatives protect significant and unevaluated sites through project redesign and avoidance.						
	Inventory	On a project basis; complete Forest inventory by 2050.	On a project basis; complete Forest inventory by 2050.	On a project basis; complete Forest inventory by 2050.	On a project basis; complete inventory by 1995.	On a project basis; complete Forest inventory by 2050.	On a project basis.	On a project basis plus 33,400 non-project acres/yr; complete inventory by 2010.
In all alternatives, nominate eligible sites to NRHP.								
	Resource enhancement	Site/yr						
	-signed sites	1	0	0	2	0	0	3
	-evaluate backlog	50	0	0	63	0	0	50
	Concerns of Native American heritage	Continue consultation on a project basis.	Continue consultation on a project basis.	Continue consultation on a project basis.	Increase consultation to include non-project inventory areas.	Continue consultation on a project basis.	Continue consultation on a project basis.	Increase consultation to include non-project inventory areas.
Diversity								
How will management provide for diversity of plant and animal communities so that diversity is at least as great as that which presently exists?	Vegetation Types and Seral Stages	See Chapter 4, Figures 4-1 through 4-11 for the anticipated vegetation types and seral stages resulting from each alternative in decades 1, 5, and 10.						

Table 2-24. Summary Treatment of Issues and Concerns. (continued)

Issue	Output or Effect to be Measured	Units	PRF	CUR	RPD	IND	RBU	AMN
	Old-Growth Timber -Decade 1	% of > 20 Timber Acres	12%	10%	11%	12%	12%	12%
	-Decade 5		9%	8%	6%	7%	9%	11%
<b>Energy</b>								
How will Forest management contribute to the federal policy of achieving national energy self-sufficiency?			Forest-wide Standards and Guidelines encourage development of new energy sources while stressing energy efficiency in all alternatives for facilities, vehicles, and equipment.					
<b>Facilities</b>								
How and where will the transportation and communication system be managed and maintained?		Management	In all alternatives, Forest-wide Standards and Guidelines require developing and managing the transportation and communication systems to help meet other resource direction and objectives.					
	Road construction and reconstruction	Miles/yr	36.5	26.7	43.7	43.0	19.1	31.0
<b>Fire Management</b>								
How will fire be managed to protect and improve Forest resources?		Fire Management Budget	All alternatives except CUR and RBU have a proposed budget equal to current levels. CUR and RBU operate under fire budgets 20% less than current.					
	Prescribed fire	Acres/Yr	2,148	1,400	3,200	2,803	1,500	979
<b>Firewood</b>								
How and where will firewood be managed?		Quantity and type of firewood available	Firewood suitable for home heating will be reserved in quantities sufficient to meet at least current demand of local Forest communities.					

Table 2-24. Summary Treatment of Issues and Concerns. (continued)

Issue	Output or Effect to be Measured	Units	PRF	CUR	RPD	IND	RBU	AMN
<b>Lands</b>								
What will be the priorities for adjustments in land ownership to meet public demand and to support resource management goals and administrative needs?			Most alternatives will have an active land adjustment program to consolidate ownerships, facilitate management, and minimize conflicts with adjacent land users. Funding limits would curtail this program under the RBU alternative.					
<b>Minerals</b>								
How will mineral areas be managed?			The Forest is open to mineral exploration and development, except for the South Warner Wilderness, Devil's Garden Research Natural Area, three Geologic Special Interest Areas, and certain administrative sites. Forest-wide Standards and Guidelines and management prescriptions are used to protect the land and resources from unacceptable environmental effects. Forest lands open to mineral development are similar for all alternatives.					
<b>Pests</b>								
How will damage from Forest pests be controlled?	Pest management approach		In all alternatives, Forest-wide Standards and Guidelines call for application of integrated pest management to reduce pest impacts. Pest management levels vary between alternatives and depend on the level of vegetation management and resource outputs.					
Under what conditions will pesticides be used?			Selection of any particular method will be made at the project level, based on site-specific analysis of relative effectiveness, environmental effects, and costs.					
<b>Range</b>								
What will be the level of range use and development?	Forage Availability	AUMs/Yr						
	-Livestock		118,800	120,000	122,500	138,400	100,000	97,300
	-Big Game		47,900	39,700	52,100	35,700	47,900	59,700
	-Wild Horses		4,400	4,400	4,400	4,400	4,400	4,400



Table 2-24. Summary Treatment of Issues and Concerns. (continued)

Issue	Output or Effect to be Measured	Units	PRF	CUR	RPD	IND	RBU	AMN
Actual allocations of AUMs for domestic livestock will be determined in allotment management plans. Big game forage requirements are primarily a reflection of deer herd numbers and are based on California Department of Fish and Game herd goals.								
Livestock Forage Improvement								
-non-structural (M AUMs)			11.8	13.5	21.4	14.5	10.4	13.0
<b>Recreation</b>								
What recreation opportunities will be provided?	Developed Recreation	Demand	Maintain existing campgrounds and construct new ones to meet future demand. Expand interpretive services.	Maintain existing campgrounds and construct new ones to meet future demand. Expand interpretive services.	Maintain existing campgrounds and construct new ones to meet future demand. Expand interpretive services.	Maintain existing campgrounds and construct new ones to meet future demand. Expand interpretive services.	Some existing opportunities will be lost. No new opportunities will be provided, and future demand will not be met.	Maintain existing campgrounds and construct many new ones. Emphasize and expand interpretive services.
		Mgmt. Level	Std	Std	Std	Std	< Std	Std
Disp. Recreation								
	-SPNM	Acres	317,000	317,000	317,000	304,100	304,100	341,000
	-SPM		219,800	219,800	219,800	222,900	222,900	234,400
	-RN		1,056,400	1,056,400	1,056,400	1,066,200	1,066,200	1,017,800
		Mgmt. Level	Std	Std	Std	Std	< Std	Std
Wilderness								
		Mgmt. Level	Std	Std	Std	Std	< Std	Std

Table 2-24. Summary Treatment of Issues and Concerns. (continued)

Issue	Output or Effect to be Measured	Units	PRF	CUR	RPD	IND	RBV	AMN
	OHV Areas	%						
	-Open - Use-able Summer	Decade 1	61	61	61	64	64	49
		Decade 5	61	61	61	64	64	49
	-Open - Use-able Winter	Decade 1	62	62	62	65	65	57
		Decade 5	62	62	62	65	65	57
<b>Timber</b>								
What amounts, methods, and locations of timber harvest and other silvicultural activities will be practiced?	Timber production emphasis - Full Yields (Reg. Class I)	Acres	145,859	228,029	153,494	180,453	202,645	30,793
	Timber production and other resources equally emphasized - Reduced Yields (Reg. Class II)		194,240	134,885	210,728	186,340	174,831	244,776
	Limited timber production with emphasis on other resources - Reduced Yields (Reg. Class III)		36,764	36,764	36,764	28,490	28,490	79,060
	Timber production on low productivity lands (Reg. Class III)		142,117	120,704	134,501	167,245	0	132,868

Table 2-24. Summary Treatment of Issues and Concerns. (continued)

Issue	Output or Effect to be Measured	Units	PRF	CUR	RPD	IND	RBU	AMN
Silvicultural Practices								
	-Clearcut		3,100	2,300	3,900	3,600	1,600	600
	-Shelterwood		300	300	500	100	400	200
	-Intermediate Harvest		200	700	800	400	200	1,600
	-Uneven-aged		300	0	0	240	0	1,170
	Forest-wide Allowable Sale Quantity	MMBF/Yr	45.5	51.4	74.6 (departure)	60.1	36.9	31.8
	Big Valley Federal Sustained-Yield Unit Harvest	MMBF/Yr	9.0	11.0	11.0	11.0	8.5	5.7
Socio-Economic								
How will the effects of management be considered in relation to community stability?	Change in Jobs Available	Person-Years	+13	+30	+212	+111	-71	-56
	Receipts to Counties	\$MM/Yr	2.3	2.3	3.4	2.8	1.6	1.5
	Change in Local Income	\$ M/Yr	-38.4	+706.4	+5,856.6	+3,020.1	-2,249.7	-2,160.6
Visual Resources								
How will the visual resource be managed to protect the scenic quality of the Forest?	Adopted VQO	Acres/%						
-Preservation			84,700/5.1	84,700/5.1	84,700/5.1	84,700/5.1	84,700/5.1	84,700/5.1

Table 2-24. Summary Treatment of Issues and Concerns. (continued)

Issue	Output or Effect to be Measured	Units	PRF	CUR	RPD	IND	RBU	AMN
	-Retention		138,300/8.3	138,300/8.3	138,300/8.3	47,900/2.9	47,900/2.9	336,300/20.2
	-Partial Retention		531,800/32.0	531,800/32.0	531,800/32.0	397,800/23.9	397,800/23.9	729,700/43.8
	-Modification		808,700/48.6	808,700/48.6	808,700/48.6	999,800/60.1	999,800/60.1	492,600/29.7
	-Maximum Mod.		99,800/6.0	99,800/6.0	99,800/6.0	133,100/8.0	133,100/8.0	20,000/1.2
	Visual Areas Rehabilitated	Acres/Yr	150	100	100	50	50	250
<b>Water and Soils</b>								
How will watersheds be managed to maintain or enhance water quality, and soil productivity?	Water quality and quantity		Through Forest-wide Standards and Guidelines and Best Management Practices, water quality will not be degraded under any alternative. Water quantity will not increase significantly under any alternative.					
	% Runoff meeting State quality objectives by 5th Decade	Acres	100%	100%	100%	94%	100%	100%
	Watershed Improvement	Acres/Yr	260	195	315	315	190	315
	Soil Erosion/Sedimentation Index (Sec Ch. 4 Sec. 18, Table 4-13)		107	100	130	122	91	97
(Numbers reflect an increase or decrease from the CUR alternative.)								

Table 2-24. Summary Treatment of Issues and Concerns. (continued)

Issue	Output or Effect to be Measured	Units	PRF	CUR	RPD	IND	RBU	AMN
<b>Wetlands and Riparian</b>								
What will be the management direction for wetland habitat?	Wetland Improvement	Acres/Yr	363	243	363	243	79	363
What will be the management direction for riparian habitat?	Riparian Areas	All Riparian areas will be protected through Forest-wide Standards and Guidelines.						
Rehabilitation of Deteriorated Areas in 5th Decade			100%	100%	100%	94%	100%	100%
Riparian Area Prescription	Acres	9,274	9,274	9,274	9,274	9,274	9,274	9,274
<b>Wildlife and Fish</b>								
Where, what kind, and how much habitat will be provided for fish and wildlife species?	Threatened and Endangered Species	Habitat for all threatened and endangered species will be managed to meet recovery levels.						
How will habitats be maintained or improved for threatened, endangered, and sensitive plant and animal species?	Bighorn Sheep	#s/5th Decade	100	100	100	100	100	300
Management Indicator Species (MIS)	Habitat for MIS is maintained or improved through Standards and Guidelines and management prescriptions. Habitat quantity and quality is increased above current levels.							

Table 2-24. Summary Treatment of Issues and Concerns. (continued)

Issue	Output or Effect to be Measured	Units	PRF	CUR	RPD	IND	RBU	AMN
	Goshawk	#s/Yr	100	73	73	73	73	73
	Deer	#s/Yr	34,200	28,900	35,600	25,500	34,500	34,600
	Resident Fish	lbs/Yr	118,800	118,500	118,800	117,400	117,800	117,800
	Big Game Forage	AUMs/Yr	47,900	39,700	52,100	35,700	47,900	59,700
	Timber-Forage Prescription	Acres/Yr	1,470	250	2,210	250	1,900	2,160
	Direct Habitat Improvement							
	-Deer	Acres/Yr	330	0	2,870	0	0	0
	-Fish	Miles/Yr	1.5	2.5	1.5	1.0	1.5	1.5
	Snags in eastside pine	1st Decade Snags/Acre	0.5	1.1	1.1	0.5	1.1	0.5
		5th Decade	1.1	1.5	1.5	1.1	1.5	1.1
	Sensitive Plants							

Forest-wide Standards and Guidelines ensure protection.









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#### A. Introduction

This chapter describes the affected environment which is the background for the Forest's proposed action and alternatives (Chapter 2), and for the assessment of environmental consequences (Chapter 4). Following a general description of the Forest and Economic and Social Environments, we describe each resource and discuss them in terms of current management and opportunities for change.

The Analysis of the Management Situation (AMS), filed in the planning records, determines the ability of the Forest to supply goods and services in response to society's demand for them. Portraying in detail each of the Forest's resources, the AMS is a series of reports summarized here as the Affected Environment.

#### B. General Description of the Forest

Nestled in the northeasternmost corner of California, the Modoc National Forest is bordered by Oregon to the north and Nevada to the east, with the Shasta-Trinity and Klamath National Forests neighboring the west and Lassen National Forest the south (Figure 3-1). The most remote forest in California, the Modoc is about 355 miles from San Francisco, 300 miles from Sacramento, 140 miles from Redding and 180 miles from Reno.

Of the 1,979,407 acres within the proclaimed boundary, the Forest administers 1,651,630 acres. The remaining 327,777 acres are privately owned or administered by other public agencies. Elevations range from 4,000 to 9,892 feet above sea level.

The variable climate ranges from warm, dry summers to cold, severe, moderately wet winters. Temperatures exceed 100° F. for a few weeks intermittently each summer, although they can drop to below freezing every month of the year. Winter temperatures reach as low as -35° F., although common daytime temperatures rise to the 30's and 40's. Approximately 12 inches of annual precipitation falls primarily as rain and about 25% as snow. Prevailing southwest breezes blow daily clearing the air and bringing frequent weather changes.

Warner Mountain, Big Valley, Devil's Garden and Doublehead Ranger Districts administer the Forest. The

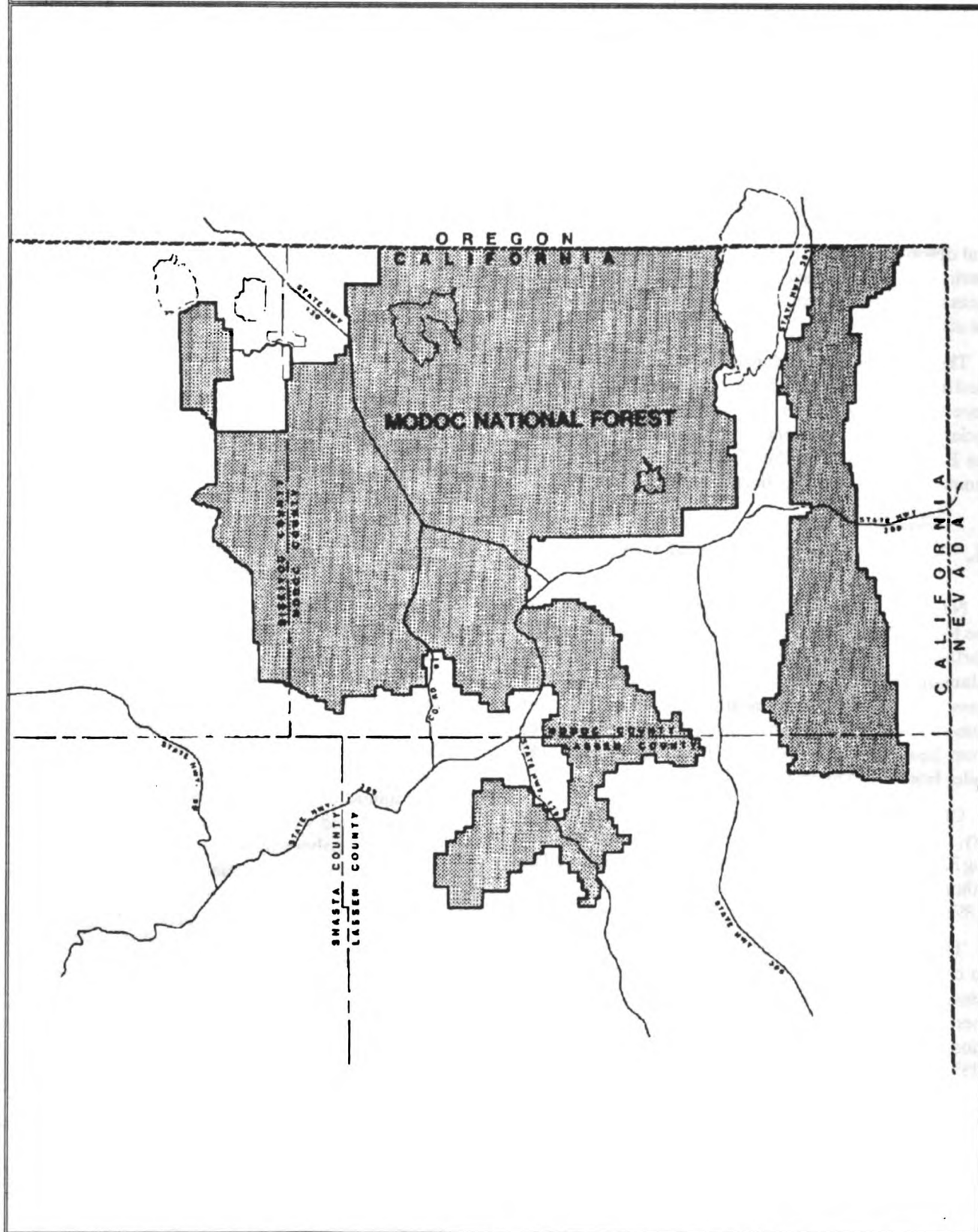
Warner Mountains, a westward dipping range on the east side of the Forest (Warner Mountain Ranger District), extend north and south for 80 miles. Approximately ten miles wide, the western face has moderate to steep slopes, while the eastern aspect is very steep and often precipitous. Elevations range from 5,000 feet to almost 10,000 feet at Eagle Peak, the Forest's highest point. Considered by many as the jewel of Modoc, the Warners boast of the South Warner Wilderness, historic High-grade gold and silver mining camps, and two national recreation trails.

At lower elevations sage, bunchgrass, and juniper are common vegetative types, while higher elevations include alpine meadows, mixed stands of ponderosa and Jeffrey pine, lodgepole and western white pine, and white fir with bitterbrush, mahogany, and sage. The Warner Mountain Range produces most of the water on the Forest. Many creeks drain into the North and South Forks of the Pit River, an important tributary of the Sacramento River. The Forest has no designated wild and scenic rivers.

The Devil's Garden, a relatively flat, volcanic plateau located on the west and northwest of the Forest, covers the entire Devil's Garden Ranger District and parts of the Doublehead and Big Valley Ranger Districts. With an average elevation of 4,800 feet, the plateau supports the largest continuous stand of western juniper in the western United States. Other vegetation on the Garden includes sagebrush, rabbitbrush, and bunchgrass. The timber is almost a pure stand of eastside ponderosa and Jeffrey pine mixed with white fir and incense-cedar on the north slopes above 5,500 feet. The total area comprises approximately 700 square miles. Unique areas include the Devil's Garden Research Natural Area, expansive wetlands, and a wild horse and burro territory.

Beyond the juniper plateau to the west lie the Medicine Lake Highlands on the Doublehead Ranger District. This area includes geologic features, such as numerous explosion craters, lava flows, and lava tube ice caves. The Highlands, an inactive broad shield volcano approximately 20 miles in diameter, rises 4,000 feet above the level of the surrounding plateau. It is considered an eastern extension of the Cascade Range which includes other inactive volcanoes such as Mt. Shasta and Mt. Lassen. Within the boundary of the District, the Lava Beds National Monument is administered by the National Park Service (NPS).

**Figure 3-1. Modoc National Forest**



Various companies have done exploratory drilling in the Highlands for geothermal energy to tap the natural hot water system lying far below the surface.

Dominant vegetation on this part of the Forest includes sagebrush mixed with juniper, and ponderosa pine at higher elevations. Other vegetation found here includes red fir, mixed conifer, and lodgepole pine. Medicine Lake, surrounded by pine, is a popular recreation area for camping, hiking, swimming and fishing.

With elevations ranging from 4,500 to 7,000 feet, the topography of the southwest portion of the Forest (Big Valley Ranger District) is a mixture of basalt-capped plateaus and moderately steep mountainous uplands. Vegetation common at lower elevations are sage, juniper, bunchgrass, and bitterbrush, while ponderosa and Jeffrey pine, mixed with white fir and incense-cedar are found on north slopes above 5,500 feet. The only oak on the Forest is located on this district and on the Devil's Gar-

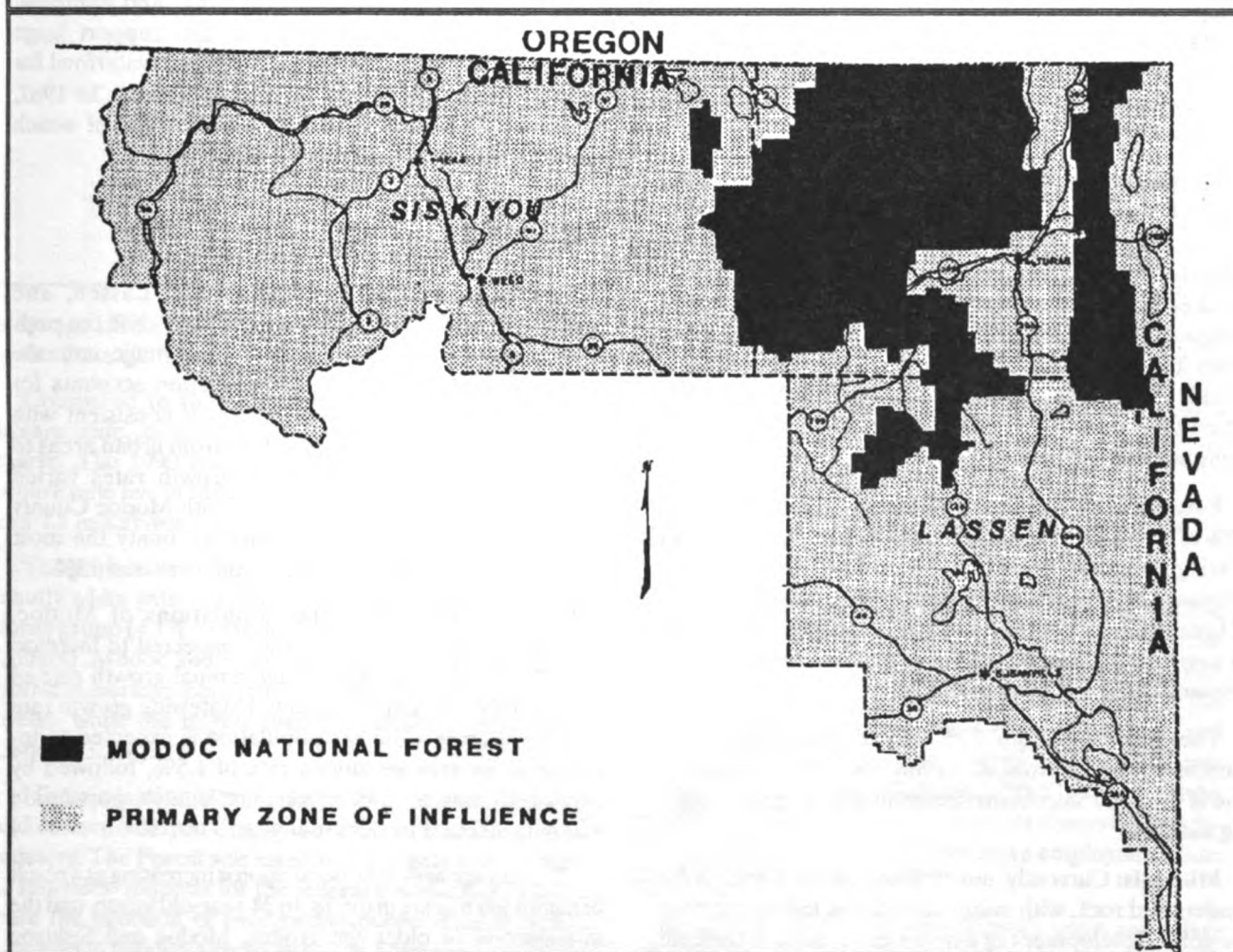
den. The Big Valley Federal Sustained-Yield Unit, covering the south portion of the District, is one of only four formally designated units in the nation.

## C. The Economic Environment

### Introduction

National Forest land management and activities affect the social and economic well-being of communities close to and dependent on the Forest. The Forest's impact areas are Modoc, Lassen and portions of Siskiyou Counties (Figure 3-2). These impact areas are characterized by a rural setting, low population density, and limited job diversity centered around agriculture, the timber industry, and recreation. The impact counties are most affected by Forest Service employment, timber, range, wildlife, and recreation. The Forest's extended zone of

Figure 3-2. Economic Impact Counties



influence includes urban centers throughout California, southern Oregon, and western Nevada. Users from this zone primarily include hunters, recreationists, and commercial firewood cutters.

The proportion of land area administered by the Forest in each county determines the extent to which the Forest affects those counties. The Forest administers 53% of the land in Modoc County, 5% of Lassen County, and 3% of Siskiyou County. Other major federal agencies in the assessment area are the Lassen, Klamath, and Shasta-Trinity National Forests, the Bureau of Land Management, USDI Fish and Wildlife Service, Bureau of Reclamation, and the National Park Service.

The economies of each county are dependent on the supply of natural resources such as sawtimber, firewood, forage, minerals, energy, and recreation opportunities.

**Timber:** The majority (72%) of commercial timberlands in Modoc County is in the Forest and, therefore, administered by it. Consequently, the Forest has major control of supply originating from Modoc County. Similarly, most of the commercial timberlands in Lassen County is administered by the Lassen and Plumas National Forests, while the majority of commercial timberlands in Siskiyou County is administered by the Klamath and Shasta-Trinity National Forests.

**Firewood:** Because of major increases in oil and gas prices during the 1970's, local residents rely more heavily on wood heat. Because volume of firewood removed from the Forest increased only 6% from 1980 and 1981, apparently local consumption needs of area residents are satisfied. The possibility of increased commercial activity exists if firewood markets in the San Francisco Bay area, Klamath Falls area, and in the Reno area become better established and if co-generation electrification plants being studied are built.

**Forage:** With livestock production comprising over 30% of the value of annual agricultural outputs, livestock grazing on public land is important to Modoc County's economy. Nearly 25% of the land in Modoc County, 25% of Lassen County, and 17% of Siskiyou County is devoted to agriculture. Lands not under public ownership are primarily used for farms and ranches.

The Forest provides 23% of the total animal unit months produced from all national forests in Region 5, and is the most important contributor to Regional grazing outputs.

**Minerals:** Currently, most mining on the Forest is for cinders and rock, with minor activities in tailing recovery for gold. Development of a major mine, such as the gold mine proposed at Hayden Hill, could have significant

impact on local communities through expanded employment and income. This impact would be short-lived, not lasting beyond the working life of the mine.

Although the existence of oil and gas in commercial quantities is not known, there is conjecture of a shale formation which may exist on Forest lands. This speculation, together with rising public interest in domestic energy sources, has led to many requests for oil and gas leases on the Forest in the last five years.

Geothermal energy is a resource presently being explored on the Forest in the Medicine Lake Highlands area of Siskiyou County. If this potential were fully developed, enough energy could be produced to supply more than 500,000 households. Development of this magnitude would create many new jobs in the local economy and generate tax revenues and receipt shares for local government. The majority of receipt shares would be distributed to Siskiyou County because most of the geothermal resource is located in that county.

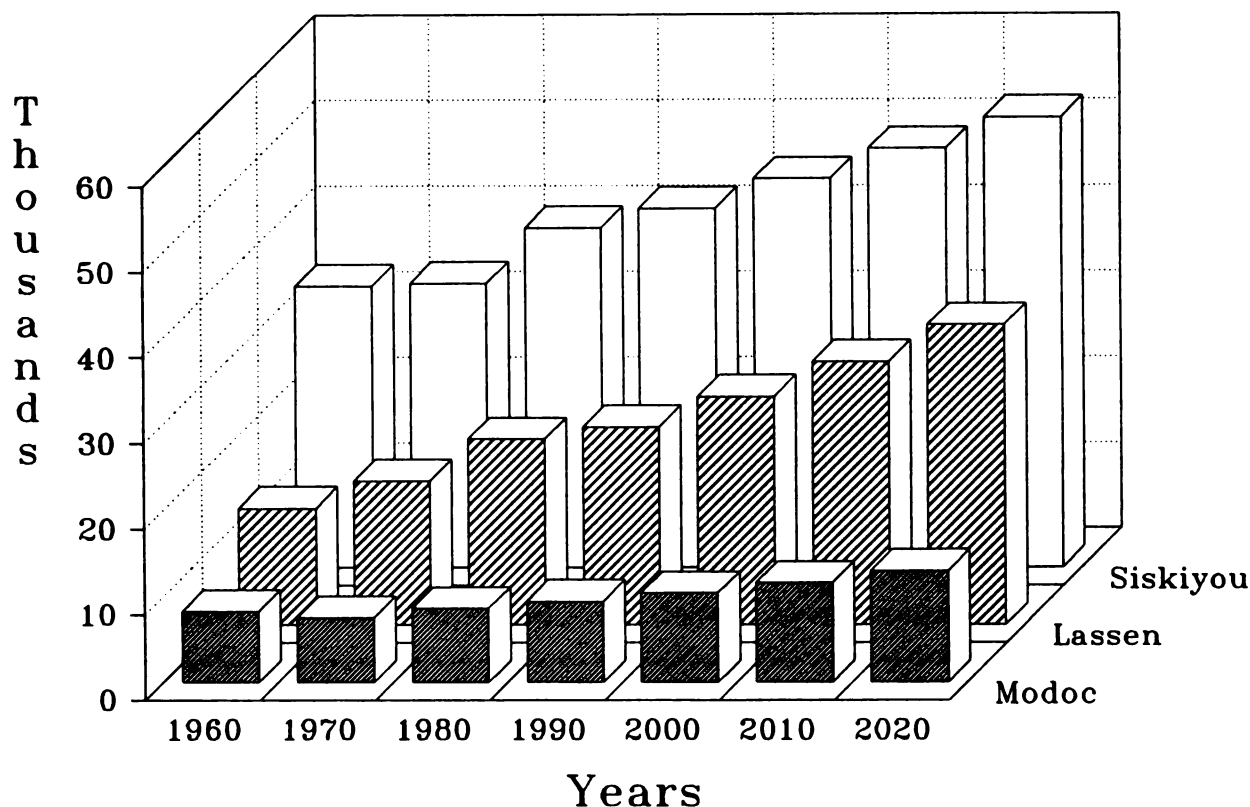
**Recreation:** Recreation is an important use of the Forest, especially for hunting, fishing, and camping. Modoc, Lassen, and Siskiyou Counties support large populations of mule deer, pronghorn, and waterfowl for hunting, as well as trout and bass for fishing. In 1981, recreation use totalled 381,000 visitor days, of which approximately 50% was related to hunting.

## Population

The current population of Modoc, Lassen, and Siskiyou Counties is 82,275. From 1980 to 1990, the population increased 17%, a greater percentage increase than that of the State (6%). In-migration accounts for 75-80% of the increase. This pattern is consistent with national trends showing movements from urban areas to more rural settings. Population growth rates varied among counties in the last decade, with Modoc County growing the least (12%) and Lassen County the most (27%). Siskiyou County's population increased 13%.

Between 1980-2020, the populations of Modoc, Lassen and Siskiyou Counties are expected to increase by 44% (Figure 3-3), an average annual growth rate of 1.1% — lower than the anticipated Statewide growth rate of 1.8%. Lassen County's population is expected to increase at an average annual rate of 1.5%, followed by Modoc County at 1.3%. Siskiyou County's population will only increase by 0.8% per year.

The average age of the population is increasing as a result of a poor job market in the 18- to 24-year-old group, and the in-migration of older-age groups. Modoc and Siskiyou counties have higher percentages of people in the 50-and-

**Figure 3-3. Combined Populations of Modoc, Lassen and Siskiyou Counties**

older age class (33% and 32%, respectively) than the rest of the State (25%).

Compared to the State average of 156 people per square mile, densities of these rural populations are sparse. The 1990 census indicates that 2.4 people per square mile live in Modoc County, 6.1 in Lassen County, and 7.1 in Siskiyou County.

The populations of the affected counties are predominantly white with Hispanics comprising the largest minority group (4.1% in Modoc County and 6.5% in Lassen County). Modoc and Siskiyou Counties have the largest Native American populations (4.0% and 3.7%, respectively), while the largest black population is in Lassen County (3.5%).

Historic land settlement patterns of Modoc, Lassen, and eastern Siskiyou Counties are linked to the livestock industry. The Forest was established largely as the result of ranchers' requests for the federal government to alleviate the problem of overgrazing public reserve lands. Long-term residents considered the Forest primarily for

the grazing forage and timber it could produce. With the recent migration of urban dwellers to these rural communities, the new residents value the Forest for its recreational aesthetic opportunities in addition to its commodity resources.

### Employment

The principal economic resources of the affected counties are government employment, timber, agriculture, and recreation (Figure 3-4). Modoc County employment from these resources is dominated by the following sectors: government (36%), agriculture and forestry (12%), wholesale and retail trade (16%), services (23%), and manufacturing (6%). Federal, State, and local government employment, in concert with educational jobs, provide two times more employment than the Statewide average of 16%.

Twelve percent of Modoc County's wage and salary employment is in the agricultural sector, a percentage

greater than the Statewide average. The Forest affects this employment sector by supplying livestock forage from public lands, which many ranches include as an integral part of their total operations.

Employment in wholesale and retail trade and services is much lower than the Statewide average. Recreation, particularly hunting, fishing and camping on forest land, affects these employment sectors. Purchase of sporting and camping equipment, vehicles, guide services, as well as gasoline, goods and other supplies, all contribute to support the local economy. The fine recreational experiences available in the area are a major reason for immigration to it.

Within the manufacturing sector, which is proportionately lower than the Statewide average, lumber and wood products (timber harvesting and mill work) comprise over 90% of total manufacturing employment. The volume of timber available from Forest lands has a major effect on the local manufacturing sector, which is primarily comprised of wood product-related employment.

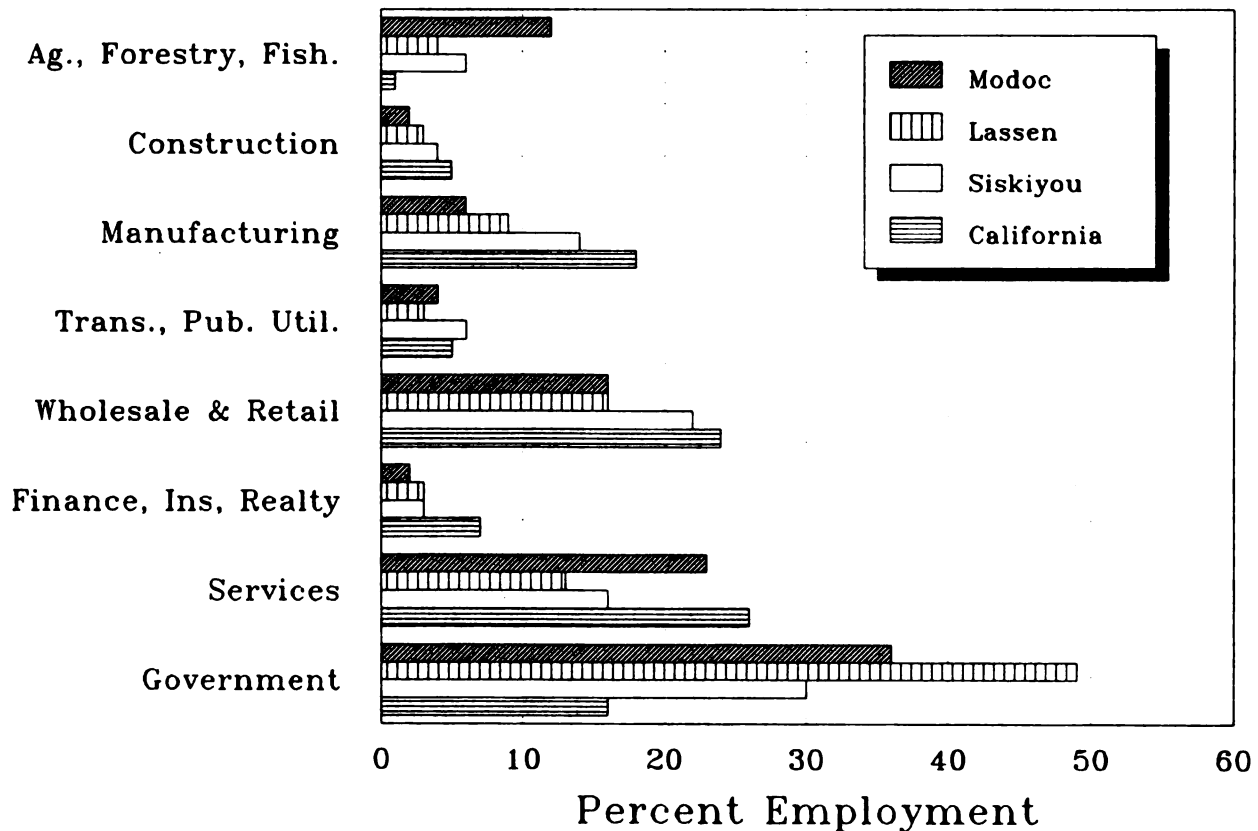
Timber also has a strong effect on the construction sector due to road construction and reconstruction requirements to transport harvested timber.

## Unemployment

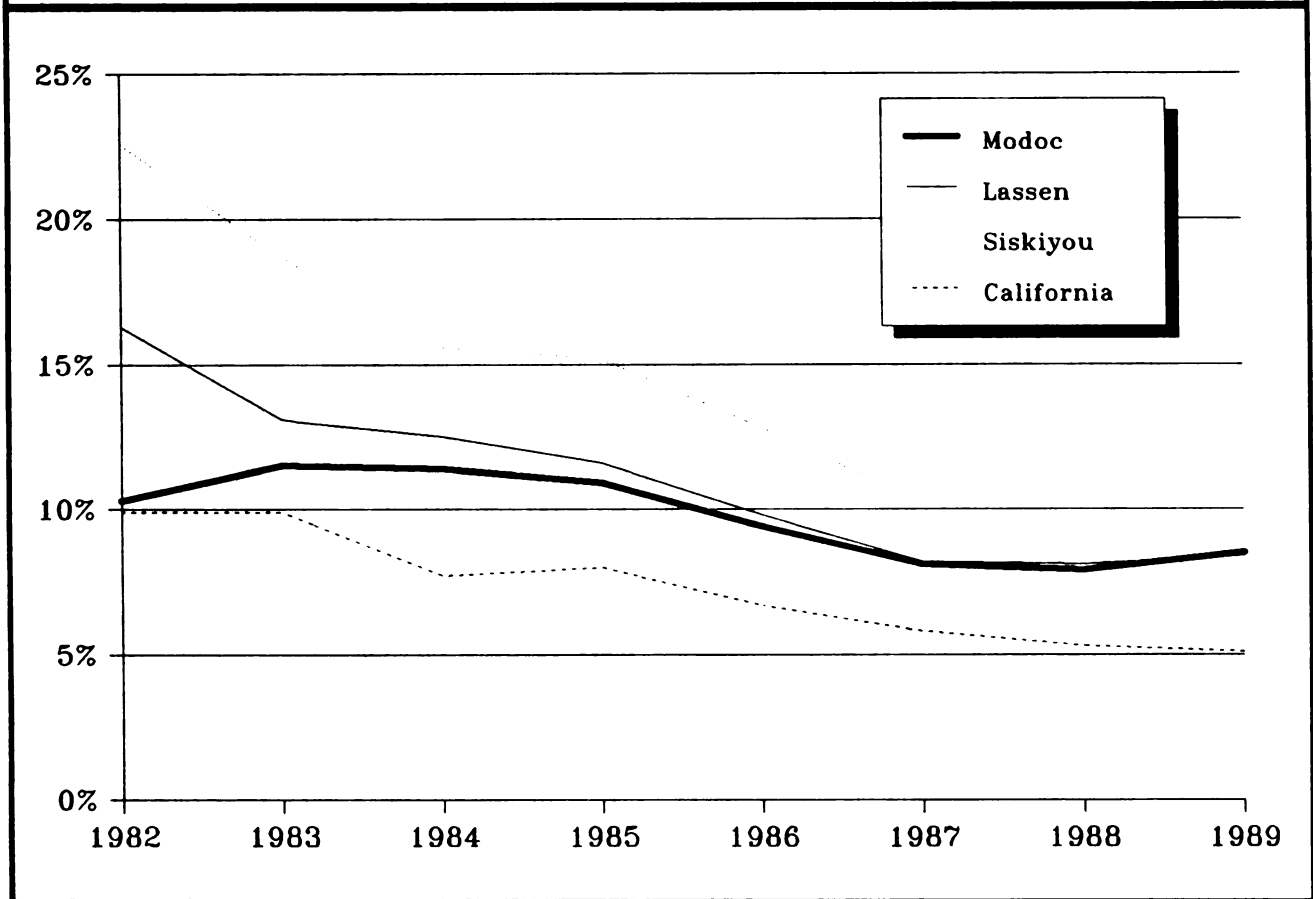
Local economics fluctuate seasonally with unemployment reaching a peak during winter months when inclement weather hampers timber harvesting, farming and ranching. Between 1982 and 1989, unemployment rates in Modoc, Lassen and Siskiyou Counties exceeded Statewide averages for the same period (Figure 3-5). Modoc County's comparatively low rate of unemployment, however, is actually higher than reported. This is typical for areas that are dominated by the agricultural sector.

Another factor driving up unemployment is in-migration from urban areas, which is occurring at a faster rate than employment opportunities. In 1982, high interest rates and an economic recession caused severe unemployment from which the counties have not completely

**Figure 3-4. Comparison of Percent Employment by Sector, 1988**





**Figure 3-5. Unemployment Rates 1982-1989.**

recovered. Many local businesses, lumber mills, and ranches have shut down; and the real estate market is flooded with properties to sell to very few buyers.

### Income

In rural areas, per capita income is usually lower than Statewide averages due to the lifestyles of the residents. People tend to grow more of their own food, cut their own firewood, barter, and work for nonreported cash such as family farm labor. These factors account for some of the differences between the counties and the State. Seasonal employment is another contributor to the difference. Construction, logging, and agriculture all have cyclical employment patterns. Finally, with low industrialization

there is less competition for labor, and union influence is low.

Lower wage rates, reliance on volatile agricultural markets, and a lack of investment-generated income within Modoc, Lassen and Siskiyou counties strongly contrasts the economic environment of California's metropolitan areas. Per capita income in the study area is nearly 30% lower than the State average. Between 1979-1987, the State's per capita personal income grew by 5%; while income per capita actually declined in real dollar terms for the rural counties (Table 3-1). Per capita personal income in Siskiyou County showed the biggest drop with a decline of 7%. Modoc (-5%) and Lassen (-2%) counties also experienced net reductions in per capita personal income values during this period.

**Table 3-1. Per Capita Personal Income  
(Adjusted to 1987 Dollars)**

County	1979	1983	1987	% Change
Modoc	9,910	8,587	9,397	-5
Lassen	9,670	8,715	9,515	-2
Siskiyou	9,868	8,509	9,162	-7
State of California	12,524	11,910	13,197	+5

Source: California State Dept. of Finance - Population Branch

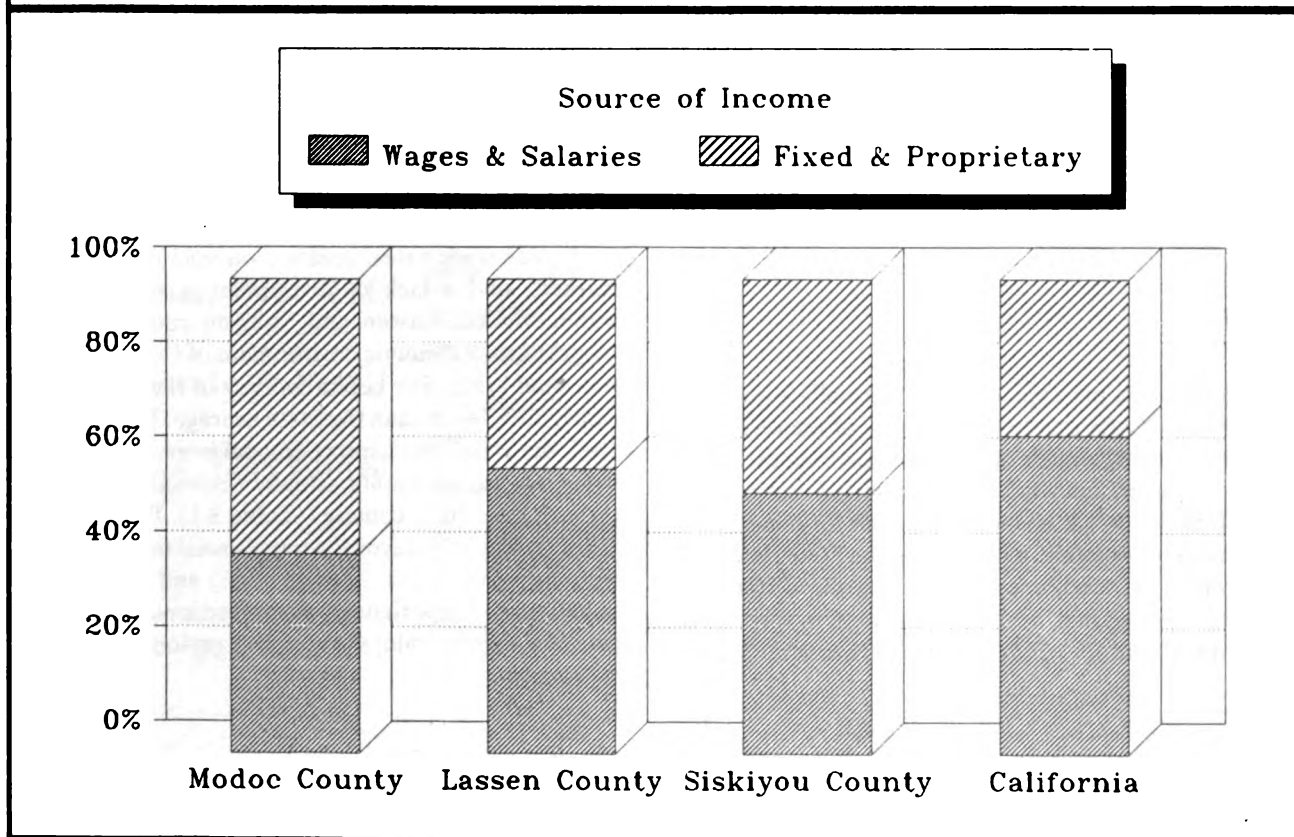
The disparity in growth rates may be explained by analyzing the components of personal income. Proprietary income from ranching and farming operations represents a larger share of personal income for rural counties than the State-wide average (Figure 3-6). Fam-

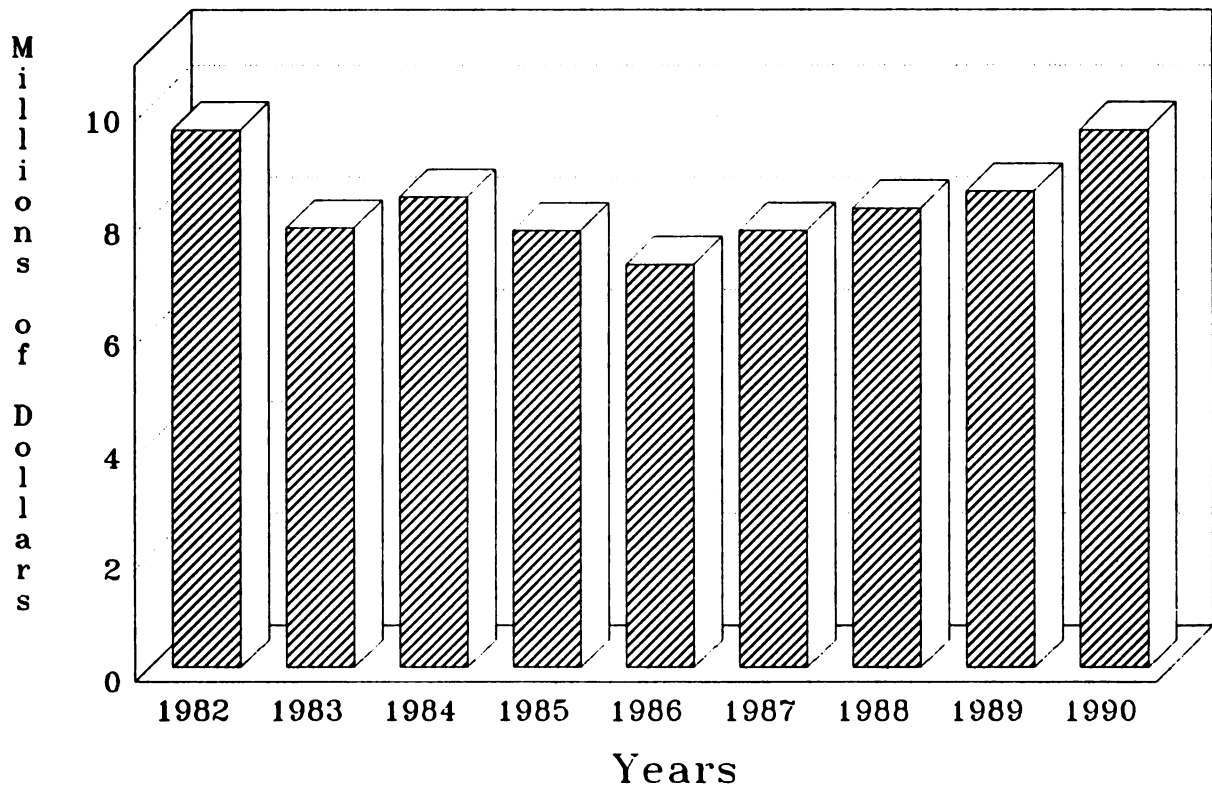
ilies at the lower end of the income scale rely more heavily on wage earnings, and are less likely to supplement income with investments in stocks and bonds. When inflation and unemployment rates are high, wage and salary increases may not keep up with escalating prices. Consequently, in periods of low economic growth, inflation and wage stagnation combine to lower the real per capita income in less prosperous regions.

### Local Economic Impacts

The Forest contributes to the local economy by providing timber for wood products, forage for livestock operations, recreation and hunting opportunities, and revenue from the Receipts Act Payment Program and through the influx of the annual operating budget. The Forest employs approximately 154 permanent people (full- and part-time) as well as 76 temporary workers.

The Forest budget reached a high of \$10 million in 1980, largely due to the expense of reforestation following enormous fires in 1977. In more recent years, funding has declined and stabilized at levels approximating that of the \$8.4 million 1989 budget (Figure 3-7).

**Figure 3-6. Personal Income Source**

**Figure 3-7. Annual Forest Budget, 1982-1990**

### Present Net Value

Present net value (PNV), a measure of cost efficiency used by the Forest Service, provides an index of worth for comparing alternatives. PNV is determined by the following method. The values of the products and uses of the Forest, such as timber, recreation, forage, and water, are calculated over the planning horizon (16 decades). The investment and management costs incurred to produce these products and uses are also determined for the same time period. In order to show that a dollar today is worth more than a dollar tomorrow, a real interest rate

of 4% is used to discount the future values and costs so that they are comparable to the values and costs of the present time. The costs are then subtracted from the values giving a net value. These discounted net values for each time period in the planning horizon can then be summed to show the present net value of an alternative. Appendix C discusses PNV in detail.

For the Forest, the values of timber, recreation, wildlife, forage, and water, as well as the budget for managing the Forest, are the primary determinants of PNV. Over the past decade, the values have increased.

## Payments to the Counties

The Twenty-Five Percent Fund, an act created in 1908, requires the return to affected counties of 25% of monies received by the Forest from the sale of forest products. Receipts from timber sales and grazing fees are the primary source of monies. The percent of forest land area in each county is the basis for the distribution of 25% funds returned to each county: Modoc County receives 83% of the Fund, Lassen County 9%, and Siskiyou 8%. The money must be used to improve public schools and roads.

Annual receipts can fluctuate widely because of the variation in volumes of timber harvested which dominate the economic base from which the 25% returns are calculated (Figure 3-8). Although the Forest regulates the volume of timber offered for sale, the price paid and

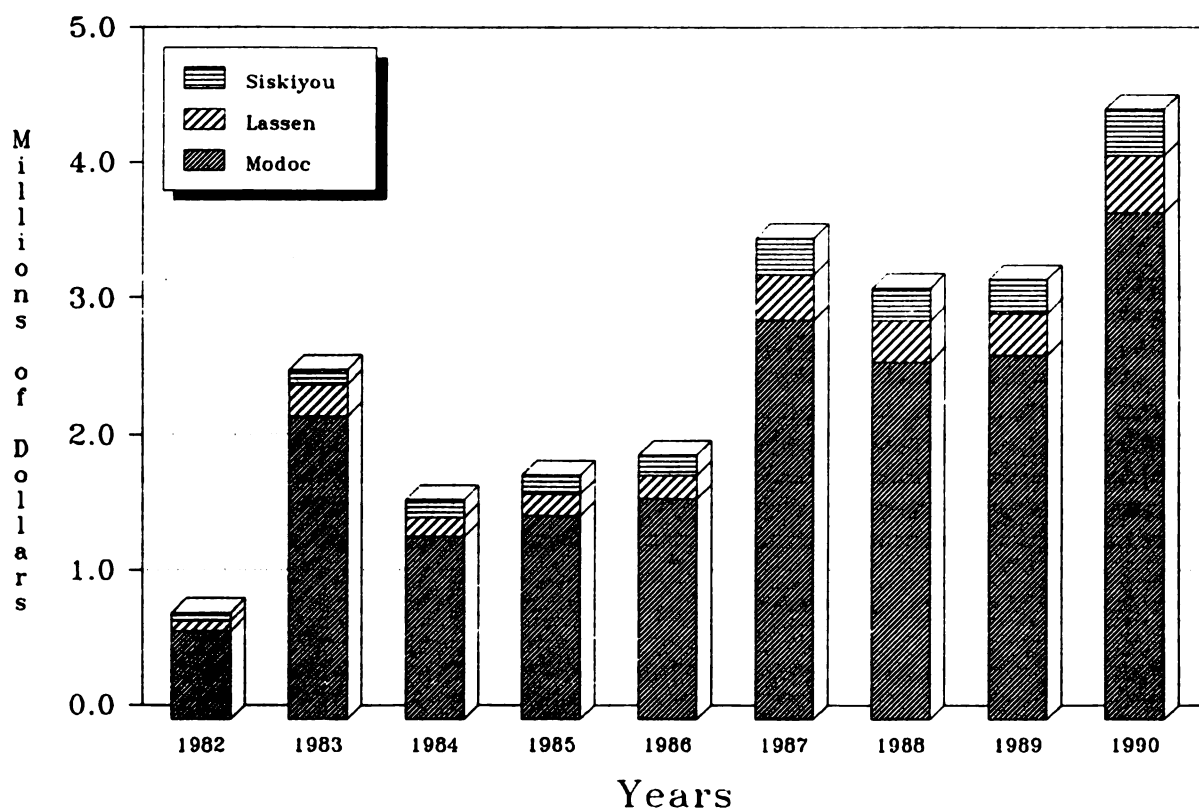
timing of the actual harvest is influenced by the market demand for wood products.

Another source of income to the counties is the possessory interest tax levied on individuals holding various permits in national forest lands. The primary source of possessory income tax from the Forest is livestock grazing. For example, Modoc County receives approximately \$29,000 in taxes annually from ranchers who graze their livestock on the Forest.

The State of California levies a timber yield tax, currently set at 2.9% of the timber harvest value, which is returned to the county of origin where the volume is harvested.

Rents from geothermal, oil and gas leasing are recent additional sources of income to Modoc and Siskiyou Counties.

**Figure 3-8. Twenty-Five Percent Fund Payments to Counties, 1982-1990**



## D. The Social Environment

### Introduction

In order to determine the effects of Forest management on the quality of peoples' lives and their well-being, the population of the assessment area was grouped into several social categories: ranching-farming, timber operators-wood products manufacturing, retail trade-services, retirees, government employees, non-local recreationists and Native American Indians. The categories are simplified, stereotypic groups, but individuals may belong to several groups because the categories are not mutually exclusive.

### Social Groups

Forest management activities can influence individuals and groups on a local, regional, and national basis. People living within and adjacent to the Forest are most influenced; they are described in detail below. Various groups may overlap at the local, regional, or national level. For example, recreationists visiting the Forest come from the local area as well as from areas outside the zone of influence. Similarly, national and regional groups interested in commodity outputs, such as timber or grazing, share many beliefs held by local commodity-oriented groups.

Descriptions of the various groups and their value systems which follow are in general categories developed for analytical purposes; individuals may not perfectly fit a unique group. Many cross ties exist between the social groups because of such factors as religious affiliations, family relations, social organizations, recreational preferences, and the desire for open space, rural environmental equality and a slower pace of life.

#### Ranching-Farming Group (Ranchers, Farmers)

This group is comprised of individuals involved in livestock production and the growing of grain crops, hay and pasture, and vegetable crops. Many of the members of this group are long-time residents of the assessment area with ranches and farms having been passed to successive generations. This group is also made up of ethnic minorities, usually Hispanics, who provide manual labor to the ranchers and farmers. The group's lifestyles and job dependencies are based on using the land to sustain their livelihoods. Currently, economic instabilities in ranching and farming create uncertainty in the ability to sustain these lifestyles.

Grazing on public lands is an integral part of many ranch operations. Currently, local ranchers depend on

approximately 15% of their cattle forage requirement from Forest land. While livestock graze on public lands during the summer months, those private lands not used for summer grazing are devoted to alfalfa and grass hay production for winter feeding. Reductions in public land grazing could increase the use of private lands for grazing livestock during the summer months. To compensate for the loss of acreage in production, ranchers would have to decrease the number of livestock their ranches could support.

The Ranch-Farming Group is generally opposed to changes that would rapidly alter their lives and communities. As a group they benefit from Forest commodities, especially forage and water for agricultural use. They have a strong feeling of ownership in public lands and believe that their historical uses of the Forest should not be altered. In fact, the Forest was established largely because of the work and recommendations of local ranchers in the last century.

Important population variables for the group are land ownership and use patterns. Believing that agricultural land should be used for agricultural purposes and not broken up for other uses under a variety of ownerships, this group is concerned about the effects of subdivision, including the effects of carving up the agricultural land base, and the limited supply of water. Because water is scarce in high desert country, its availability for agricultural uses has been and will continue to be a major source of concern.

#### Timber Operators-Wood Product Manufacturing Group (Timber Industry Workers)

This group includes individuals involved in logging, the manufacturing of wood products, and commercial firewood cutting. Members are generally long-time residents of the assessment area with some minorities employed primarily in wood products manufacturing. The group's employment opportunities are totally dependent on the availability of wood fiber, a major source of which is located on federal lands.

Like those in the ranching-farming group, these peoples' lifestyles are dependent on the land for basic subsistence. For those involved with commercial timber, maintaining their way of life is a major concern due to the economic uncertainties of the wood products market and the policies of the Forest concerning availability and quality of wood fiber.

The values of the group are similar to the ranching-farming group. They have a traditionally strong community orientation. This group believes that the Forest should be managed to provide wood fiber and has strong

feelings of ownership regarding Forest lands. Timber operators and wood products manufacturers within the Big Valley Federal Sustained-Yield Unit feel that the Unit is an important part of their community and that it should be managed for the benefit of the Big Valley area. In general, the group values the Forest for its ability to supply their sustenance. Of all the groups considered, this one is most affected by land use patterns on the federal lands.

#### **Retail Trade-Service Group (Retail and Service Personnel)**

This group sells merchandise, provides lodging, amusement and professional services, and works in finance, insurance, and real estate. They include long-time residents and newcomers. Although the employment opportunities for this group are not directly dependent on commodity outputs from the Forest, they are dependent on the economic stability and growth of the area. The group uses the Forest primarily for leisure activities. The certainty of this group to maintain its lifestyle is directly related to the certainty or uncertainty of the other groups. For example, members of this group from the Big Valley area generally feel that their lifestyles and jobs are dependent on the maintenance of the Big Valley Federal Sustained-Yield Unit because timber industry is a major employer in Big Valley. A loss of jobs in the wood products sector would reduce local income, resulting in loss of trade and services.

Although the beliefs, values and attitudes of this group are varied, they generally believe that the Forest should be managed for a mixture of commodity and non-commodity outputs. While the commodity outputs provide much of the existing economic stability of the area, the non-commodity outputs provide for their personal recreational activities, as well as some economic benefits to certain segments of the group from the attraction of tourists to the area for hunting, fishing, and other recreational activities. Similar to all of the local groups, there is a strong community spirit which is generally found in rural areas.

This group would be affected by a change in land use and ownership patterns if there were a general loss of open space. As a whole the group favors subdivisions which usually result in increased economic activity. Business people recognize that population growth and resulting expansion in business depend largely on increasing commodity production or visitors to the area. Therefore, those alternatives which promote production and use of forage, timber, big game, and recreation opportunities would benefit the business community.

#### **Retirees and Second Homeowners Group**

For the most part, members of this small but growing group have come to the area to escape large population centers, to retire, or to purchase second homes or parcels of land for vacations or investment. They are attracted to the area by its rural character, and their use of the Forest is recreational. Their source of income is primarily from retirement funds or from employment outside the area.

This group believes the Forest should be managed for amenities and that convenient access should be provided. Primary concerns of the retirees on fixed income are taxes and the ability of the local communities to provide adequate social services.

The group favors a land use pattern which allows ownership of rural property. A major concern is loss of open space and the natural setting, an amenity that attracted many individuals into moving to the area. Ironically, their arrival generally has resulted in subdivisions of open spaces and new development.

#### **Government Employees Group (Federal, State, and Local Employees)**

This group is composed of individuals employed by State agencies (such as the Department of Fish and Game), county agencies (such as the schools and county road maintenance), and federal agencies (such as the Forest Service). This group, like the retail trade-services group, is a mixture of long-time residents and newcomers. Individuals in this group have jobs that are more directly affected by Forest management.

Forest employees are especially dependent on the scale of programs that the Forest undertakes. In the last five years, the Forest Service has been operating under reduced budgets which has required reductions in the work force and the number of non-commodity programs undertaken, such as wildlife habitat and recreation development improvements. Decreased habitat improvement funds could reduce timber and range activities if damage to certain fish and wildlife habitats cannot be mitigated. Curtailed activities could then result in diminishing county receipts received from the sale of timber and forage. In other words, Forest programs directly affect some members of this group (Forest Service employees) and indirectly affect other (county programs).

In general, this group believes in a mixture of outputs, uses and services to provide for commodities and amenities. The group's values are varied because government agencies tend to employ people from many areas. Many members of this group tend to favor community improvement.

### **Recreationist Group (Recreationists)**

This group primarily includes local residents and individuals from California to the south and west of the assessment area, and from southern Oregon. They use the Forest seasonally for recreation such as mule deer and pronghorn hunting, fishing, camping and rock-hounding.

With more interest in amenity values on the Forest than in resource developments, recreationists benefit from alternatives which enhance the natural environment and recreation opportunities. They benefit from conservation and development of wildlife populations, maintenance of access roads and trails, preservation of traditional hunting camps, and maintenance of developed recreation sites.

### **Native American Groups (Traditionalists and Non-traditionalists)**

The members of this group primarily include Upper Pit River, Paiute, and Modoc/Klamath Indians. Most of the Upper Pit River Indians are located in the Alturas area, while the Paiute are generally found in the Ft. Bidwell area. Modoc/Klamath Indians are primarily non-residents. The group experiences high unemployment (approximately 75%), and those who are employed work seasonally in ranching and construction off the reservation.

Native Americans have traditional and non-traditional (economic) ties to the land. That is, religious/heritage sites are located on the Forest; and many individuals are employed by the timber products industry (logging, thinning, planting, mill work, etc.). Traditional Native Americans hold nature in high regard and believe that all land, plants, animals, and water are sacred.

The major influence of Forest management on this group is the disturbance of Native American cultural and religious resources. Traditionalists believe in retaining a natural landscape and using resources necessary to sustain their lifestyle. They consider major land alterations (clearcuts, road building, etc.) disrespectful to nature. Thus, protection and preservation of hunting, gathering and spiritual places is only part of their concerns in the way the Forest is managed. Major prehistoric sites, such as villages, seasonal base camps, cemeteries, rock art, and prayer seats, are also of concern and should similarly be preserved out of respect for ancestors and to preserve examples of past lifestyles.

The certainty and uncertainty of maintaining the group's way of life and their traditional uses of the land is directly related to the amount of environmental disturbance caused by Forest activities: the greater the disturbance, the more likely an area of religious or cultural significance will be changed. Consequently, traditional Native Americans prefer alternatives which stress maintaining the Forest in a natural setting.

Traditionalists may include tribal elders who are not involved in the current job market. They may also include younger individuals interested in reviving some aspects of past lifestyles, beliefs, and traditions. These revivalists may be involved in the current local job market.

Non-traditional Native Americans are generally younger to middle-aged individuals involved in the current job market. While they may lean toward the traditionalist point of view, they are also concerned with the economic necessity of employment. Because of their need to work, non-traditionalists accept more intensive management of the Forest, including disturbance of some cultural heritage sites. Generally, increased opportunities for local employment, especially in the timber products industry, is a benefit to this group.

### **Summary**

Effects on the local economy will be determined through increases and reductions in major outputs and uses of the Forest which include timber, forage, and recreation (particularly hunting). Changes in these outputs can then be related to changes in employment, income, and receipts to the counties. Because the Forest is a major employer in several local communities, major modifications to the Forest budget not only affect its own employees and contract workers, but the entire economic and social base.

Cultural lifestyle is an important social variable in the groups' value systems. Local lifestyles are highly dependent on the land and natural resources for both livelihood and recreation. The Forest directly influences local lifestyles in supplying various goods, services, and opportunities. Management effects on local lifestyles will be a primary consideration in the determination of community stability. Stability affects attitudes and beliefs of the people toward use of the Forest, the organization of the community, and population.

## E. The Resource Environment

### Introduction

This section outlines the current management situation. The Forest is managed on an integrated basis, which means that management decisions affect all resources and are designed to achieve multiple resource objectives.

Because management activities affect a variety of resources, the Forest makes decisions only after considering all consequences. Similarly, single management activities are actually designed to serve a variety of resource objectives. For example, treating lodgepole pine stands with small clearcuts to increase water yield will provide additional wildlife habitat and a wood source for various purposes. Water developments are designed for wildlife as well as domestic livestock needs. Roads located to efficiently transport logs from a timber sale area to a mill also provide access for hunting, firewood gathering, and other recreation activities.

Other interrelationships are less obvious because results are manifested over a period of months or years. For example, diverse vegetation in various stages of growth leads to a gradual increase in populations of certain animal species, which in turn enhances recreation opportunities for viewing, photographing, and hunting. Although these events may take several years to come to fruition, they may be the result of a single management activity.

Managing a forest is a complex process of numerous interactions. Resources are described individually to emphasize important aspects of the current situation in an organized framework. One must conceptually combine all elements to grasp the current situation on the Modoc National Forest. (For a comprehensive discussion of each Forest resource, see the Analysis of the Management Situation in the Forest planning records.)

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### 1. Air Quality

Crisp, clean mountain air is a hallmark of the Forest, which is geographically within the Northeast Plateau Air Basin under the jurisdiction of County Air Pollution Control (CAPC) officers in Lassen, Siskiyou and Modoc counties. Air quality over all the Forest is excellent, as

acknowledged under standards set by the Federal Clean Air Act. The South Warner Wilderness within the Forest, and the Lava Beds Wilderness in the Lava Beds National Monument in the northwest corner of the Forest, are rated as Class I areas. The rest of the Forest is designated Class II. In Class I areas, even a minimal change in air quality is considered significant, while Class II areas can have changes in air quality if they are the result of moderate, well-controlled growth.

### Current Management

State of California regulations<sup>1</sup> for pollution control and air quality standards affect this Forest. Authority to regulate and monitor state air quality requirements are delegated through the State Air Resources Board to local Air Pollution Control Districts. The Forest follows agricultural burning guidelines and reporting requirements together with Forest Service Manual guidelines when using prescribed fire. To meet these regulations, the Forest maintains records for the amount of forest fuels burned and submits records to the CAPC quarterly.

Burning vegetation, the principal source of air pollution on the Forest, is the traditional method for disposal of logging slash, site preparation for reforestation, and range improvement projects. Suspended particulate matter is the primary pollutant of concern when burning on the Forest. Disposing of slash by prescribed burning degrades the air quality less than if the slash were to burn by wildfire. During prescribed burns, fuel volume and fire area are managed under weather conditions which dissipate smoke.

### Public and Management Concerns

Because Modoc County has a low population, few industrial plants and low vehicle concentrations, air quality degradation is insignificant. The high elevation, remoteness from other pollution sources, and frequent storm patterns with prevailing southerly and westerly winds allow rapid dispersal of local pollutants. As a result, the public has expressed few concerns regarding air quality on the Forest. Because stable air conditions (inversions) are uncommon in this area, neither local, State nor federal agencies have imposed burning restrictions on the Forest or local communities.

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<sup>1</sup>

California Health and Safety Code Part 4; and California Administrative Code Title 17.



Logging activity, mineral extraction operations and other commercial uses of the Forest resources create dust. Although annoying to the Forest visitor in localized situations, dust pollution is temporary and insignificant. To abate dust, the Forest or contractors apply water, oil or even paving to roads near residences, recreation sites, and timber sale areas.

## Opportunities

The Forest is working toward better use of logging debris in ways that will solve disposal problems as well as reduce suspended particulate releases (air pollution). Through the personal use firewood program, the Forest encourages firewood users to gather dead and down logging slash by offering it free of charge. Other alternatives to slash burning include chipping small material, pulverizing by heavy equipment, and burying road slash.

Co-generation plants which utilize wood fiber to produce electricity are developing in this area. One such plant is in operation and two others are in planning stages. Although prescribed burning is one of the least expensive treatments for slash disposal, removal of slash for cogeneration plants may eventually reduce our need to burn it, and consequently reduce air pollution.

As regenerated timber stands are harvested, logging slash is expected to decrease. Trees in these stands will be more uniformly shaped with less cull and breakage, and, therefore, less slash.

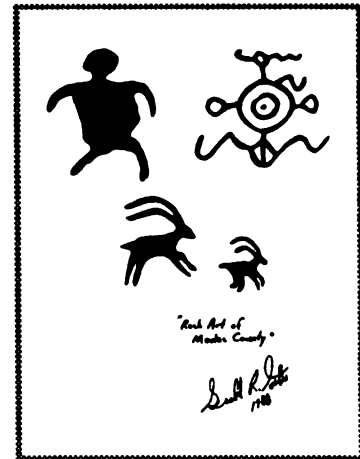
As future management activities are proposed near the South Warner Wilderness, the Forest must consider if even minimal changes will degrade air quality. To comply with the Class I designation of this area, the Forest will identify air quality resource values and limits of acceptable change in Class I areas.

Geothermal exploration on this Forest may impact air quality. Temporary disturbances would include dust from construction activities, and emissions from diesel- and gasoline-powered equipment. During cold months, even small releases of water vapor could freeze producing fog, highway icing, or precipitation. Hydrogen sulfides may form sulfate particles that could reduce visibility, although this transformation probably would not produce a major effect on air quality. A more likely impact from hydrogen sulfide is the emission of odors from geothermal wells and power plants.

## 2. Cultural Resources

### Overview

Cultural resources provide information on the Forest's unique pre-historic and historic ethnic heritage, including evidence of several Native American groups (Achumawi, Atsugewi, Modoc-Klamath, and Northern Paiute) and their predecessors. In addition to providing archaeological evidence of past



lifeways and adaptation to the environment, cultural resources also lend a historic perspective on today's technological and sociological change.

Cultural resources are buildings, sites, areas, architecture, memorials, and properties having scientific, historic, and cultural importance. Cultural resources comprise an irreplaceable and nonrenewable resource relating to past human life. Physical remains of over 11,000 years of human history are found throughout the Modoc National Forest. Except for the past 150 years of written history, the only record of this long, unwritten history are the abandoned villages, camps, and other remains left by the native prehistoric peoples.

Paleo-Indians were the earliest inhabitants of the Forest who lived 10,000-11,000 years ago at the end of the last Ice Age. Using fluted projectile (spear or dart) points, they hunted big game such as mammoth, bison, ground sloth and other extinct animals. Little evidence of this period has been found.

Indian peoples who lived in this areas about 8,000 years ago left abundant evidence of their habitation. Most prehistoric archaeological sites contain surface materials (chipping debris and projectile points) spanning the last 4,000-6,000 years. During this period, various native cultures specialized in their adaptations to locally available resources.

Today, the Klamath-Modoc, Northern Paiute, and Pit River (Achumawi and Atsugewi) Indian tribes are the principal occupants of the area. All followed a hunting and gathering, semi-sedentary existence. Groups seasonally inhabited settlements, and generally returned to the same village sites and camping spots year after year. Food

resources were used on a seasonal basis whenever and wherever they occurred.

Prehistoric site types on the Forest range from winter village complexes to scattered hunting stations, tool manufacturing sites, and plant food processing areas. They also include petroglyphs, pictographs, bedrock mortars, rock shelters, caves and obsidian and basalt quarries. Of particular significance are the well-known obsidian quarries at Glass Mountain and the Warner Mountains, and the numerous rock art sites within the Devil's Garden area.

Hudson Bay Company fur trappers who came in the late 1820's were the first Euro-American explorers in the area. In the 1840's and 1850's, explorers made topographic and railroad surveys. Throngs of emigrants streamed toward Oregon and California farmlands and gold fields on their way into or through Modoc County.

By the 1860's, white settlers in Oregon and California wanted the Klamath and Modoc Indians moved to a reservation and the rest of their traditional territory opened for settlement. The treaty of 1864 established the Klamath Indian Reservation for the Klamath, Modoc, and Snake (Northern Paiute) Indians. The Modoc War (1872-73) effectively ended Indian and white hostilities in the area.

Settlement of the area rapidly increased in the 1870's and 1880's. Sawmills, mining operations, and ranching businesses were soon in full operation. Ranching and logging activities continue to be the major economic focus of Modoc County.

The most common historic sites on the Forest are homesteaders' cabins and ranchers' line shacks; mining related sites; logging railroads and camps; and emigrant trails and wagon roads. Of particular importance are several sites associated with the Modoc War of 1872-73 located in the northwestern portion of the Forest outside of the Lava Beds National Monument. An intense period of Indian-White hostilities is also represented by reputed massacre sites at Fandango Valley and Bloody Point.

Historic ethnic groups—Native American, Basque, Euro-American, and Chinese—made significant contributions to the local ranching, dairy, logging and mining industries. Ethnic sites include Native American religious and resource gathering sites, Basque aspen carvings (dendroglyphs), and Chinese occupation sites. The Civilian Conservation Corps has left its unique legacy on the Forest in the form of roads and trails, fire lookouts, administration sites, recreation facilities, former camp locations, and wildlife and fishery conservation projects. In addition, the Forest was the scene of an early twentieth-century gold rush in the High Grade Mining District in the Warner Mountains.

## Current Management

The Forest Service inventories, describes, and evaluates the prehistoric and historic cultural resources on the Forest. Direction for these activities is outlined in the National Historic Preservation Act (NHPA) of 1966 and Executive Order 11593. The Forest consults with the State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Preservation, and reviews State and federal registers when applicable.

Cultural resource sites are managed in several ways. The level or intensity of management has the following range:

- **Preservation**—sites are protected by excluding incompatible land management activities.
- **Conservation**—when preservation is not feasible, scientific information is recovered from sites so that other land use activities can occur.
- **Interpretation**—sites are developed for public enjoyment and education through signs, trails, and public information kiosks.
- **No Management**—sites are not preserved in any way. (These sites are not of the quality suitable for nomination to the National Register. They contain little scientific information or Native American cultural heritage value.)

## Inventory and Evaluation

As of 1983, about 254,000 acres (16%) of the Forest lands had been inventoried for cultural resources, and approximately 2,600 properties were identified (Table 3-2). Of these, seven are on the National Register of Historic Places and over 500 sites have been evaluated as potentially eligible for nomination. An estimated 26,800 cultural properties on Forest have not yet been identified.

**Table 3-2. Cultural Resource Summary (as of 1983).**

	Number of Properties	Total Acres*
National Register Sites	7	32
Potentially Eligible Properties	500	2,000
Properties Identified	2,600	12,000
Estimated Unidentified Properties	26,800	120,000
Acres Inventoried		254,000
Acres Not Inventoried		1,400,392
* approximate figures		

About 83% of the recorded cultural resource sites are managed at the preservation level, and less than 2% at conservation level. No sites have been interpreted, and about 15% are not managed. Most prehistoric and historic sites are in the preservation category. Sites not managed are small, surface lithic scatters with little scientific or heritage value.

Many pieces to the archaeological puzzle on the Forest are missing because inventories are primarily conducted on a project-by-project basis, rather than area-wide. If an area has no associated projects, it will be one of the last to be inventoried. Because no major archaeological excavations have been conducted, the Forest has little information on the time periods of occupation in the area. Evaluation of sites is difficult because of these deficiencies in the cultural resource data base.

Due to a lack of baseline data, no single theoretical orientation<sup>1</sup> was used for data accumulation or program development. Archeological data was collected and recorded so that any theoretical orientation cultural materialism, techno-environmental determinism, or historical materialism) could be used for future analysis. In evaluating site significance, a cultural materialist framework generally was followed.

## Native American Consultation

As part of the Forest's normal compliance procedures, and in accordance with the American Indian Religious Freedom Act (AIRFA), the Native American Heritage Council and local Native American groups are consulted on most large-scale projects, such as timber sales. If Native American groups determine that a project area has cultural or heritage value, the area is surveyed and results given to the groups. Heritage values are considered when designing project alternatives and site protection measures.

Groups routinely contacted are the California Native American Heritage Commission, the Klamath Tribal Council, the Ft. Bidwell Indian Community Council, the Pit River Tribal Council, the Pit River Home and Agricultural Cooperative Association, the Alturas Rancheria, and the Lookout Rancheria.

<sup>1</sup> Theoretical orientation is a basis for studying human behavior to determine why cultures act in a particular way. Three approaches to theoretical orientation are:

**techno-environmental determinism:** an archaeological and anthropological theory which states that groups with similar technologies in similar environments will tend to develop similar lifestyles and social organization.

**cultural materialism:** as related to archaeology and anthropology, a theory that man's past culture may best be studied in terms of his technology (tools), society (social organization), and ideology (beliefs, religion, morals). How these aspects are interrelated determines human behavior.

**historical materialism:** an anthropological theory that a group's technology, environment, and economy may yield information on understanding its cultural organization.

## Integrating Cultural Resources with Other Resources

Integrating cultural resource management with other project activities requires coordination in advance of any undertaking. Inventories are usually conducted before the project begins, and significant cultural resources are protected. If sites are not inventoried, cultural resources could be damaged. In some cases inventory procedures are initiated only a short time before the project begins, resulting in project delays. Some projects are begun prior to completing inventories. Most large-scale projects, such as timber sales, meet cultural resource requirements.

### Opportunities

Because most cultural resource inventories are conducted on a project-by-project basis, several areas are underrepresented or not represented in the cultural resource data base. The Forest could conduct non-project inventories to correct deficiencies in the data base and improve the overall cultural resource picture on the Forest.

In all areas, more work on prehistoric and historic resources is needed, including inventories, excavation, analysis of recovered remains, archival research and oral histories. Little is known about early logging activities of the 1860's to the early 1900's. Photographs, official records, journals, and on-the-ground inventory of physical remains from all historic periods could be investigated.

The Forest has a backlog of more than 1,500 unevaluated archaeological sites. They are protected as though they were eligible for the National Register. The Forest could evaluate 150 sites per year and eliminate the backlog in the first decade of the Forest Plan.

Better coordination with interpretive services and recreation is needed to fulfill the goal of interpreting cultural heritage for the public. The Forest could encourage local groups, such as the Modoc County Historical Society or the Modoc County Chamber of Commerce, in cooperative ventures such as interpretive locations on the Forest and oral history programs. Cultural resources appropriate for interpretation include rock art (petroglyphs and pictographs), the Glass Mountain obsidian quarry, Modoc War fortifications, remnants of emigrant trails or roads, homesteads, and sites associated with historic mining activities.

## 3. Diversity

### Introduction

The regulations written to implement NFMA define diversity as "the distribution and abundance of different plant and animal communities and species within the area covered by a land and resource management plan" (36 CFR 219.3). Results come from managing other resources such as vegetation and animals, which are elements of diversity. We can evaluate or project diversity by measuring or quantifying vegetation types, seral stages, and animal species inhabiting a particular area. By maintaining vegetative diversity in a natural dispersion pattern and in sufficient amounts, the Forest can meet another regulatory obligation: to maintain viable populations of the Forest's animal species by providing suitable habitat conditions. The relationship between plants and animals is the basis for the California Wildlife Habitat Relationships (WHR) Program (Laudenslayer 1982).

Diversity is evaluated by richness, evenness, and pattern. Richness is the number of species, communities, or special habitat elements found in the planning area. Evenness is the relative abundance of animals, habitat types, successional stages, and cover classes within the planning area. Evenness describes the extent to which these elements are uniform. Pattern reflects the sizes and structural complexity of vegetation stands and the spatial distribution of plants and animals within the planning area.

### Richness

Richness can be represented by the number of vegetation types on the Forest (Figure 3-9). Plant community diversity or habitat type diversity are common terms used in discussing richness. The 17 vegetation types found on the Forest are based on a classification of California vegetation, CALVEG (Parker and Matyas 1981), and on the WHR Program.

The presence of 17 major vegetation types indicates that the Modoc NF is a diverse forest spanning a wide range of environmental conditions. Vegetative richness is also reflected in the richness of animal species. The Forest supports more than 350 vertebrate species (Appendix K). They include 25 species of amphibians and reptiles, 218 species of birds, 81 species of mammals, and 30 species of fish. Species richness has remained relatively stable over the last 100 years. While bighorn sheep

have been extirpated locally, a few others, such as chukar, have been introduced.

### Evenness

Evenness of both plant and animal communities can be approximated by the proportions of the Forest within each vegetation type. Figure 3-9 estimates evenness from a Forest-wide perspective. The Forest is clearly dominated by juniper and eastside pine. Western juniper covers approximately 28% of the Forest. Juniper has increased substantially as a result of fire suppression efforts and past grazing practices.

The low sagebrush vegetation type is the third most dominant type. It is indicative of vast acreages of shallow-soil, generally low-production land on the Forest. Big sagebrush adds variety to sagebrush which, together with low sagebrush and associated silver sagebrush, covers 20% of the land. The Forest has no chaparral.

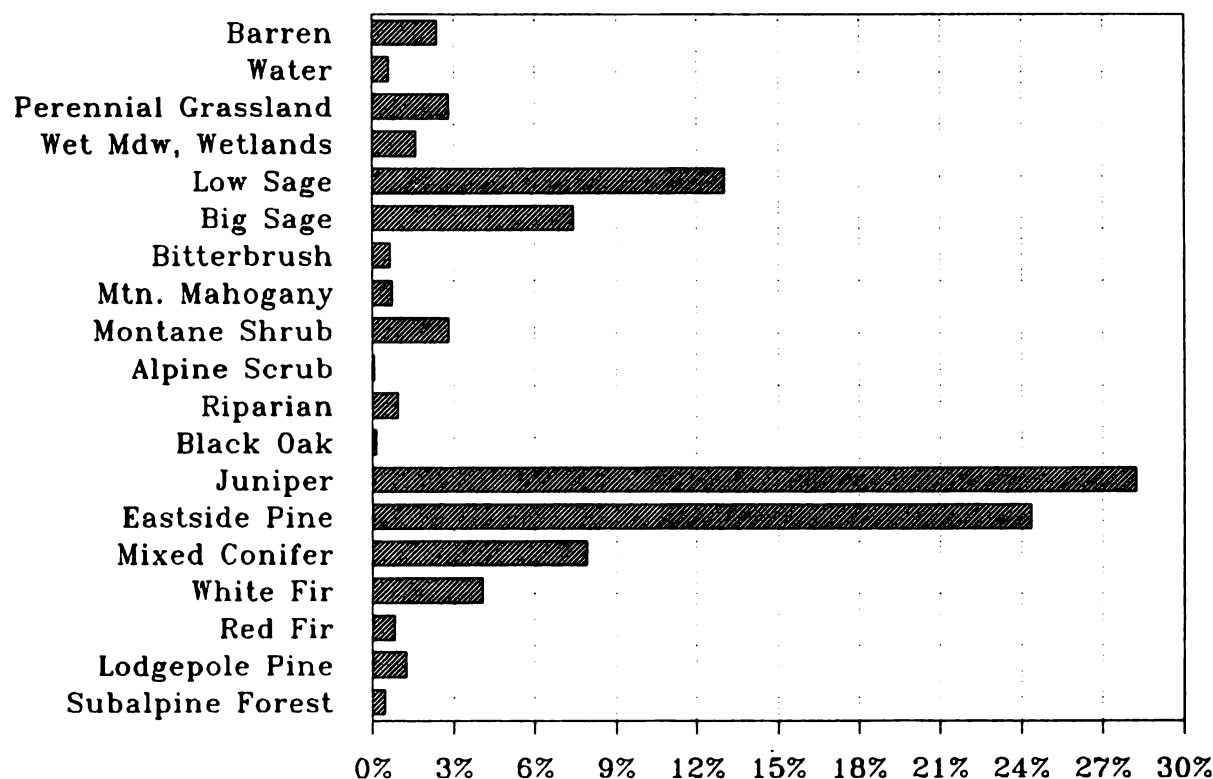
In addition to eastside pine, other commercial conifer vegetation types are mixed conifer, white fir, red fir,

lodgepole pine, and subalpine forest. In total, commercial conifer vegetation types are found on nearly 640,000 acres, or 40% of the Forest. Two-thirds of this land base is capable of growing greater than 20 cubic feet per acre per year ( $> 20$  timberlands), while the remainder is less productive.

Remaining vegetation types are relatively sparse, but nevertheless add vegetative richness to the Forest. They include wet meadow, wetlands, riparian, mountain mahogany, and black oak types, all of which are important to the Forest's animal communities.

Vegetation can be further categorized by plant size, density, and age to evaluate the evenness component of diversity on a finer scale. These categories are referred to as habitat stages or successional stage diversity. Succession of tree habitats generally advances from seedlings through small trees, large trees, and in some cases, to two-storied canopies. Succession of shrub habitats similarly advances from seedlings through young shrubs and mature shrubs to decadent shrubs (if they are not disturbed). As the structure of vegetation types changes naturally or by human intervention, so do animal species

**Figure 3-9. Vegetation Types**



dependent on various successional stages. In forested habitat, some animal species favor young, early successional timber stands, while others prefer (and in some cases depend on) old-growth timber stands.

All successional stages of trees are found on the Forest. On > 20 timberlands, (Figure 3-10), over half the land has small- to medium-sized timber (successional stages 2 and 3). Only one-third of the forested lands has old, large-diameter trees (successional stage 4a, 4b/c, and 4b/c-older). Animals that favor young, small-diameter timber stands, therefore, are more abundant than species that prefer older stands. Similarly, animals that favor open-canopied stands are more abundant overall than animals favoring closed-canopied stands. On < 20 timberlands, open-canopied timber stands provide additional habitat in successional stages 3A and 4A.

The relative amount of shrub vegetation in various age classes is also an important aspect of habitat diversity. The Forest, however, lacks consistent age data on hardwoods, juniper, and shrubs. From field observation, these vegetation types are primarily in mature to decadent age classes.

## Pattern

The pattern aspect of diversity is difficult to quantify at the Forest level. Sagebrush, juniper and other rangeland vegetation dominate lower elevations of the Devil's Garden Plateau, an expansive lava plain located in the middle of the Forest. Covered with many rock fragments and low ridges of angular fragmented scabrock, the plateau is a monotony of sagebrush and juniper frequently interrupted with playa-like mudflats, meadows, and swamps. Eastside pine dominates sites with good drainage at slightly higher elevation.

Immediately west of the Devil's Garden the Medicine Lake Highlands demarcate the Forest's western boundary. The area dramatically contrasts with the open, flat rangelands of the Devil's Garden. The Highlands developed from a large shield volcano which erupted and subsided to form an elliptical caldera. A full spectrum of conifers is found here from lower elevation eastside pine, to higher elevation mixed conifer, white fir, red fir and lodgepole vegetation types. Red fir occurs only on this area of the Forest.

The Warner Mountains on the eastside of the Forest adds to the pattern aspect of the Forest's diversity. Timber stands are scattered because of the high degree of interspersed shallow and rocky soils and south- to south-west-facing slopes. Conifer types are eastside pine, white fir, mixed conifer and juniper. Well-represented and

distributed throughout the mountain range are aspen, willow, meadows, montane shrubs, sagebrush and other rangeland types.

The southern part of the Forest encompasses the Adin Mountains and a broad plateau with shallow canyons, known as Hayden Hill. On much of the land conifers are interspersed with rangeland vegetation. Major vegetation is juniper, eastside pine and mixed conifer. Unique to this area is black oak.

## Current Management

NFMA states that national forests will "provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives...." Furthermore, Forests should provide, where appropriate, "...for steps to be taken to preserve the diversity of tree species similar to that existing in the region controlled by the plan" (Section 6(g)(3)(B)).

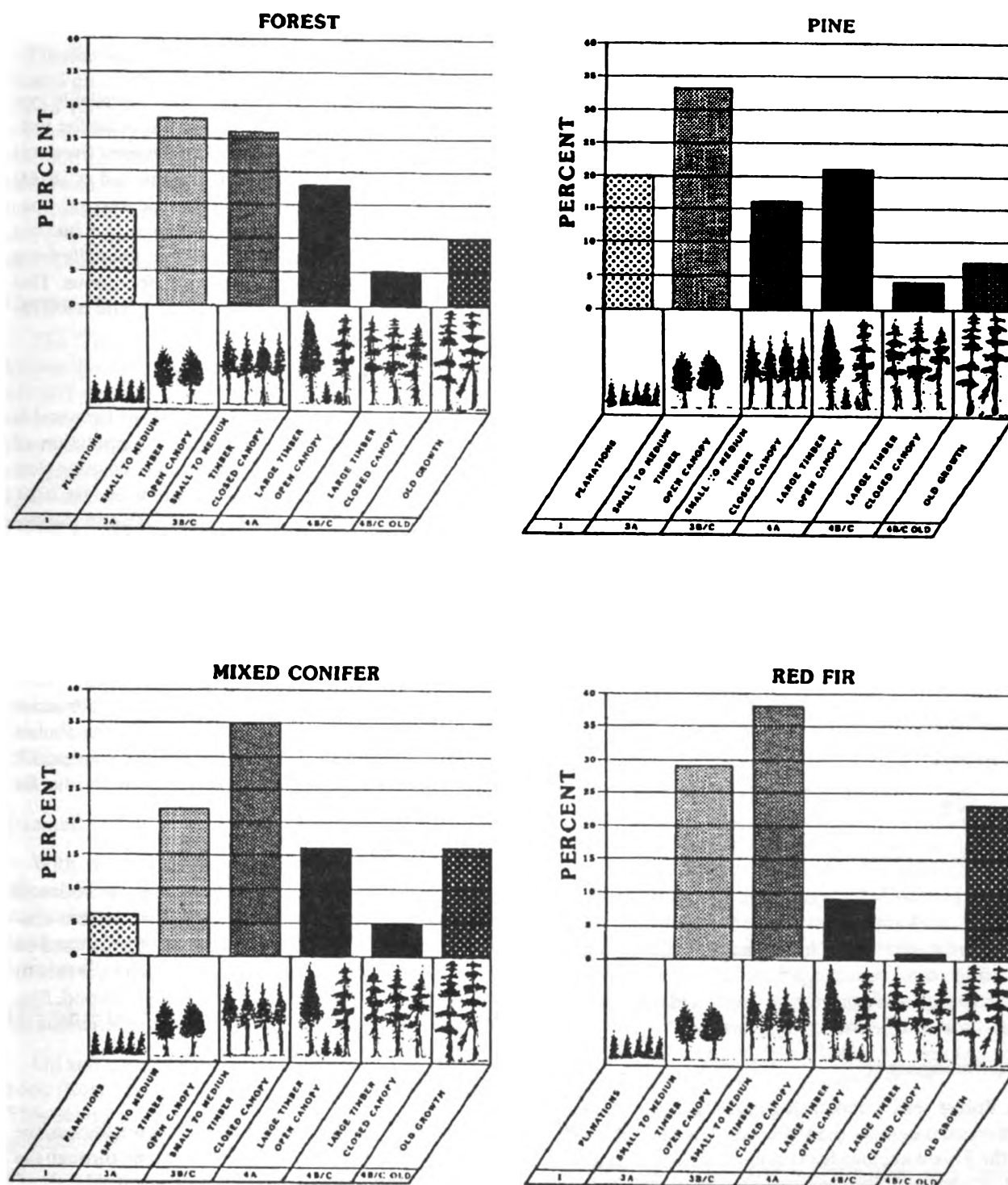
In response to NFMA and subsequent regulations, diversity requirements were issued as Regional policy in 1980 to "...maintain a minimum of 5% of the land area occupied in each forest type in older mature stands exclusive of wilderness...."

Managing forest successional stages complements managing for a regulated forest under even-aged timber management. Maintaining 5% of the area in the old-growth stage, however, is difficult and controversial. Particularly in the eastside pine type, remaining old-growth stands supply the only significant harvestable volume.

Since 1980, addressing diversity in timber sale environmental assessments has become more common. But the decision to fully provide for vegetative diversity is still difficult. In some cases, existing old-growth habitat is retained, while in other cases, recruitment acres in the next lower successional stage is used as a substitute. Efforts are improving.

Providing old-growth habitat in eastside pine is the Forest's most serious problem. Of the suitable timberlands producing > 20 cubic feet per acre growth, only 6% of eastside pine remains in old growth (Figure 3-10). The amount of old growth is low in the eastside pine for several reasons. In the mid-to-late 1970's pine sold at high prices; \$400 per MBF was common. In combination with easy access to pine stands, harvest was heavily concentrated in this type. Inappropriate use of overstory removal and sanitation/salvage treatments understocked many stands to where old-growth habitat was no longer present. Large fires also destroyed many eastside pine acres.

**Figure 3-10. Conifer Forest Successional Stages on > 20 Timberlands**



Mixed conifer and red fir still contain sufficient old growth (Figure 3-10), although distribution is inadequate in some parts of the Forest.

Fire suppression practices and livestock are primary factors which have reduced diversity in shrub communities. Under historic conditions, shrub communities were probably more a shrub/steppe type represented by light or moderate densities of shrubs, with perennial grasses and forbs in the understories. Wildfires would periodically reduce these to earlier seral stages and increase both spatial richness and plant species diversity.

Fire suppression and livestock grazing encourage shrub and juniper encroachment and reduce perennial herbaceous components of these types. In less than 150 years, these vegetation communities grew from predominantly shrub/steppe types with well-developed perennial understories to shrub- or juniper-dominated sites with poorly developed understories.

Land managers have not managed vegetation within these communities to counteract shrub and juniper invasion. One reason is the inability to predict results of habitat treatment. In favorable climatic years, desirable responses can be achieved by removing shrub overstory. However, in unfavorable climatic years, undesirable shrub species and annual exotics can invade treated areas. As a result, shrub communities show a continuing trend toward older, less productive seral stages, or are replaced by juniper.

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## 4. Energy

### Firewood

#### Introduction

This resource includes logging slash, sawmill and thinning residue, and non-industrial species of timber. Firewood is used primarily for home heating. It is typically harvested by commercial or private woodcutters, or removed from logging slash and cull decks, and is regulated through the issue of woodcutting permits.

#### Current Management

The Forest sells woodcutting permits to the highest bidders on sales of more than 25 cords. For sales of 10-25 cords, the Forest average for commercial sales of similar species is charged. Personal woodcutting permits are available for \$5/cord, and are sold in 2-10 cord lots. Free-use permits are offered to encourage woodcutters to use downed culls and limbs from logging and thinning operations. All permits specify the species of wood to be

cut and permissible cutting areas. Permits require woodcutters to check weather conditions (available on 24-hr recorded telephone messages) and to prevent fires and road damage. The Forest also uses permits to monitor firewood use. (See Firewood AMS.)

#### Supply

In total, 56,000 cords of firewood are available per year. Western juniper is the preferred species for firewood, easily accessible, and produces the most firewood in the area. Juniper reproduction is estimated at 18,000 cords per year. People who burn firewood also use ponderosa pine, red fir, white fir, lodgepole, and incense cedar. About 38,000 cords are available annually from logging slash and commercial thinning operations. This material will decay on the ground, however, and is worthless if not harvested within three years.

#### Demand

As the population increases, demand for firewood is also expected to increase. In 1980, the population of Modoc County was 8,600 people, and woodcutting permits were issued for 23,000 cords of firewood. By 2020, the population is expected to reach 13,000, and the demand for firewood could increase to 34,700 cords.

### Biomass

#### Introduction

Biomass is residue from logging and thinning operations. When biomass use is more economically attractive than purchasing an outside power source, the timber purchaser will usually chip it at the site and transport it to the sawmill. There it is burned with sawmill residue for power generation.

#### Current Management

The use of biomass has been left to the discretion of timber purchasers or thinning contractors. Where economically advantageous, biomass has been processed on the site and transported to cogeneration plants, presently located in Beiber, Burney, Wendell and Westwood. Biomass haul trucks are subject to the same restrictions as log or water trucks during timber sales.

#### Supply

While the future demand of biomass is not known, the present supply will meet anticipated demand through the planning period.

#### Demand

The cogeneration plants have a combined capacity to burn 435,000 tons of biomass per year. While this is



roughly equivalent to 400,000 cords, it also includes material not suitable for firewood.

## **Geothermal**

### **Introduction**

Geothermal energy is harnessed by tapping superheated ground water. This water provides steam which drives turbines, thus generating electrical power for transmission. This resource is found in some areas where volcanic activity exists. Two potential geothermal areas have been identified on the Modoc: Glass Mountain in the Medicine Lake Highlands, and Lake City on the east side of the north Warner Mountains. (See Minerals AMS and Minerals discussion below for detail.)

### **Current Management**

The Glass Mountain and Surprise Valley Lake City known geothermal resource areas (KGRAs) cover 151,000 acres. Surface effects of geothermal development are presently the responsibility of the Forest Service. Subsurface management falls under the jurisdiction of the Bureau of Land Management (BLM). As with hydroelectric projects, the Forest Service cooperates in mitigating surface disturbance of site development.

### **Supply**

The Glass Mountain site has had extensive exploration performed. As a result of this exploration the Glass Mountain KGRA has been declared suitable for geothermal development. Duration and volume of production is currently being determined. Little exploratory work has been done on Forest lands in the Lake City KGRA. (See Minerals AMS and Minerals discussion below for detail.).

### **Demand**

With the recent drop in oil prices, the search for alternative energy sources has slowed. However, as future energy demands and environmental concerns rise, geothermal energy undoubtedly will become a very attractive alternative.

## **Oil and Gas**

Oil and gas development means extracting hydrocarbons (liquid or gas form) beneath the earth's surface. This energy source is developed in a manner similar to geothermal energy.

### **Current Management**

Currently, one 7,700-acre oil and gas lease exists on the Forest. The Forest is currently supplementing the existing environmental assessment for oil and gas leasing

to include cumulative effects of commodity production. Five oil and gas leases totally approximately 28,000 acres are pending.

### **Supply**

Information estimating the volume of hydrocarbon reserves within Forest boundaries is not currently available.

### **Demand**

The Forest anticipates little or no demand for oil and gas.

## **Hydroelectric**

### **Introduction**

Hydroelectricity is produced by falling water. Typically, water is stored in a reservoir or transmitted in a canal to a location where the water drives a turbine generator.

### **Current Management**

No hydroelectric plants are currently in operation on the Forest. Applications for hydroelectric development are processed by the Federal Energy Regulatory Commission (FERC). The Forest Service provides FERC with measures to alleviate potential negative effects, issues use permits and rights-of-way for transmission lines, and conducts environmental analyses.

### **Supply**

Feasibility studies indicate potential for future development on Pine Creek, Parsnip Creek, and South Fork Pit River (West Valley Reservoir). Powerhouses could be developed at these locations which could produce energy totalling 31.1 million kw per year. Energy consulting firms suggested two powerhouses for the Pine Creek location: a 1,000 kw plant capable of 8.6 million kw per year, and a 900 kw plant for 7.7 million kw per year. A 2,100 kw powerhouse at Parsnip Creek would yield 8.3 million kw per year. Powerhouses of 360 kw and 620 kw each at South Fork Pit River (West Valley Reservoir) together would produce 6.5 million kw per year.

### **Demand**

With the recent drop in oil prices, the search for alternative energy sources has decreased. However, demand for small hydroelectric projects are expected to increase as the State's population increases and the price of energy rises.

## 5. Facilities

Facilities support Forest management activities such as timber production and harvest, wildlife and range management, fire protection, recreation, and administration. Forest facilities include roads, trails, major stream crossings, utility transmission lines, buildings, dams, electronic sites, and a military defense installation. Each type is discussed separately.

### Roads

Access to the Modoc National Forest is provided by a system of federal, state and county highways. Forest Development Roads (FDR) are extensions of these highways, and provide access to and mobility within the Forest. Roads allow protection, management, use, and development of Forest resources on which local communities are dependent.

The FDR System consists of 3,178.4 miles. Integrated with the system are 270.8 miles of private roads. Forest roads have three functional classifications—arterial, collector, and local—defined in Appendix G of the Forest Plan. Arterial and collector roads total 250 miles and 347 miles, respectively. Local roads make up the remainder of the system (Table 3-3).

**Table 3-3. Road Mileages.**

Functional Classification	FDR System	Private	Total
Arterial	250.0	0	250.0
Collector	347.0	10.7	357.7
Local	2,581.4	260.1	2,841.5
<b>Total Miles</b>	<b>3,178.4</b>	<b>270.8</b>	<b>3,449.2</b>

If the present arterial system is expanded in the north Warner Mountains, the Forest will be completely accessed. The collector road system is nearly complete, but some sections require reconstruction.

Approximately 50% of Forest timber lands are within one-half mile of a road. The average density of roads is about 1.3 miles per square mile on timber lands and 0.1 mile per square mile on range lands. Roads cover about 0.5% of the land base. While the number of roads on

range lands is adequate for range management, access to hunting, fishing and dispersed recreation sites are inconvenient and difficult for two-wheel drive vehicles.

The Forest maintains roads at the minimum level necessary for recreation, timber, administration, and adjacent area protection. Roads are assigned a management objective so they can be maintained at levels commensurate with these goals. Each road or segment receives one of five maintenance levels defined in Appendix G of the Forest Plan.

About 15% of the Forest roads should be maintained at Level 1. They would be closed for use by the Forest Service and the public except during emergencies and for specific resource activities. However, less than 5% of Level 1 roads are closed. Over the last few years, the Forest has reclassified many miles to maintenance Level 1 roads. Most of these roads will be allowed to revegetate naturally. Some will be utilized as haul roads during future timber sales and closed by the timber purchaser after use; others will be developed into higher level roads. Those causing resource damage will be obliterated or restored when watershed restoration funds are available.

Half of the system roads are Level 2 roads to which access is permitted in firewood areas and for project-related work, such as timber sales. Seasonal closure is encouraged. Roads in maintenance Levels 1 and 2 are inspected and drainages maintained. Road surface and user comfort are not criteria for maintaining this class of road.

Level 3 through 5 roads are used by the general public and comprise the remainder of the system. They are generally arterial and collector roads and certain local roads used for access to recreation sites and facilities. These roads are given priority for annual maintenance because of the higher traffic levels and the need to protect the investment in road surfacing materials.

In the past, the Forest attempted to seasonally close some roads by signing, but with marginal success. By using seasonal road closures and traffic control, road maintenance has improved. While the Forest recognizes the importance of keeping areas open to firewood gatherers and dispersed recreation users, it is also concerned about road and resource damage, as well as wildlife issues. A road closure and off-highway vehicle plan will be initiated.

Approximately 700 miles of uninventoried roads have been created over the years as vehicles imprint flat terrain in search of firewood, dispersed camping sites, or access to resources. In many cases, these roads are located in sensitive areas including meadows, along stream courses, geologically unstable areas, cultural resource areas,

within or close to wildlife habitat, or in visual corridors. Often these temporary roads serve no resource management purpose. Unneeded roads will be obliterated; all others will be included in the Forest Development Road system.

Two Modoc County roads which are major Forest arterials have been designated as Forest Highways in California:

- Jess Valley Road (Co. Road 64), 14.1 miles
- Crowder Flat Road (Co. Road 73), 30.8 miles

This designation permits the Federal Highway Administration to spend federal money to upgrade county roads and associated structures to required standards for removal of forest products, recreation and other purposes.

The Forest and county agencies cooperate through agreements and memoranda of understanding to ensure that design and maintenance standards match Forest use levels. Further, this Forest and other federal, state, and local government agencies, and private land owners have mutual interests in the current and future integrated transportation system. Continuous review and monitoring of coordination efforts with all agencies is a normal part of Forest management.

## Trails

The 118 miles of developed inventoried trails include 7 miles of National Recreation Trails, 79 miles of South Warner Wilderness Area trails, and 32 miles of other trails. In general, trails are maintained, but not all meet desired standards. Trails are discussed in the Recreation section of this chapter.

## Major Stream Crossings

The Forest has 14 road bridges, 5 trail bridges, and 63 other major structures consisting of culverts (> 35 sq. ft. end area), and low water crossings. All of the structures require maintenance to protect the investment, provide safe crossings, and protect fisheries.

Additionally, Modoc County has 9 bridges, 3 culverts, and 1 low-water crossing. The Forest has cooperative agreements with the County to upgrade or maintain these structures as needed for timber hauling. Two bridges under the jurisdiction of the Bureau of Reclamation are closed and beyond repair.

Most structures crossing major streams are in place and are maintained or replaced for traffic safety and

protection of the stream environment. Construction of additional stream crossings depends primarily on locations of future resource activities and their access needs.

## Utility Corridors

A north-south utility corridor on the Big Valley and Doublehead Ranger Districts contains 500-kv overhead power transmission lines and a buried natural gas transmission line. In 1990, an additional 500 KV transmission line will be constructed on the Big Valley and Doublehead Districts parallel to the existing corridor. In November 1984, the Bonneville Power Administration constructed an additional 230-kv transmission line from Malin, Oregon, to Alturas, California. Designed to meet increased electrical demands from agricultural pumping, the transmission line is approximately 68 miles long, 50 miles of which are within the Forest boundary. (See the Lands section of this chapter for more information.)

## Buildings

On the Forest's 16 administrative sites are 156 structures. The government leases four administrative sites from private parties: Supervisor's Office, Warner Mountain District Office, Doublehead District Office, and Highway 299 Compound (2 buildings). Leasing requires less initial capital investment, but significantly increases annual costs. Constructing Forest-owned buildings or purchasing leased buildings would offer long-term savings. To minimize costs, the Forest will move from leased to government-owned buildings by the end of the 1st decade.

Approximately 48% of the buildings are 40 years old or older; 35% are 20-40 years old; and 17% are less than 20 years old. Six percent of the Forest-owned structures are in good condition; 49% in fair condition; 11% in poor to fair condition, and 34% in poor condition. Maintenance costs will continue to increase as older structures deteriorate. Presently 26 residences and 4 barracks are located on Forest sites. The Forest has prepared a facilities master plan for long-range needs and development of facilities at administrative sites.

## Dams

One hundred forty-nine dams on the Forest were constructed for livestock, irrigation, and wildlife habitat reservoirs. One hundred twenty of these dams are owned by the Forest — 11 are covered by special use permits, and 18 are considered USDI easements. The Forest inspects

and maintains 127 dams; the State inspects 19; and the U.S. Dept. of Interior inspects the remaining 3.

Dams under national forest jurisdiction fall into 3 classifications (defined in Appendix G of the Forest Plan): B, C, and D. Nine dams are Class B, 51 are Class C, and 67 are Class D. Two dams have a high hazard potential, 11 have a moderate hazard potential, and the remainder present a low hazard (hazard levels defined in Appendix G of the Forest Plan).

Dam maintenance prevents damage to streams and downstream structures such as culverts and other dams. The risk to life is very low, but moderate environmental damage could result if a dam failed. However, existing dams must be routinely inspected and maintained to protect investments and the stream environment.

## Electronic Sites

Electronic sites serve the Forest's telecommunication needs and those of commercial users in the area. Of the 35 existing electronic sites on or adjacent to the Forest, 31 are service-type low power sites (150 watts or less), and 4 are future electronic sites (AM, FM, microwave, TV, or radar stations). The Forest currently uses 28 sites for its telecommunication system while sharing 9 sites with commercial users under special-use permits.

The Forest has designated electronic sites for its own use on Grouse Mountain, Payne Peak, Sugar Hill, and Red Shale Butte to accommodate a Forest microwave communication system.

Demand for service-type and broadcast station sites (AM, FM, TV, and radar stations) will increase. Because telecommunications companies, such as AT&T, MCI and SPRINT, are expanding their services, the Forest anticipates an increased demand for microwave electronic sites.

## Military Defense Installation

Under special use permit, the U.S. Air Force constructed an Over-the-Horizon-Backscatter (OTHB/S) defense radar site on the Doublehead Ranger District near Rimrock Lake which is south of Clear Lake. The radar system detects missiles and aircraft 1,500 miles from the site.

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# 6. Fire and Fuels

## Fire History

The average number of annual recorded fires on the Forest has not changed significantly. From 1910 to 1979, more than 6,094 fires burned 705,334 acres of Forest. Twenty-three percent of these fires were caused by people, and 77% were started by lightning. In the last 25 years, the number of human-caused fires has decreased dramatically as a result of intensive public education programs, especially the Smokey Bear prevention effort.

Acreage burned has varied widely. From 1910 through 1969, an average of 9,607 acres burned annually. From 1970 through 1979, the average number of acres burned rose to 12,890, while the average annual acres burned decreased to 1,393 from 1980 to 1985. Cooler, moister weather than normal, as well as fewer lightning-caused fires, account for the dramatic drop in burned acres.

In 1977, a severe drought in the western United States set the stage for many holocausts which raged out of control in several areas of California. At this time, dry lightning bombarded the Modoc National Forest, starting numerous small fires which burned together causing large fires, notably the Gerig and Scarface Fires. Over 100,000 acres burned that year. Unusually large fires in 1973 and 1978 added many acres to the Forest's annual average number of acres burned.

The value of resources lost to fire during the 1970's averaged \$2.1 million per year. Since 1975, timber volumes requiring salvage because of fire totalled 159 MMBF. Of this total, approximately 128 MMBF resulted from the Gerig and Scarface fires. Fire salvage volume from those fires represent about 25% of the programmed allowable harvest for the past decade.

## Current Management

The objective of fire management is to administer a program that is cost efficient commensurate with the values at risk. Although protection budgets have decreased since 1979 (from an average of \$1,700,000 annually to less than \$800,000), management emphasis remains constant. Most of the fire budget is allocated to attack, and the remainder (in descending order) to prevention, detection, fuels treatment, and air operations. Air operations were disbanded in 1981. To offset reduced funding, the Forest is working toward the "closest appropriate forces" concept, which means dispatching the ap-

propriate suppression forces closest to a fire, regardless of the controlling agency.

The elements of fire management are prevention, detection, suppression, and fuels management.

**Prevention** – Prevention includes public contacts, law enforcement, building inspection, and patrols. Prevention has a low priority because the Forest averages 100 lightning fires and 15 person-caused fires annually.

**Detection** – Lookouts from the Forest Service and other agencies provide detection coverage. After lightning storms, Forest personnel conduct reconnaissance flights over areas which lookouts are unable to see.

**Suppression** – Suppression includes the customary firefighting activities with hand crews, engines, helitack, and retardant aircraft. With its own suppression forces, the Forest cooperates with the California Department of Forestry (CDF), Bureau of Land Management (BLM), Lava Beds National Monument (LBNM), and the Fish and Wildlife Service (FWS) to protect mutual boundaries for cost efficient fire suppression. In addition, local rural fire departments protect structures on some federal and State lands. Altogether, the Forest is responsible for protecting 1,805,069 acres.

**Big Sage Fire Management Unit (BSFMU)** – In 1980, the Forest developed the BSFMU. This 430,000-acre area on the Devil's Garden and Doublehead Ranger Districts is designed to save suppression costs and personnel for fires which threaten higher resource values.

Vegetation in the BSFMU is so sparse and the ground so rocky that fire does not easily spread, even under dry, windy conditions. Most fires in the BSFMU involve single juniper trees. The fire plan for the Unit allows lightning-caused fires to burn under a *confine, contain and control* strategy. In addition to suppression costs, fires in the BSFMU have eliminated encroaching juniper trees.

**Wilderness Fire Suppression** – Terrain, elevation, open vegetation patterns, and natural barriers are generally favorable to fire control. Currently, Forest policy requires immediate and aggressive suppression of all fires, regardless of location or cause. Where used, firelines are constructed without the use of mechanized equipment, unless the fire crosses firelines. At that time the Forest Supervisor may authorize the use of helicopters, chainsaws, and air tankers (retardant). The Regional Forester can approve the use of tractors. A recent amendment to fire management permits lightning-caused fires to play, as nearly as possible, their natural ecological role in wilderness. This direction may be included in the Wilderness Implementation Plan which will be prepared after the Forest Plan is approved.

**Fuels Management** – Because of an aggressive suppression policy to extinguish all fires, much fuel has accumulated on the Forest floor. Activity fuels are created primarily from timber harvest or precommercial thinning. Natural fuels include grass, brush, downed dead limbs, needles, and leaves. Prescribed fire is an important fuels management tool for reducing hazards from fuel accumulations, improving wildlife habitat and range conditions, controlling undesirable vegetation, and improving seedbeds for natural regeneration. Fuel treatments are planned and paid for by the activity creating the fuel.

The Forest treats about 5,100 acres of accumulated fuels each year. Of those acres, 4,800 are timber activity fuels, 250 are fire-related, and 50 are from other activities. Most fuels are treated by non-burning methods, such as crushing, cutting into short pieces, removing for firewood, or lopping and scattering.

## Future Fire Conditions and Opportunities

Only a slight increase in human-caused fires is expected because of increased public awareness and an historically low incidence of person-caused fires on the Forest. The historical trend of lightning-caused fires will probably continue with implications for future management problems if the current fire program is not maintained. Plantations established after large fires in the late 1970's represent a significant investment in dollars and future supply of timber. Fires in plantations burn through the crowns of young trees, producing fast-moving, high-intensity fires which are difficult to control. Even low-intensity fire causes significant damage to young trees. Combined with greater emphasis on even-aged timber management in the future, more acres of fire-susceptible plantations will pose serious protection problems for the Forest.

As stands on steeper terrain are harvested and more short-span cable loggings is undertaken, block burning will be a common fuel treatment. Block burning is technically and logistically demanding, and suitable burning days are limited. Yarding small fuels is an alternative to burning. As industry's demand for forest fuels as an energy source increases, use of timber slash for energy production would offer a significant cost savings for fuel treatment.

To better use fire as a resource tool, fire suppression strategies could be based on the objectives of each management area. Permitting unplanned ignitions to burn in the South Warner Wilderness above 8,000 feet could allow fire to fulfill its role in perpetuating natural ecosystems. Other management areas can also be evaluated for use of unplanned ignitions.

Forest managers could encourage firewood users to remove logging slash which would reduce the fire hazard from accumulated fuels. Prescribed burning could also be used more often to reduce fuels as well as to remove encroaching species from rangelands and limit competition for grasses and forbs. In this way, range ecological condition would improve.

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## 7. Firewood

### Supply

The major sources of firewood on the Forest are juniper woodlands and logging slash. Of the 1.6 million acres on the Forest, western juniper covers approximately 469,000 acres (29%). The largest single area of western juniper is found on the Devil's Garden and eastern portion of the Doublehead Ranger Districts. An additional 616,000 acres of the Forest have stands of commercial tree species (such as eastside pine, white fir, and incense-cedar) which produce potential firewood in the form of limbs and cull logs.

The growth rate of western juniper is more than double the current demand. Less than 3,300 acres will be cut each year, because the acres selected for harvest will have higher volumes per acre than the 2.74 cords per acre average from the total Forest inventory. Estimates show that annual growth would permit removal of 18,760 cords of western juniper if all areas were accessible for harvest, and trees with diameters up to six inches were used.

Limitations on the supply of western juniper include thermal and hiding cover requirements for deer, cutting patterns, visual quality considerations and cultural resource protection. Access is another limitation, but difficult to assess because no data exists to determine accessibility to juniper woodlands on the Forest.

Based on assumptions in the Firewood AMS, logging and thinning slash (merchantable and unmerchantable trees) can create about 6.3 cords per acre. Depending on the number of acres harvested, as many as 38,000 cords could be produced. Not all firewood from commercial sales can or will be used because of vehicle access problems, small material, and undesirable species.

In addition to projected annual supply, the Forest has a large backlog of logging and thinning slash which degrades rapidly. Other sources of firewood are on lands administered by the Bureau of Land Management (BLM), private industrial lands, and private non-indus-

trial lands (primarily ranches). BLM and Forest firewood management is coordinated to the extent possible.

A total potential supply of 56,760 cords of firewood from all sources on the Forest (Figure 3-11) is an estimate based on assumptions in the AMS. Actual cordwood volume produced depends on acres harvested and fuel treatments prescribed.

### Demand

Forest-wide, woodcutters prefer juniper for firewood, with eastside pine logging slash of secondary importance. Since 1974, demand for free use permits increased from about 800 permits (3,808 cords) to 2,213 permits (22,822 cords) in 1980. The amount actually removed is unknown.

The personal use charge program began in 1983. Its effect is assumed to be negligible. In that year, over 18,000 cords of personal use (26%), free-use (57%), and commercial use (17%) firewood, were removed from the Forest. Most firewood comes from the Devil's Garden and Doublehead Ranger Districts.

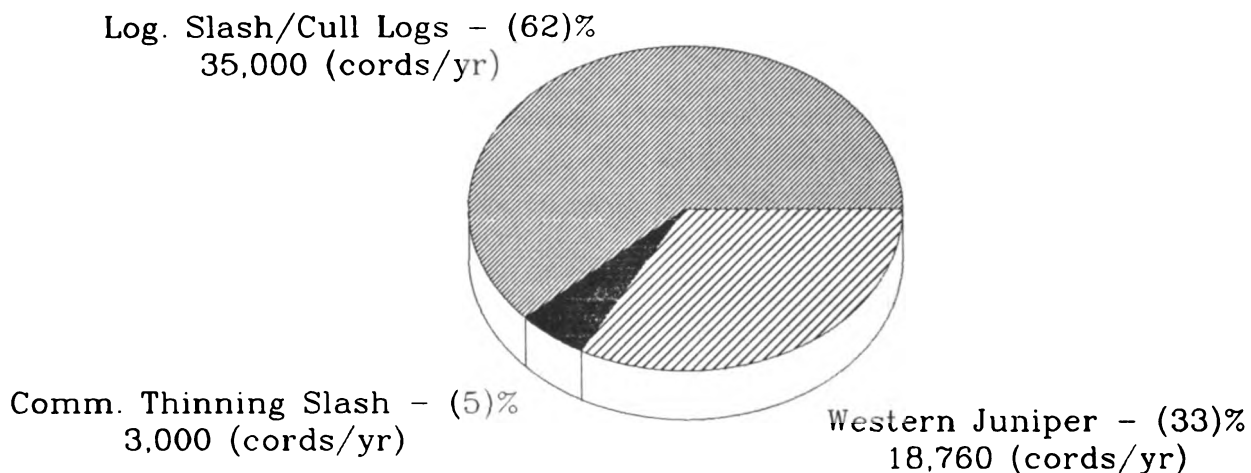
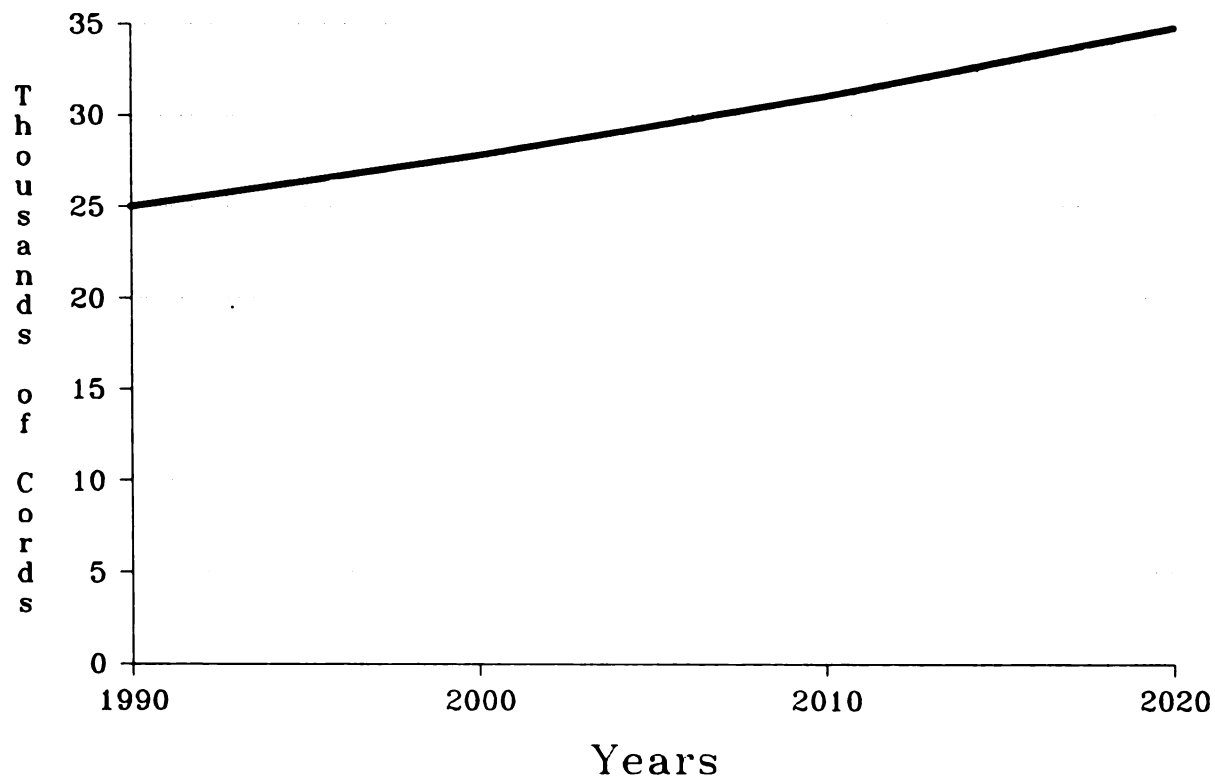
As the population increases, demand for firewood is also expected to increase. In 1980, the population of Modoc County was 8,600 people, and woodcutting permits were issued for 23,000 cords of firewood. By 2020, the population is expected to reach 13,000, and the demand for firewood could increase to 34,700 cords (Figure 3-12).

Demands for biomass for industrial plants cannot be predicted because actual use depends on the cost of producing biomass fuel, a fact presently unknown.

### Current Management and Concerns

Because most local residents use wood stoves to heat their homes, they are very interested in the firewood supply and policies governing its home use. Forest Service policy (FSM 2462.1 and FSM 2430) requires a nominal charge for most personal use firewood. The objectives are to make firewood available to as many individuals as practical and to provide an opportunity for utilization of material which might otherwise go unused.

All firewood for personal use, except logging and thinning slash, costs \$5.00 per cord. To encourage people to collect dead and down limb and bodywood, the Forest also issues free use permits for up to ten cords of logging or thinning slash per household. The more debris that is hauled away by the public, the less money the Forest spends on treating the debris by crushing and compacting. In addition to saving money, public collection of

**Figure 3-11. Potential Firewood Supply****Figure 3-12. Projected Demand for Personal Use Firewood, 1990-2020**

logging slash improves the appearance of the Forest and reduces fire hazards.

Commercial firewood sales are offered routinely to provide local employment opportunities, meet firewood demand, and accomplish land management objectives such as rangeland improvement.

Within the general Forest policy, each ranger district varies its implementation to address the concerns of the public and Forest managers.

- Some personal users feel that the firewood supply is limited. This perception stems from (1) personal preference for particular types and species of firewood; (2) recent increase in firewood use which resulted in heavy cutting near various communities; and (3) increasing distances traveled from community centers for the preferred firewood. However, when considering all types and species of firewood, including commercial slash, the firewood inventory has continued to accumulate.
- Personal use woodcutters are concerned that supplies in favorite cutting areas will be depleted by commercial woodcutters with whom they compete.
- Protecting roads and assuring compliance with woodcutting permit requirements are the main law enforcement concerns to the Forest. Associated with these concerns are enforcing the no snag cutting policy, preventing damage to government property (range fences, gates and signs), and protecting cultural resource sites.
- Slash disposal is a concern in minimizing risk of fire intensity and spread. Increased firewood cutting and the resultant slash has heightened the risk of fire in some areas.
- Opening large areas to personal use woodcutting adversely affects some species by gradually eliminating large, older trees and reducing stand density.
- Range managers are concerned that much of the juniper now present invaded formerly open grass and sagebrush lands. Generally, juniper removal has had either neutral or positive effects on range management because additional forage is usually produced after the tree canopy is removed.

## Opportunities

Because current growth of juniper exceeds demand, opportunities exist to create new markets for firewood. To help reduce accumulated logging slash, the public could be encouraged to use it as a firewood source. Data on growth and yield of juniper lands would provide more accurate assessments of current and future supplies.

Clearing more juniper woodlands would improve forage for both livestock and wildlife. More data is needed to determine (1) the relationship between thermal and hiding cover and deer forage, and (2) the effects of juniper cutting patterns on diversity.

Firewood cutting requirements could be simplified, and the objectives of the program better explained to the general public.

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## 8. Geology

### Seismic Hazards

Although the Modoc National Forest is not situated in an area of high seismic activity, numerous active and inactive faults lie within the boundaries of or near the Forest. Surprise Valley Fault, a normal fault, is one of two major faults which have affected the geomorphology of the Forest. There has been an estimated 5,000 feet of vertical displacement along this fault which is located on the eastern slopes of the Warner Mountain Range. The Likely Fault, the second major fault, is also a dip-slip movement fault from Howard's Gulch southeastward toward the Madeline Plains (Potter, 1988).

If a major earthquake (e.g., a seismic event with a magnitude of 5.0 or greater on the Richter scale) were to occur on Forest lands, the estimated amount of overall damage would be minimal. Minor slope movement on the east side of the Warner Mountains, as well as some liquefaction in isolated basins, would occur. Both phenomena would occur only if the epicenter was situated in or near either location.

The Forest geologic resource inventory of potential seismic hazard areas has not been developed. However, ground motion or rupture would probably be the most catastrophic events in a major earthquake. Either event could cause structural damage to bridges, dams, roads, gas lines, power lines, and buildings; flood or fire damage; loss of electric or gas power; or impair travel. In addition, localized landslides or talus movements may



occur as a result of an earthquake. Death or injury is likely if occupied structures collapsed.

To minimize hazards associated with seismic activity, the Forest constructs permanent facilities away from active fault traces. During the planning phase of a project, the Forest will use the following opportunities summarized from Guidelines to Geologic/Seismic Reports No. 37 by the California Division of Mines and Geology:

- Establish the proximity of the site to known faults and epicenters.
- Review geologic conditions at or near the site that might indicate recent fault or seismic activity.
- After accumulating all data, determine potential hazards relative to the intended land use or development.

## Volcanic Hazards

Geologically, the Forest is composed predominantly of volcanic and associated sedimentary formations. Some volcanic material is less than 500 years old. In particular, the Medicine Lake Highlands in the northwest portion of the Forest has had at least three eruptive cycles in the last 1500 years. The Highlands is a very broad shield cone in which the main vent has collapsed to form the present caldera. On the flanks of the volcano there are numerous parasitic cones and recent lava flows. The United States Geological Survey (USGS) has identified the Highlands as one of the four most probable sites in California where a volcanic eruption may occur.

As a result of a recent increase in numerous small-magnitude and shallow-depth earthquakes, the USGS has indicated that molten material may be rising to the surface. That agency installed a series of monitoring stations able to detect even slight ground movement. Recently, the amount and frequency of seismic activity has decreased.

The USGS indicates that an eruption of the Highlands would be similar to previous eruptions—comparatively non-catastrophic. Based on that assumption, some general hazards associated with such an eruption can be predicted. From a geologic perspective, the eruption would not be violent, but accompanied by gases and deposits of ash, pumice and cinders. Because of prevailing southwest winds, the deposits would probably fall near the Lava Beds National Monument. The amount of deposit could be 20-50 feet deep, depending on the distance from the source. Surface flows of hot molten lava and mud would not be extensive. As mud flows are ejected from a volcano, they pick up more water as they

melt snow, slide through lakes, and eventually flow down existing drainages. Mud flows occurring as a result of an eruption in the Highlands would not be extensive because few drainages exist in the area.

Currently, no formalized multi-agency emergency response plans associated with a volcanic eruption at Medicine Lake Highlands exist. If an eruption were to occur, the USGS would be the lead agency and would establish all potential hazard zones. The Forest Service would support the USGS by providing facilities, communications, vehicles, and personnel assistance. The Forest could restrict public access, inform the public through the media, and establish an emergency administrative center.

## Landslide Hazards

Eighty-five percent of the Forest has a low-risk of slope movement, because of gentle slopes (less than 30%), stable parent material (volcanic bedrock), and a preponderance of cohesive soils. The remaining 15% has high risk slope movement. Areas of high risk are located on the eastern slopes of the Warner Mountain Range. The Forest Geologic Resource Inventory (GRI), scheduled for completion in FY 1992, will identify these high-risk areas.

Because the risk of a landslide is low for most of the land, little monitoring is done. When slope failures do occur, prudent ground operations can virtually eliminate all adverse effects of slope movement. For areas with a high potential for landslides, a site-specific inventory will be completed during the project planning phase of a specific proposal. The inventory will accurately delineate potential areas of mass wasting and identify means to reduce potential impacts.

If mass land movement occurred, associated resource damage would be expected. A landslide would degrade the water quality of adjacent streams, and timberland would be lost. The most costly effect would be loss of roads, which would temporarily prevent access to the slide area.

## Special Interest Areas

Modoc National Forest has set aside Burnt Lava Flow, Medicine Lake Glass Flow, and Glass Mountain Glass Flow as three Geological Special Interest Areas to preserve their undisturbed condition while providing educational, scientific, and recreational opportunities. These areas are discussed in the *Special Interest Areas* section of this chapter.

## Groundwater

Within or adjacent to the Forest boundary, the Forest has mapped 20 groundwater basins or recharge areas. As a result of management activities, either the quantity of water being recharged into the groundwater or the quantity and quality of groundwater being withdrawn in the groundwater basins may be adversely impacted. The Forest reviews each management proposal to determine if it could significantly impact the quantity or quality of the groundwater. Currently, the Forest does not have an overall groundwater management plan. However, if management activities or natural events were to adversely impact groundwater, the Forest would develop a plan.

Aquifers (underground areas saturated with water) are generally more than 300 feet deep. Each groundwatershed has its own recharge area and basin. The Forest has 53 groundwater withdrawal sites comprised of 36 deep-water vertical wells and 17 horizontal, gravity wells. Water from these wells supports logging activities, road construction, and livestock. The Forest is developing a management scheme for well sites which will address user cost, unit responsibilities and future needs.

Prior to groundwater development, each proposed location is examined for the geological suitability and overall economic feasibility to develop at the site. The geological work includes field mapping, geophysical testing where appropriate, and test drilling, while the economic analysis includes cost of transporting water to the desired location and total development cost.

The Forest currently uses about 30 acre-feet of water per year for human needs, fire suppression, livestock, and road construction. As interest in geothermal development increases, so does the use of groundwater for exploratory activities.

Forest Service activities that could effect groundwater quality and quantity include removing large volumes of timber, withdrawing groundwater in the recharge areas, and using chemical pollutants.

If the amount of groundwater recharge is not drastically reduced due to climatic changes, the existing groundwater should meet the needs of the Forest. The cost to access the water will be high because most of the withdrawal basins are more than 300 feet deep. Forest Service activities probably will not adversely affect groundwater withdrawal points outside Forest boundaries, because Forest Service use is minimal compared to the total groundwater available.

If geothermal exploratory work continues at its present pace, current water sources within these areas will not adequately supply the needs for exploration. The Forest will require monitoring new sources of groundwater.

## Rock and Earth Construction Materials

The Forest's road aggregate program locates and develops new quarries within its boundaries, and monitors and re-evaluates existing quarries. (See Minerals section for a discussion of the sale of these materials to federal and state government agencies and to the public.) Seventeen active rock quarries totalling over three million tons exist on the Forest. In addition to these sites, the Forest uses pit run materials such as gravel and cinders. While they do not have the durability of crushed aggregate, there is generally no crushing cost. Twelve cinder sites and one gravel site, totalling an additional one million tons of rock material, are available to the Forest. Tonnage available at each site varies because of quality and resource mitigating measures, such as visual and wildlife considerations.

Each year the Forest extracts an average of 15,000 tons of fill for road construction, and another 200-500 tons of rip-rap material for erosion protection on waterfowl nesting islands. Total annual use is less than 0.4% of the current supply of rock and pit run materials. Because of budget restrictions on road surface aggregate, and because the arterial-collector road system is near completion, the Forest will not require as much aggregate in the future. However, the Forest continues to surface and maintain roads, and protect resources in unstable land areas with aggregate materials.

As additional needs for rock and earth construction materials arise, the Forest has the opportunity to examine the economic benefits of using materials found in one source over another and to develop various methods of road surface replacement. The Forest can also analyze the effects of developing new sources of construction materials.

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## 9. Lands

### Land Ownership

The Modoc National Forest is situated in the extreme northeastern portion of California. It encompasses 1,979,407 acres (Land Status 6/89) — 1,654,392 acres National Forest System lands and 325,015 acres private lands. Of the Forest lands, 2,762 acres are administered

by other public agencies. The Lava Beds National Monument (administered by the National Park Service (NPS) but on national forest land) totals an additional 46,238 acres. The Forest lies within three counties: Siskiyou (8%), Lassen (9%), and Modoc (83%).

There are four administrative ranger districts on the Forest:

Warner Mountain	335,090	Acres
Devil's Garden	541,575	Acres
Doublehead	469,004	Acres
Big Valley	308,723	Acres

The majority of the Modoc National Forest land base is under Forest Service administration; however, parcels of State, other federal, and privately owned agricultural lands are scattered throughout the Forest. These parcels range from 5 acres to over 3,000 acres. Timber companies own relatively large blocks of land within the Forest boundary, primarily northwest and south of Adin on the Big Valley Ranger District, and in a large block of land adjacent to the Oregon border on the Devil's Garden Ranger District. A subdivision sprawls southwest of Alturas, partly within the Forest boundary on the Big Valley Ranger District. Jess Valley, a large block of privately owned agriculture lands, lies adjacent to the South Warner Wilderness.

Indian Trust lands under the jurisdiction of the Bureau of Indian Affairs are the only other federal lands within the Forest boundary. The State of California owns or controls various lands throughout the Forest including easements for highway corridors and "school lands", and restricts hunting in three State game refuges.

Landownership adjustments on the Forest are guided by a Landownership Adjustment Plan which gives broad direction on the types of land to be acquired and the areas in which land should be acquired. The emphasis is on acquisition, with only general direction on disposal. The 1988 Plan assumes that exchange will be the method of adjustment. Future land adjustments will be guided by direction in the Forest Plan.

## Adjacent Lands

The Forest is adjacent to four other national forests (Figure 3-13): Shasta-Trinity and Klamath to the west, Fremont to the north in Oregon, and Lassen to the south. The forests share administrative duties along common boundaries. The Lassen administers a small portion of

the Modoc and Shasta-Trinity in the Whitehorse area. The Modoc also shares allotment management with the Shasta-Trinity and Fremont.

On the east and south, the Forest is bounded by the Susanville District of the Bureau of Land Management (BLM) with which it collaborates closely on shared projects. Both agencies have coordinated such efforts as grazing allotment management, wild horse and burro gathering, fire protection, and firewood programs.

The Clear Lake, Lower Klamath and Tulelake National Wildlife Refuges, administered by the USDI Fish and Wildlife Service, and Clear Lake Reservoir, administered by the Bureau of Reclamation, are other federal lands all adjacent to the boundary in the northwestern portion of the Forest.

Whether management objectives between the Forest and agencies administering adjoining public land are compatible determines the degree of contrasting management. Management objectives for timberlands and rangelands administered by BLM, the State, and USFWS are similar to those held by the Forest Service.

On the other hand, the NPS generally focuses its management on maintenance and protection of the existing environment for recreation, to the exclusion of resource development. Because the Forest encourages resource development, shared boundaries at the Lava Beds National Monument could create conflict with management objectives.

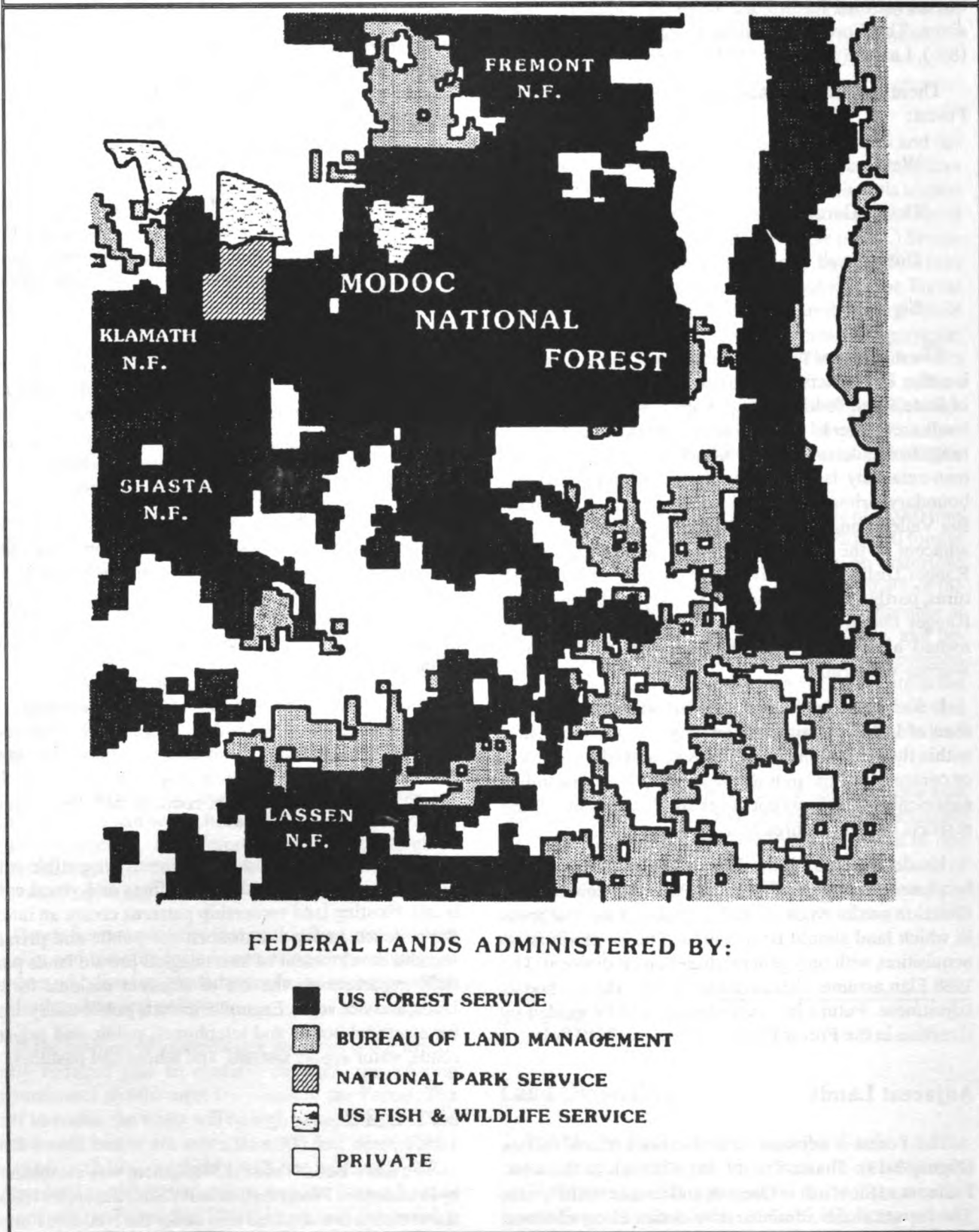
Numerous opportunities exist to coordinate management of lands along boundaries shared with other federal, State, and local agencies. By harmonizing land management objectives during project development, the Forest can reduce or prevent conflicts with these agencies.

Managing Forest land in a manner compatible with adjacent private land reduces conflicts and visual contrasts. Existing land ownership patterns create an interdependence among the owners: the public and private use and development of intermingled private lands partially predetermine the use of adjacent national forest lands, and vice versa. Examples include public utility lines for electrical power and telephones, public and private roads, water supply systems, and fences and pastures.

## NPS-USFS

The Lava Beds National Monument was established by Presidential Proclamation in 1925. Its dual reservation status means that the land falls under the National Forest System but is administered by the National Park Service.

Figure 3-13. Adjacent Lands



The Proclamation directs that rules and regulations governing National Park System lands shall take precedent over those by which National Forest System lands are administered.

Since the original Proclamation, each agency's legal advisors have issued opinions regarding its interpretation. While the NPS believes the Monument is under its sole jurisdiction, the USFS maintains that national forest boundaries can only be adjusted by Congress. Therefore, the lands remain under USFS jurisdiction.

Regardless of interpretation, the Modoc National Forest and Lava Beds National Monument coordinate activities such as fire suppression, recreation development and transportation systems, to ensure that the lands are managed according to the intentions of the original Proclamation.

## Special Uses

The Forest has issued approximately 218 special use permits (affecting 26,082 acres) primarily for utilities, communications, water (such as dams and diversion ditches), transportation, and agriculture (Table 3-4).

## Utility Corridor

The Modoc NF is geographically an essential link between the power generation sources of the Pacific Northwest and the user areas of central and southern California. Currently, two 500kv transmission lines transect the Forest; they are commonly called the Pacific Northwest intertie lines. In addition, the Regional Forester has approved construction of a third intertie line known as the California-Oregon Transmission Project (COTP). The new line constructed west of the present lines. COTP participants are particularly concerned about the nearness of its line to the existing lines: a three-line power failure could result from a single catastrophic event such as a wildfire. In cooperation with the proponents of COTP, the Forest Service is developing strategies to minimize the potential for such an event.

In addition to electric overhead transmission lines, a natural gas line is buried near them. Pacific Gas and Electric (PG&E) has proposed another gas line for construction along the same easement.

In managing Forest activities near the utility corridor, the Forest coordinates with the respective federal or private utility managers to ensure that Forest activities

**Table 3-4. Categorical Summary of Special Uses, Easements, and Licenses Granted for the Use of Modoc National Forest**

Kind of Use	Total Cases	Total Uses	Total Miles (Right-of-Way Length)	Permitted Area Total Acres
100 Recreation Uses	10	10	0.0	36.7
200 Agriculture Uses	37	38	22.5	6,584.6
300 Community Uses	2	2	0.0	3.9
500 Public Information Uses	2	2	0.0	.2
600 Research, Study, and Training Uses	4	4	0.0	19.8
700 Transportation Uses	45	45	233.6	4,175.9
800 Utilities and Communications Uses	61	63	196.7	4,905.0
900 Water uses	57	57	32.6	13,820.5
<b>Total</b>	<b>218</b>	<b>221</b>	<b>485.4</b>	<b>26,082.4</b>

Source: 1983 Land Use Report

will not conflict with the intended permitted use and management of the utility corridor.

The Federal Land Policy and Management Act of 1976 (FLPMA) directs the Forest to minimize proliferation of separate utility corridors by confining future needs to existing corridors. However, the Forest Service will consider construction of new corridors outside existing utility rights-of-way if technology, safety, national and state practices, engineering, or environmental quality precludes coexisting uses.

## **Electronic Sites**

Electronic sites are used for transmitting and receiving information, and are typically located on mountain tops. Currently the Forest administers 30 electronic use permits. Use ranges from local (e.g., televisions clubs, county Sheriff, school districts) to national and international needs (e.g., MCI, AT&T, and PG&E). In addition, the Forest uses the same mountain tops for its communication needs (see Facilities section in this chapter).

As with utility corridors, the Forest limits proliferation of electronic uses on mountain tops. Forest Plan Appendix U lists the Regional Forester's designated and the Forest's recommended electronic sites. After the Regional Forester makes a designation, the Forest develops a management plan for the specific site, identifying compatible uses on and managerial responsibility for the mountain top. Future uses of the site must comply with the electronic plan.

In addition to mountain-top electronic sites, the Forest has issued a permit to the United States Air Force for an electronic radar receiver site located on the Doublehead Ranger District.

The Forest coordinates all its management activities with permitted electronic site users to ensure that activities will not interfere with electronic uses in the area.

## **Withdrawals**

Various acts of Congress and Executive Orders authorize the Forest Service to withdraw land from mineral entry. Currently, 22,211 acres of Forest land are withdrawn for administrative or recreation sites, scenic roadways, special interest areas, research natural areas, and water development (Bureau of Reclamation projects).

The California Wilderness Act of 1984 increased the total South Warner Wilderness to approximately 70,385 acres. These areas are also withdrawn from mineral entry.

In addition to mineral entry withdrawal, lands may be withdrawn for specific purposes including power and reservoir projects and known geothermal resource area (KGRA) development. Currently, the Forest has withdrawn 50,600 acres of KGRAs and 3,464 acres of power-line rights-of-way lands.

P.L. 94-579 (section 204) directs that withdrawals will be reviewed to determine their need and duration by October 1991. As a result of the review, the Forest has recommended revoking 1,287 acres from mineral withdrawal (Appendix H).

In accordance with 43 CFR 2300, Forest lands could be withdrawn in the future to protect five electronic sites, nine recreation sites, and three special interest areas (Appendix H).

## **Landline Surveys**

As of 1983, 122 miles of Forest property line have been surveyed and marked; 1,755 miles still must be located. Of these, 658 miles of line are not cost effective survey; or lie adjacent to lands administered by other government agencies, along wilderness boundaries, or in areas where trespass is unlikely. This leaves 1,097 miles of line to survey.

Meeting the Resources Planning Act (RPA) goal of completing all landline surveys by the year 2020 is a Forest concern. The goal could be met if the Forest surveyed 45 miles of line and monumented 180 corners per year, a figure more than double the average survey program that has been funded in the last five years.

## **Rights-of-Way**

The transportation system for the Forest is essentially complete. No major new routes are known or planned. Right-of-way acquisitions will be programmed for individual timber sales or other projects as needed. As of 1989, the Forest needed to acquire an additional 100 miles of rights-of-way so that the existing transportation system would fall under Forest Service jurisdiction. No public concerns have been identified, and none are anticipated.

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## 10. Law Enforcement

### Introduction

The Forest is a land management agency with law enforcement responsibility authorized by the United State Code (USC) Title 16. The emphasis of law enforcement is preventing violations and protecting Forest users, employees, resources, and facilities. If employees or the general public do not comply with laws and regulations, lives may be threatened, resources damaged, or Forest work targets not completed. For example, human-caused or arson fires threaten all these values.

### Current Management

Protection is provided through federal laws and regulations. The Forest Service enforces federal laws contained in Titles 7, 16, 18, and 21 of the USC, and Title 36 of the Code of Federal Regulations. Various State laws pertaining to fire prevention, wildlife and stock are also enforced. The Regional Forester and Forest Supervisors may issue special orders in their respective areas of jurisdiction to address particular situations such as seasonal fire use regulations, road closures, and public health and safety concerns.

The Forest's major law enforcement problems are theft of timber, primarily firewood; cultural resource depredation; clandestine drug manufacturing; wildlife violations; vandalism to and theft of property; and human-caused and arson fires.

Law enforcement activities include prevention, protection, investigation, and cooperation.

**Prevention**—By informing the public and employees of laws, rules, and regulations, the Forest can avoid prosecuting potential offenders. Education before a violation and publicity after it can be strong deterrents.

**Protection**—Protection means ensuring a safe environment for the public, employees, natural resources, and government facilities and property.

**Investigation**—Investigation consists of gathering enough evidence to successfully prosecute an offender after the commission of a violation.

**Cooperation**—The Forest cooperates with local, State, and other federal agencies in providing law enforcement coverage, such as campground patrols, deer hunter patrols, and other joint law enforcement operations and investigations. The Forest has cooperative agreements with the Modoc, Lassen and Siskiyou

Counties' Sheriffs' offices amounting to \$25,000 annually. These funds are reimbursable expenditures for services beyond those normally provided by the departments.

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## 11. Minerals

### Introduction

The geology of a forest contributes significantly to the amount of mineral activity that will occur within its boundaries. The Modoc National Forest is primarily composed of volcanic material which has low potential for most mineral occurrences except for geothermal and mineral materials used in construction trades.

### Current Management

Generally, mineral management depends on the types of mineral commodities present on the Forest. Minerals are classified into three categories:

- **Mineral Materials**—common minerals such as stone, gravel, cinders, and decorative rock.
- **Leasable**—oil, gas, geothermal, and other minerals on acquired lands without public domain status.
- **Locatable**—all metallic and non-metallic minerals, except common mineral material and leasable minerals.

Originally, the authority to manage the federal minerals estate belonged to the Secretary of the Interior. However, following various memoranda of understanding between the Secretaries of the Interior and Agriculture, and recent legislative acts; the Forest Service was given responsibility to manage minerals commodities and to regulate mineral prospecting and development on, and removal from, national forest lands.

Managing each category of mineral varies slightly. The Forest authorizes removing *mineral material* by issuing mineral material permits. However, mining activities associated with *locatable minerals* are authorized through an approved plan of operation which is originally submitted by a mining operator. Regarding *leasable minerals*, the Forest Service must identify lands which are available for leasing and prescribe resource protection measures for each lease. The Bureau of Land Management is responsible for issuing leases.

In addition to managing minerals commodities according to category, the manner in which lands were incorporated into the Forest Service System affects the

method by which the minerals are managed. If lands were originally part of the Modoc National Forest at its inception in 1908, minerals are managed as public domain status minerals.

#### Weeks Law Lands

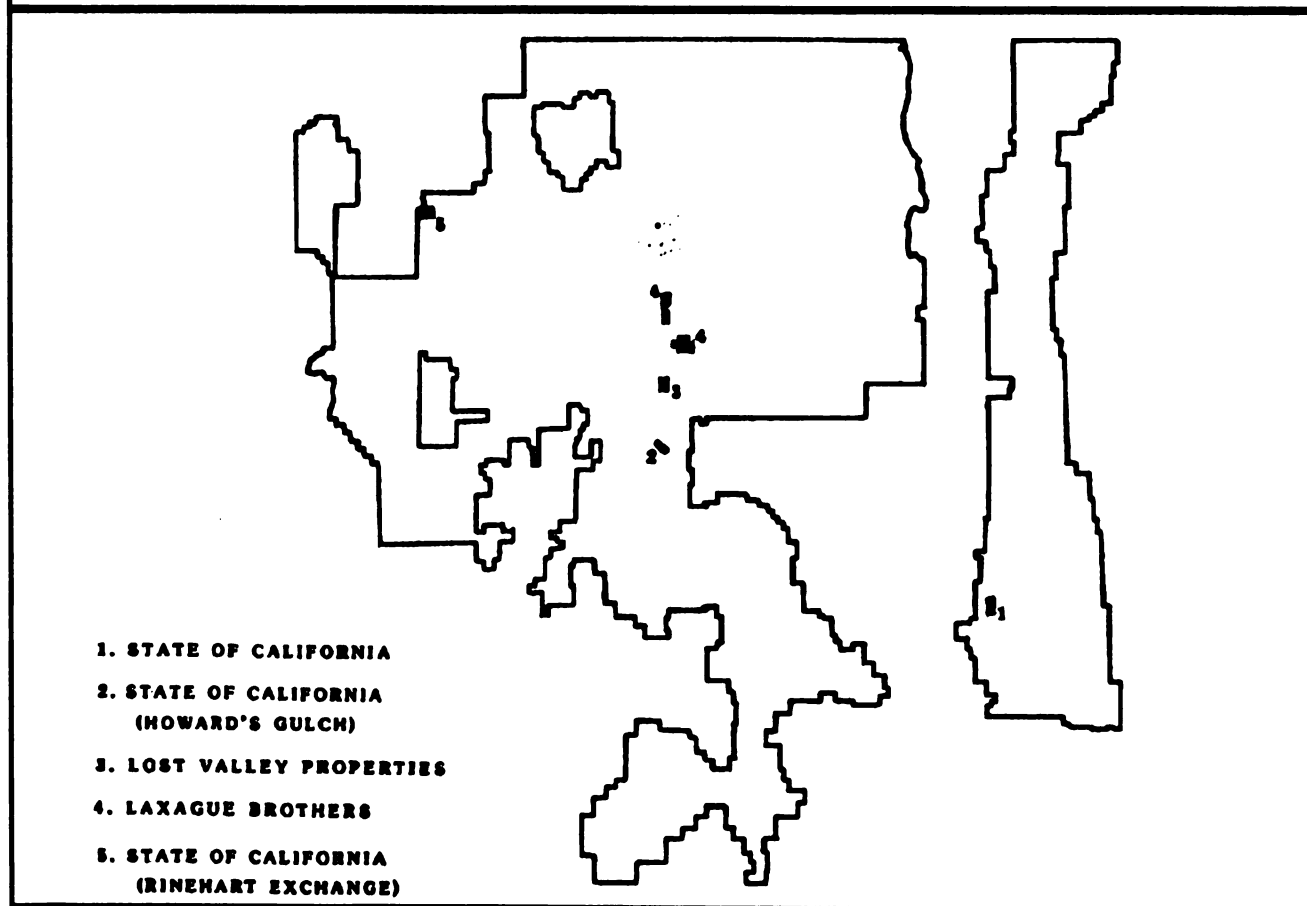
Lands with Weeks Law status are subject to the Act of March 4, 1917, which makes hard-rock minerals leasable, rather than locatable. Through the Weeks Law, the Forest may lease minerals at its discretion. Disposal of mineral materials from Weeks Law lands is by sale. The Forest has 203 acres in Weeks Law status in the Rattle-

snake Creek drainage on the Devil's Garden Ranger District.

#### Outstanding and Reserved Minerals Rights

Outstanding and reserved minerals rights are rights to the mineral estate held by an entity other than the holder of the surface rights. The Forest has five reserved minerals rights areas, most with the State of California, covering 4,000 acres. Figure 3-14(a) displays the locations and owners of outstanding mineral rights within the Forest boundaries.

**Figure 3-14(a). Reserved Mineral Rights on the Modoc NF.**





If an entity were to exercise its mineral rights, impacts to the surface resources would be analyzed in an environmental document and directed in the 36 CFR 251.15. The rights are located in areas with low mineral potential for locatable and leasable minerals (Figures 3-14 and 3-15).

#### Areas Withdrawn from Mineral Entry

The Forest encourages mineral exploration and development except within areas withdrawn from mineral entry. The Forest Service may request the BLM to exclude (withdraw) an area from mineral development. The Forest has previously withdrawn areas from locatable and leasable mineral development (Appendix H).

In 1989, the Forest reviewed the withdrawals, as directed by the Federal Land Policy and Management Act of 1976, except for wilderness and research natural areas. As a result of this review, the Forest is recommending to the BLM a reduction in the number of locations and acres of mineral withdrawals (Appendix H).

#### Access

Unless an area is withdrawn from mineral entry, it is open for mineral-related activities. However, special surface occupancy mitigation measures may be imposed to

restrict the activities associated with mineral development. The Forest Service reviews plans of operation filed for mineral activities to determine if restrictions (leasable or saleable minerals) or mitigating measures (locatable minerals) to access are required. Limiting or prohibiting access to specific areas would reduce impacts to other resources, such as riparian values, raptor habitat, and semi-primitive non-motorized and visual retention areas.

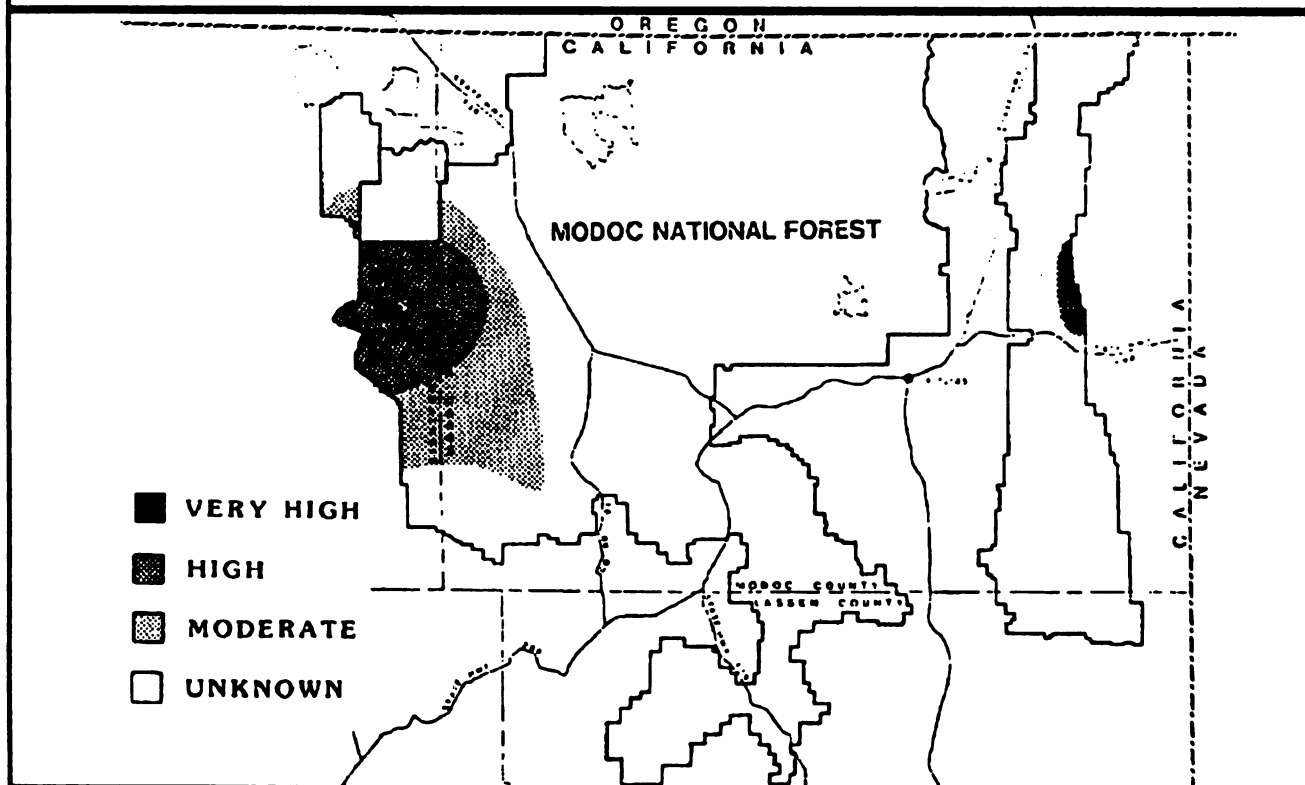
#### Supply

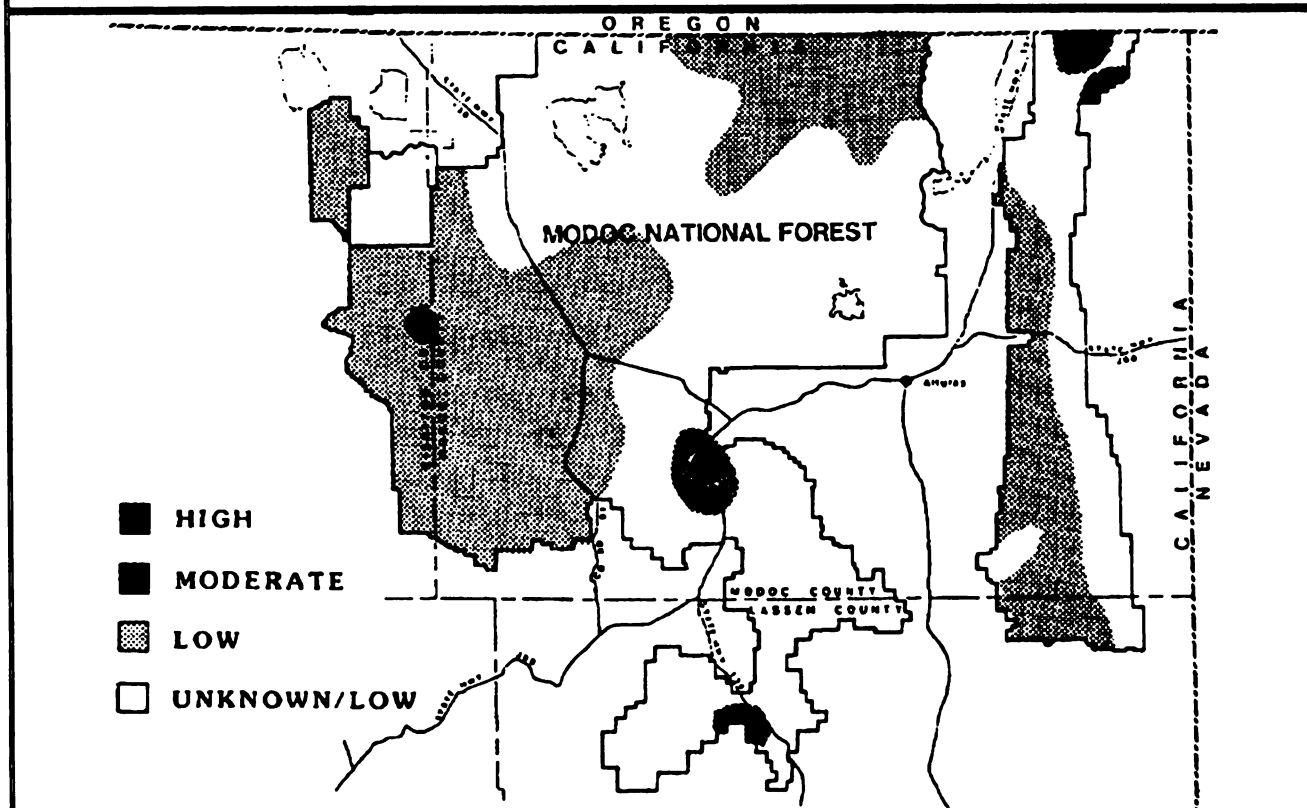
##### Minerals Materials

Cinders, aggregate, and decorative rock are the principal common variety minerals on the Forest. Seventeen active aggregate sources and twelve cinder pits are currently available for saleable minerals.

Most of the Forest is covered by basaltic lava flows. Some basalt is used as decorative stone. The most popular decorative stone is a thin-layered basalt, lightly covered with moss, which occurs nearly everywhere. The Forest does not have an accurate estimate of the volume of mineral material within the Forest boundaries. However, we anticipate that it is sufficient to meet project demands for both short- and long-term needs.

**Figure 3-14. Mineral Potential for Leasable Minerals**



**Figure 3-15. Mineral Potential for Locatable Minerals**

Regarding the geologic nature of volcanic rocks, the Forest provides opportunities for novices and experienced rock collecting enthusiasts. Items collected include obsidian needles, quartz crystals, petrified wood, and assorted gemstones. The Forest does not have an adequate inventory of the quantity of material available for rock collecting. However, we anticipate developing a management plan for rock hounding which may include estimates of available material.

The northern and eastern flanks of the Medicine Lake Highlands have deposits of pumice material that range from a few feet to more than 60 feet deep. Pumice is a common variety material, so classified as a result of the

Common Varieties of Mineral Materials Act of 1947. Prior to the Act, pumice was considered a locatable mineral. The Act also provided a "grandfather clause" which allowed all valid existing pumice claims to be subject to the Mining Law of 1872, and would not become authorized under the Mineral Materials Act. Currently, all pumice activities operate under the 1872 General Mining Law.

#### **Leasable Minerals**

Figure 3-14 is a map of the mineral potential for leasable minerals on the Forest. Each mineral potential category is defined as follows:

- **Very high:** Includes areas within a Known Geothermal Resource Area (KGRA). Leasable mineral development will take place during the planning period within a small part of the area.
- **High:** Leasable mineral development is expected during the planning period within at least a small part of the area.
- **Moderate:** Leasable mineral development may take place during the planning period within at least a small part of the area.
- **Unknown:** There is not sufficient data to determine the potential within the planning period.

### *Geothermal*

The United States Geologic Survey (USGS) has identified most of the Forest as prospectively valuable for geothermal resources. Within the Forest boundary, two known geothermal resource areas exist. The Lake City-Surprise Valley KGRA is located on the eastern edge and includes approximately 1,880 acres on the Forest. No data of the total geothermal development within the KGRA has been published. In 1981, the Regional Forester signed a Decision Notice which allowed geothermal exploration activities within the KGRA. That Notice authorized the issuance of federal leases with certain lease stipulations. Those stipulations are less restrictive than the lease stipulations proposed in Appendix I of the Forest Plan. In addition to recommending leasing in the Lake City-Surprise Valley KGRA, the Decision Notice authorized similar geothermal activities within the Carey Reservoir area of the Big Valley Ranger District.

The Glass Mountain KGRA is located on the western edge of the Forest and covers approximately 161,000 acres, of which 69,300 are within the jurisdictional boundary of this Forest. The remaining acres are located on the Shasta-Trinity and Klamath National Forests. In 1981, the three forests recommended that the BLM issue competitive geothermal leases in the KGRA. The recommendation was based on an environmental assessment which analyzed impacts associated with geothermal exploration. In 1984, the three forests recommended issuing additional leases within an expanded KGRA. That recommendation was based on a supplementary environmental analysis of the original EA. The supplement analyzed impacts within the total KGRA for exploration and development. Mitigation measures and lease stipulations identified in the supplementary EA have been incorporated into the more comprehensive Forest Plan. Appendix I of the Forest Plan lists special stipulations for geothermal, oil and gas leasing.

After preliminary drillings, the potential for geothermal development at the Glass Mountain KGRA was estimated at more than 500 megawatts. However, subsequent drilling exploration reduced the estimate; but the exact potential has not yet been determined.

### *Oil and Gas*

In 1982, the Regional Forester signed a Decision Notice recommending oil and gas leasing on approximately 876,000 acres within the Forest boundary. The recommendation was based on an environmental analysis which analyzed the impacts of only oil and gas exploration. The EA identified certain resource protection measures (i.e., stipulations) which should be included in any leases. Any future oil and gas leases will require additional analysis of impacts associated with oil and gas development.

### *Locatable Minerals*

The primary locatable mineral activity on the Forest is mining for lode gold, silver, copper, mercury, perlite, block pumice and gemstones. Prospecting for these commodities is based on past mining activities and the geologic setting of the Forest. We do not anticipate that any new minerals will be found in large quantities within the Forest boundary.

Figure 3-15 is a map of the locatable mineral potential on the Forest. Each mineral potential category is defined as follows:

- **High:** Includes areas with active mines. Mineral development will take place during the planning period within at least a small part of the area.
- **Moderate:** Mineral activity is expected during the planning period within at least a small part of the area.
- **Low:** Mineral development may not take place during the planning period.
- **Unknown:** There is not sufficient data to determine the potential for development within the planning period.

The known deposits of gold on the Forest are epithermal (shallow) (Cox, et al., 1986). Most mining activity has been confined to the Hayden Hill, Winters and High Grade mining districts. Periodic drilling has been done in other areas of the Forest. However, as a result of these activities, the areas have generally been classified as having low potential for mineralization. No estimates of the quantity of available ore deposits within any of the three mining districts have been made. Currently, an open pit mine is proposed in the Hayden Hill area. The project, which includes removing approximately 43 million tons of ore, is located on BLM land adjacent to Forest Service

land. At this time, no one has proposed expanding the project onto Forest Service lands.

Pumice and block pumice are mined on the northern flanks of the Medicine Lake Highlands. The pumice operation has been active for many years. The block pumice operation is currently under a mineral patent application to the BLM. No known estimates of reserves of either block pumice or pumice in the Medicine Lake Highlands are available.

## Demand

### Mineral Materials

The greatest increase in demand for mineral materials will be for road surfacing cinders and decorative rock. Federal, State, and county agencies are the primary users of these minerals. From 1981 to 1985, about 67,000 tons of cinders were removed annually. Demand for road surfacing material will probably increase 10-20% over the next five years, because (1) other mineral development will require access; (2) new road surfacing will be required to accommodate a growing population in the rural areas of Modoc, Lassen and Siskiyou Counties; (3) existing roads will continually require maintenance; and (4) in-service access needs will continue.

Demand for decorative rock will also increase as the population grows. Because the Forest has large amounts of basaltic material, it should easily meet the increased demand for this commodity. As demand for this commodity warrants, locations will be analyzed on a case-by-case basis.

### Leasable Minerals

Of the leasable minerals, geothermal energy will command the greatest interest in the next ten years. Currently, 31 geothermal leases encompass 49,410 acres. During the last few years, exploration activities (both in type and amount) have significantly increased in the Glass Mountain KGRA. As a result, one of the exploration wells has been declared a production well. We anticipate that development will occur within the next five years. Further exploration drilling and testing will establish the extent and intensity of the development.

In addition to the leases at the Glass Mountain KGRA, there is a lease at the Lake City-Surprise Valley KGRA. No exploration activity has been associated with this lease within the last five years.

Besides geothermal interest, the Forest has one oil and gas lease encompassing approximately 7,700 acres. Five oil and gas lease applications have been filed with the BLM. Applicants are requesting oil and gas leases on

approximately 28,000 acres of Modoc National Forest lands.

### Locatable Minerals

As of March 1990, approximately 530 active mining claims had been filed. Demand for gold, the primary locatable mineral, will probably increase over the next five years, depending on national and local demand.

In 1989, Lassen Gold Mining, Incorporated, a subsidiary of Amax Corporation, Incorporated, submitted a plan of operation for an open pit gold/silver mine in the Hayden Hill area. The site is located primarily on BLM lands which are adjacent to Forest Service lands. At this time, we have no indication that expansion of the pit will adversely impact Forest Service lands.

Pumice has been mined periodically from the Medicine Lake area. In conjunction with the pumice mine, block pumice has been mined for the last six years. In addition to pumice mining, operators have removed perlite from the area. While the volume of perlite being mined is currently small, if perlite is used as a substitute for asbestos, the volume of material removed may significantly increase.

### Critical Minerals

Critical minerals are those needed to supply military, industrial, and essential civilian needs of the United States during a national emergency. Copper is the only critical mineral on the Forest in this category; demand for it from this Forest is insignificant.

### Potential for Development

Forest managers are dependent on the private sector for information regarding locatable and leasable minerals. Most conclusions are based on environmental or geologic setting, and input from industry. Areas were rated from high to low according to their potential for mineral development. If no information was available, the area's potential was rated as unknown (Figures 3-14 and 3-15).

The Medicine Lake Highlands have a high potential for geothermal development. Withdrawal of the South Warner Wilderness has little effect on the mineral industry. In a recent USGS inventory of potential mineral development in the Wilderness, the agency found few occurrences of mineral resources (Duffield and Weldin 1984).

## 12. Pests

### Introduction

Pests are diseases, insects, animals, and noxious weeds which adversely affect vegetation, land productivity, structures, and occasionally human health. Diseases, insects, and animal damage can cause tree mortality, or reduced growth, wood quality, and seed production. Rodent populations in developed recreational areas can cause significant structural damage. They also endanger human health if they carry diseases such as bubonic plague or rabies. Noxious weeds can reduce productivity of rangelands and pastures. By defoliating large acreages of bitterbrush, tent caterpillars can reduce available forage and eliminate bitterbrush from the area.

The effects of pests and diseases in an ecosystem are usually the result of a pest complex rather than the action of a single organism. As an example, common complexes in forests include dwarf mistletoe/bark beetles and root disease/bark beetles. Complexes also involve the host and stand conditions, environmental influences, pest population, and effects of management activities.

### Integrated Pest Management (IPM)

While no forest or rangeland pest can be fully controlled, their effects can be prevented or reduced. The overall approach is called Integrated Pest Management (IPM), which recognizes interrelationships of the pest-host system. IPM also recognizes that insects, diseases, and destructive animals are important elements of forest and rangeland ecosystems, and are considered pests only when they interfere with the attainment of management goals and objectives.

The IPM approach emphasizes the integration of pest management activities (prevention, surveillance, detection, evaluation, suppression and monitoring) with resource management planning and decision making. Pest information is considered, for example, in developing and implementing silvicultural prescriptions.

The goal of IPM is to prevent or reduce pest-related damage considered unacceptable because of its negative impact on resource management objectives. In selecting pest management methods, all techniques, including chemical, biological, mechanical, manual and cultural, are considered on a case-by-case, project level basis. Methods are selected according to site-specific analyses of biological effectiveness, cost, and effects on human health and the environment.

## Major Forest Pests

Pest-related damage varies by year and location within the Forest. Primary pests on the Modoc, summarized below, include root diseases, bark and engraver beetles, dwarf mistletoes, defoliators, rodents and noxious weeds. Appendix I discusses specific pests in more detail.

**Root Diseases** — Root diseases can kill individual trees and clusters of trees, or weaken them until they succumb to bark beetle attack. The most prevalent root disease on the Forest is *Heterobasidion annosum* (formerly *Fomes annosus*). While the actual percentage is unknown, many of the Forest's true fir and eastside pine stands are probably infected. Black stain root disease (*Ceratocystis wagneri*) infects ponderosa and Jeffrey pine in the southern part of the Forest on about 17,000 acres.

**Bark and Engraver Beetles** — Bark and engraver beetles typically kill tops or entire individuals or groups of trees throughout the Forest. Bark beetle problems are often associated with trees and stands that have been weakened by predisposing agents or conditions such as root diseases, mistletoes, drought, and competition from overstocking. Primary bark beetles include the western pine beetle (*Dendroctonus brevicomis*) in ponderosa pine, the Jeffrey pine beetle (*D. jeffreyi*) in Jeffrey pine, and the mountain pine beetle (*D. ponderosae*) in ponderosa and lodgepole pine. Primary engravers frequently associated with top-killing are true fir engravers (*Scolytus ventralis*) in red and white fir, and pine engravers (*Ips* spp.) which attack various species of pine.

**Dwarf Mistletoes** — Dwarf mistletoes infect all commercial conifers on the Forest except incense-cedar. The main impact from mistletoe infection is loss of growth and decreased vigor, which increases susceptibility to attack by insects. Most mistletoe infection centers on the Forest are of local incidence.

**Stem Decay** — Stem decay (rot) causes significant wood losses in the old-growth trees by destroying the heartwood.

**Douglas Fir Tussock Moth** — On this Forest *Orgyia pseudotsugata* infests white fir. Outbreaks have been small and of short duration. The Forest uses pheromone-baited traps in locations to monitor the moth population for predicting population trends and possible defoliation.

**Modoc Budworm** — The Modoc budworm, *Choristoneura viridis*, is unique to the Modoc and Fremont National Forests and similar to the spruce budworm. The host for this defoliator is white fir; it attacks trees of all ages. The budworm causes loss of tree growth. Death does not generally occur unless defoliation continues for 4-5 years, or the tree is already in a

weakened condition. White fir in the Warner Mountains were defoliated between 1959 and 1962. A larger outbreak, which peaked in 1973 and declined rapidly in 1975, also included fir stands on Knox Mountain on the Big Valley District. The most recent occurrence was observed in 1984 in the Warner Mountains. The infestation spread in 1985 and involved most of the Warners. The population has since declined to endemic levels.

**Tent Caterpillar**—The western tent caterpillar (*Malacosoma californicum*) periodically defoliates bitterbrush stands. The most recent outbreak occurred 1981-1984, and affected about 30,000 acres. Bitterbrush is a preferred browse species for domestic livestock and wildlife. The tent caterpillar has the potential to reduce available forage, particularly in older, decadent bitterbrush stands.

**Animal Pests**—Deer, pocket gophers, and porcupines eat seedlings and small saplings, particularly in plantations. Currently the damage is localized. Where damage from deer is heavy, such as in wintering areas, the Forest uses vexar (plastic mesh) tubes to protect planted seedlings. Porcupines are a particular nuisance because their gnawing reduces tree growth and quality, and damages signs and buildings. Pocket gophers pose the most serious threat to entire plantations and associated timber management objectives.

Ground squirrels and other rodents can damage campground structures through their chewing and digging behavior; they can also carry bubonic plague. Predation by animals such as coyotes may result in livestock loss. The Forest cooperates with appropriate State and local public health agencies in monitoring, reporting, and controlling problems.

## Noxious Weeds

Noxious weeds include species which have been inadvertently introduced and grow out of their natural habitat. Since they have little or no food value for wild or domestic animals they can reduce site productivity of rangelands, farmland, and pastures. Many are allelopathic, that is, they can inhibit growth of other plants in their area of influence through a build-up of toxins in the soil. In the past the Forest and counties have cooperated in treating noxious weeds, generally herbicide applications. Noxious weeds which occur on the Forest are puncture vines, Mediterranean sage, dyer's woad, dalmatian toadflax, Scotch thistle, sweet clover, Klamath weed, squarrose knapweed, plumeless thistle, poison hemlock, yellow star thistle, and Russian knapweed.

## 13. Range

### Introduction

The range management program on the Forest is important to local and adjacent livestock industries because of forage provided for their animals. This Forest provides 122,500 animal unit months (AUMs) for livestock, which is 23% of the permitted livestock forage produced in the Region, and ranks first among 18 national forests in California.

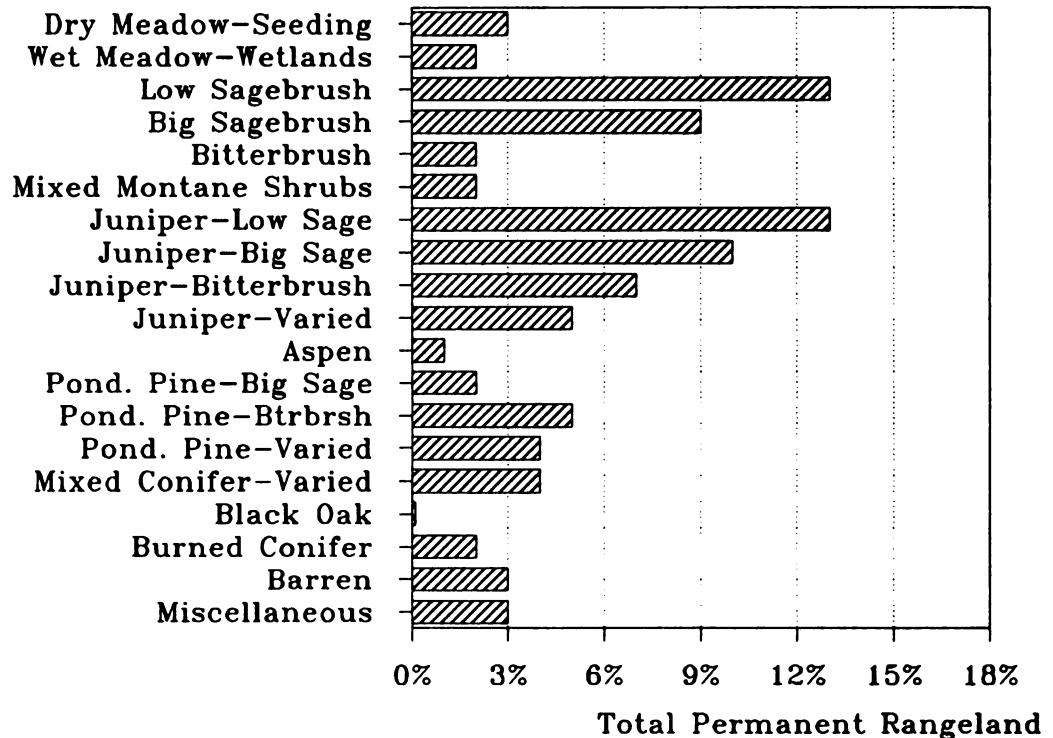
Wild horses depend on rangelands for forage and habitat. Under the Wild Horses and Burros Protection Act, the Forest is legally obligated to manage horses within a 258,000-acre wild horse territory. The Forest's rangelands also provide forage for wildlife, primarily deer and pronghorn. Eight deer herds and five pronghorn herds use part or all of the Forest for habitat.

Approximately 1.0 million acres (63%) of the Forest's 1.6 million acres is rangeland, of which 90% is suitable for grazing. Ten percent is unsuitable for grazing because of steep slopes, inaccessible dense timber, and lack of forage. An additional 200,000 acres of timberland growing less than 20 cubic feet per acre per year (less than 20 timberlands) is also discussed as part of the permanent rangeland. Less than 20 timberlands provide long-term forage production because the timber stands have open canopies.

The Forest is broadly divided into permanent rangeland and transitory rangeland. Under proper livestock management, permanent rangeland can perpetually produce forage. Transitory rangeland produces palatable forage for a limited time following timber harvest or fires.

A variety of vegetative associations are represented on permanent rangeland (Figure 3-16), from mixed conifer associated with various montane shrubs, such as serviceberry and snowbrush, to low sagebrush/perennial bunchgrass flats. Vegetative associations dominating the greatest acreage, each at 13% of the total, are western juniper/low sagebrush/bunchgrass and low sagebrush/bunchgrass. Where these associations occur, the terrain is usually flat, often rocky, sparse in vegetation, lacks water, and the soils are shallow.

Ponderosa pine is a dominant overstory on 11% of the Forest's rangeland. It is found in association with 12 different understory types but primarily bitterbrush and big sagebrush. The ponderosa pine type as well as other timber types found on rangeland have low timber growth potential, with less than 20 (<20) cu. ft. of growth per acre per year.

**Figure 3-16. Vegetation on Permanent Rangeland****Vegetation Associations**

Twenty-eight percent of the rangeland on the Forest is comprised of: big sagebrush (9%); big sagebrush/bitterbrush (2%); big sagebrush/juniper (10%); bitterbrush/juniper (7%). These associations are more productive and livestock tend to graze them more heavily than other vegetation combinations.

**Current Management****Livestock Management Strategies**

To manage rangeland vegetation, the Forest is divided into 84 grazing allotments. Allotment boundaries are determined by natural features, land ownership, and historic use. Sixty-six allotments are permitted for cattle, 15 for sheep, and three for dual use by cattle and sheep. Over 119 term permittees depend on using the allotments to graze their livestock primarily from late spring to early fall. Consequently, permittees can grow and cut hay on their home ranches for winter feeding.

To achieve vegetation management objectives through livestock grazing, allotments are managed at

various levels of intensity (Appendix O in the Forest Plan).

**Grazing Seasons**

Range analysis and monitoring—including annual allotment inspections and utilization measurements—are used to establish grazing seasons, permitted livestock numbers, and grazing management strategies. In turn, these factors are designed to achieve vegetation management objectives. Overall management is regulated through grazing permit administration.

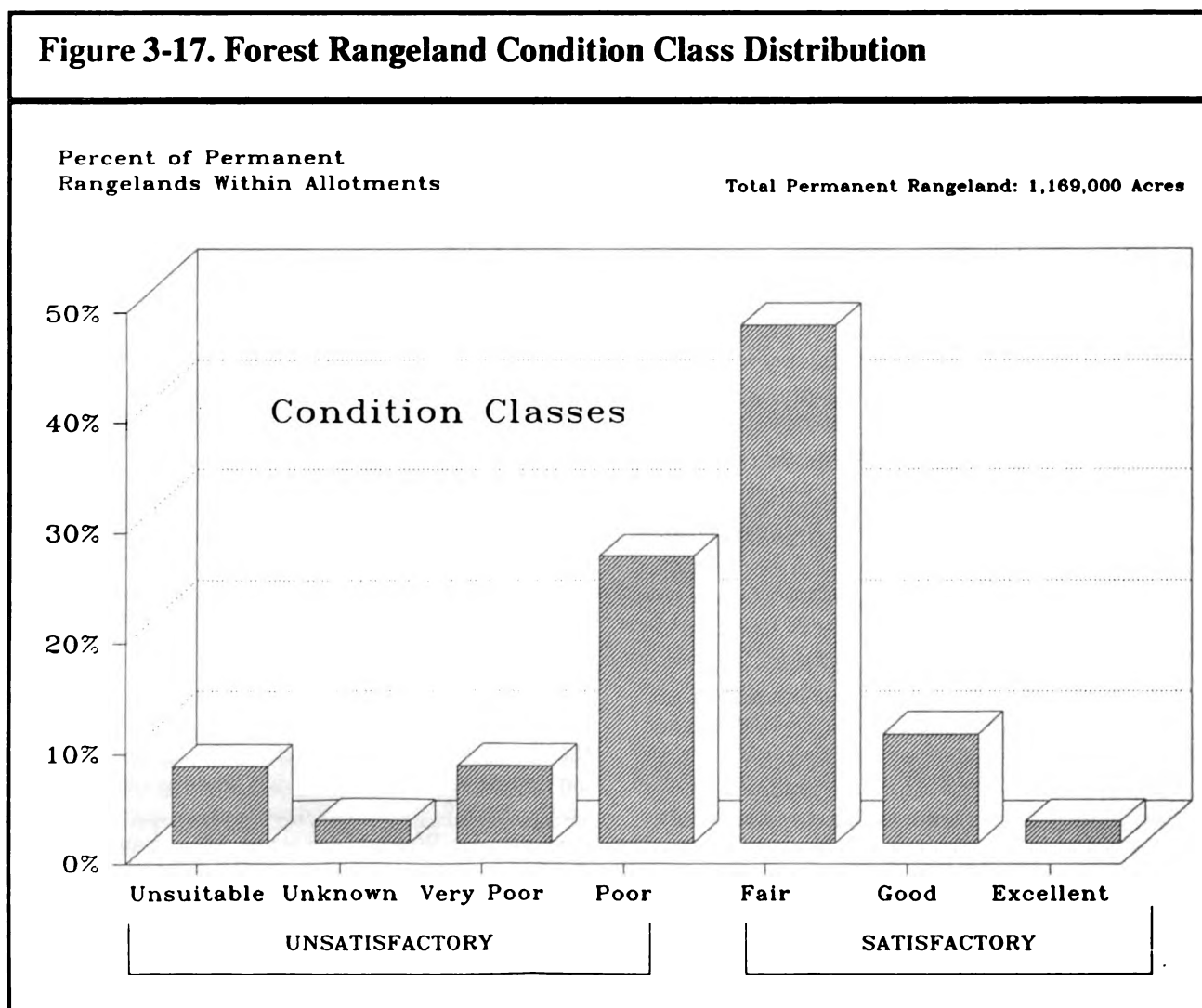
Elevation, precipitation, and ecological condition of the rangelands are also factors in establishing appropriate grazing seasons. Grazing may begin as early as April on the Devil's Garden Plateau and as late as July or August in the Warner Mountains. Most seasons end in October with an average length of 4-1/2 months, although length of season can vary considerably. One allotment on the Doublehead Ranger District supports two bands of sheep during winter; most allotments are grazed in spring, summer and fall.

### Rangeland Condition

Rangelands in satisfactory ecological condition provide a diversity of herbaceous, shrub, and forest vegetation; and produce forage for livestock, wildlife, and wild horse herds. The vegetation management objective is to produce desired expressions of these vegetative components according to site potential and resource needs. Generally, rangelands in satisfactory ecological condition may be utilized up to 50% by weight of key forage species. On the other hand, rangelands in unsatisfactory ecological condition should be utilized no more than 30% by weight of key forage species.

Ecological condition is satisfactory if current range condition is good to excellent with static trend, or fair with upward trend. Ranges are in unsatisfactory ecological condition if current range conditions are poor or very poor with static or downward trend. Most of the Forest's permanent rangelands are in satisfactory ecological condition: 120,000 acres are in good to excellent range condition, while 462,000 acres are in fair range condition (Figure 3-17). About 342,000 acres are in unsatisfactory ecological condition; the amount of forage available on these areas is limited. Generally, less forage is produced from rangelands in unsatisfactory range condition. However, trend is generally static to upward.

**Figure 3-17. Forest Rangeland Condition Class Distribution**





Unsatisfactory ecological conditions have resulted from improper grazing practices, including overgrazing by livestock, wildlife, and wild horses; lack of uniform livestock distribution and forage utilization; and extensive encroachment by juniper stands due to historic grazing practices and suppression of natural fires<sup>1</sup>. All factors combined to reduce forage production on these sites.

To achieve vegetation management objectives through livestock grazing, the Forest develops and implements allotment management plans (AMPs). The AMP planning process, identifies resource concerns, establishes vegetation management objectives, and designs strategies to correct concerns and accomplish objectives. Management tools include:

- implementing improved grazing strategies;
- fencing to prevent livestock drifting from adjacent allotments or to create pasture systems;
- developing stock watering areas to disperse livestock more evenly and provide better forage utilization;
- rejuvenating decadent brush, or removing juniper with prescribed fire or herbicides;
- cutting firewood to remove juniper; and
- adjusting permitted livestock numbers and grazing seasons as appropriate.

Because of limited funds, most allotment management plan revisions and improvement and monitoring projects have been deferred. Forestwide, rangeland in fair or better range condition (satisfactory ecological condition) has been sustained. Rangeland in poor range condition (unsatisfactory ecological condition) is unchanged, except on a few specific sites where small-scale riparian enhancement projects are improving the area. For some sites, technology to improve conditions from unsatisfactory to satisfactory does not exist. The Forest will identify these areas through site-specific allotment management planning.

#### Forage Available for Livestock and Wildlife

Forage needs for deer and pronghorn were not considered in original stocking assessments for most allotments, particularly on wildlife summer ranges. Generally,

the areas livestock would not use were made available to wildlife.

#### Grazing in Riparian Areas

Riparian areas in satisfactory ecological condition produce diverse herbaceous, shrub, and forest vegetation for wildlife, wild horses and livestock. Closely associated with water, riparian areas are characterized by lush vegetation that remains green and palatable to grazing animals when surrounding uplands have become dry and less savory. In addition to more palatable forage, riparian areas typically offer a ready source of water, shade, and a more temperate climate. As a result, grazing animals will concentrate in these areas if not properly managed.

Impacts to riparian areas from improper management include:

- decreased forage production and vegetative diversity;
- streambank alteration;
- reduced water quality and quantity; and
- lowered water tables.

On the Modoc NF, nearly all riparian areas have been affected by improper management practices to some extent. Refer to the *Riparian Area* section of this chapter for a more detailed discussion.

#### Grazing in Wetlands

Wetlands developments on the Forest have increased forage yield about five-fold over natural forage yields on comparable uplands. Generally, forage produced on wetlands is available for livestock, wildlife, and wild horses. Livestock have been excluded on two or three wetlands so that wildlife can use the forage, particularly waterfowl which need it for nesting cover.

#### Wilderness Grazing

The South Warner Wilderness Area on the Warner Mountain Ranger District was designated by Congress in the 1964 Wilderness Act. The Act provides for continuation of livestock grazing in wilderness areas which predates the Act, consistent with protection of vegetation and other wilderness values.

About 3,000 AUMs of livestock grazing is currently permitted. In some cases, past and present grazing prac-

<sup>1</sup> In the young stage of growth, juniper is not fire tolerant and thins out during natural fires. However, when fires are suppressed and juniper is allowed to grow, fire has little chance of destroying it. Juniper spreads over an area, closes the canopy, and eventually prevents forage growth. The greatest loss of forage production occurs where juniper has encroached on better sites.

tices have not protected the vegetation. In these areas, allotment management planning is needed to design grazing strategies which protect the vegetation resource. Specific issues include livestock drifting onto adjacent allotments; utilizing forage in a more uniform manner through improved livestock distribution; and improving watershed conditions and riparian areas.

### Transitory Rangeland

In contrast to permanent rangeland, transitory rangeland produces palatable forage which is available only for a limited time. Transitory forage is produced following timber harvest activity, and may be available for livestock and wildlife for several years to several decades, depending on site conditions, and harvest method and cultural practices applied when establishing a new stand of trees. Eventually, the Forest canopy closes enough to prevent growth or reduce the palatability of herbaceous species (grasses, forbs, browse), thereby reducing forage available for livestock and wildlife.

On a Forest-wide basis, livestock permittees depend on forage produced on transitory range for 26% of their permitted use. When < 20 timberlands are included, this figure increases to a 46% dependency on timberland forage production. Individual livestock operators vary from no dependency on transitory forage to more than 75% of their permitted use based on transitory forage production.

While timber harvests and fires open forested areas, producing an abundance of palatable forage which livestock readily consume, forage production sharply decreases when canopy closure exceeds 40%. Forage palatability and nutrient value also decline during canopy closure.

Grass seeding to control soil erosion after fires, overstory removal, and salvage and sanitation logging practices have all contributed to an abundance of transitory forage (Modoc National Forest 1975). Seeding produces hardy, rhizomatous grasses that resist intensive site preparation and impede timber regeneration. Competition between grasses and trees for soil moisture can lead to plantation failure. In addition, palatable grasses attract livestock and some wildlife into plantations where tree seedlings may be damaged by trampling or browsing.

### Grazing in Timber Plantations

Most Forest timber plantations are in burned areas which were seeded to grass with non-native species as an erosion control measure. As a result, when plantations are accessible they attract livestock. Proper timing of grazing use and balanced livestock distribution is essential to ensure plantation success.

The Forest is experimenting with various methods to ensure plantation success while making transitory forage available for livestock use. Fencing timber plantations facilitates early-season livestock grazing while forage is still green and palatable; and browsing on tree seedlings does not occur. A rider can disperse livestock to prevent trampling damage. Another method involves herding sheep between plantations which are widely spaced. The method selected to promote plantation success while ensuring that transitory forage is available for livestock is based on site-specific factors such as type of livestock, livestock management needs, allotment topography and vegetation mosaic, plantation size and location, and the type of site preparation. The decision to fence or graze is made on a case-by-case basis.

### Wild and Free-Roaming Horses

Wild horses have freely roamed the Forest since settlement days. For many people, they are living symbols of the Old West. With the passage of the Wild Horses and Burros Protection Act, forests are directed to ensure the animals' well-being. More specifically, the Forest is charged with maintaining ecologically balanced habitat in areas on national forest land which wild and free-roaming horses inhabit.

The Forest has one wild horse territory of about 258,000 acres located on portions of the Doublehead and Devil's Garden Ranger Districts. Fulfilling requirements of the Act, the Forest prepared the Wild Horse Management Plan in 1985, which identifies a population objective of 275-335 animals to manage. To determine population objectives, the Forest considered the animals' forage and habitat requirements, wildlife and other multiple-use needs, and range conditions. Many areas within the wild horse territory are in unsatisfactory ecological condition (poor range condition). These areas are being analyzed for improvement opportunities through the allotment management planning process.

### Cooperative Approaches to Grazing Management

The Forest uses several cooperative approaches to grazing management:

- cooperative management agreements with the Bureau of Land Management;
- coordinated resource management planning process (CRMP); and
- the Modoc/Washoe Experimental Stewardship Program.

A cooperative management agreement with BLM provides administration authority for specific allotments whose logical geographic boundaries are not reflected in

administrative boundary lines. The agreement facilitates allotment management where minor portions of BLM or national forest land are included within either agencies' allotment boundaries.

The coordinated resource management planning process (CRMP) involves all parties interested in a particular allotment's management. Recent examples of allotment management planning using the CRMP process involved the Ash Valley and Oxendine Allotments on the Big Valley Ranger District. Parties who were interested in resource management or potentially affected by a change in grazing management came together to identify resource issues, develop alternatives, and recommend management strategy to resolve their concerns.

Another cooperative approach to grazing management is the Modoc/Washoe Experimental Stewardship Program (ESP). Established on the Forest in April 1980, the ESP is administered jointly by the Susanville District of BLM and the Modoc NF. The objectives of the program, as mandated in Section 12 of the Public Rangelands Improvement Act of October 25, 1978, are to *"...develop and implement, on an experimental basis..., a program which provides incentives to, or rewards for, the holders of grazing permits whose Stewardship results in an improved range condition...cooperation and coordination between Federal and State agencies and with local private range users."* The ESP area totals 2.25 million acres of private and federal lands in California and Nevada, including all 350,000 acres of the Warner Mountain Ranger District. Like CRMP, ESP is a cooperative process for resolving on-the-ground resource problems.

## Supply

Forage available within allotments is about 149,000 AUMs. An AUM is 1,000 pounds of air-dried forage needed to support one cow for one month. Of this estimate, 122,500 AUMs are available to livestock, 4,400 AUMs to wild horses, and the remaining 22,100 AUMs to wildlife. When the original AMPs were developed 20-30 years ago, stocking levels for wild herbivores were not considered. The 22,100 AUMs available for wildlife represent only 67% of their estimated current forage needs.

The Forest issues permits allowing livestock to graze on allotments. Numbers of livestock permitted on each allotment is determined in allotment management plans. In 1984, 26,632 cattle, 20 domestic horses, 305 wild horses, and 24,913 sheep were permitted to graze the Forest, for a total of 122,500 AUMs. This figure differs from the permitted value of 153,975 AUMs reported by

the Forest in 1984, because term and temporary permitted numbers were counted twice.

Actual use differs from permitted use on an annual basis depending on economics, weather conditions, marketing conditions, etc. In 1984, actual use was 115,204 AUMs.

## Demand

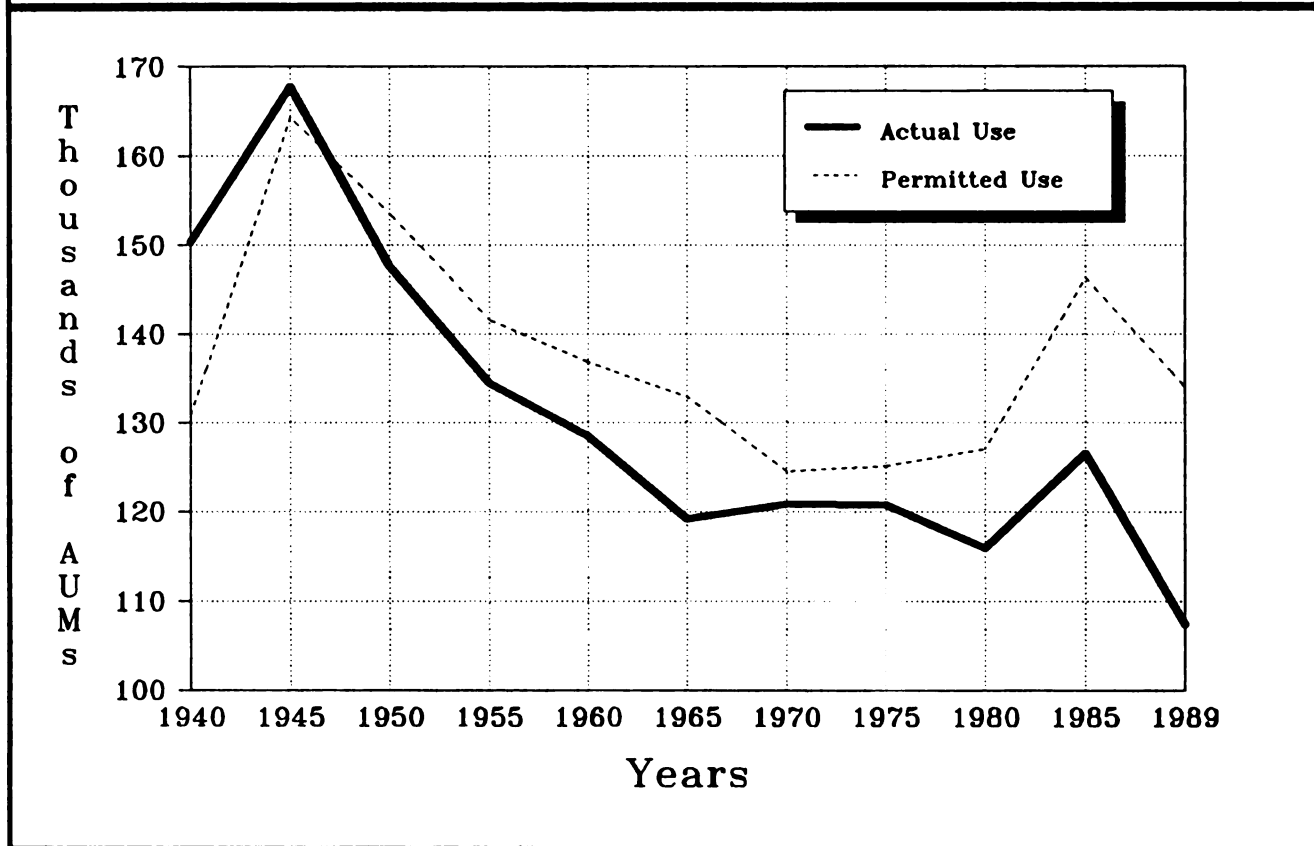
Although President Theodore Roosevelt created the Warner Mountain and Modoc Forest Reserves in 1904, demand for livestock forage began in the early 1860's and continues today. Demand for forage comes from the local livestock industry in communities surrounding the Forest.

Livestock grazing has been a primary use of the Forest since its inception. Forest grazing records show an increase in permitted numbers from 1910 to the early 1920's. The numbers then remained relatively constant into the mid-1930's when they began to drop. Even as late as 1939, the Forest permitted 270,000 AUMs, more than double the current permitted use. Grazing remained heavy throughout the Depression and World War II with a 5-year average high of 168,000 permitted AUMs in 1945 (Figure 3-18). After the war, livestock numbers were reduced, and reduced further in the 1960's when cheatgrass invasion on rangelands became extensive.

Actual use has been less than permitted use over the past decade (Figure 3-18) largely because the demand for beef has decreased. Normally, one would expect demand to increase as the population increases. However, demand for beef has decreased since the mid-1970's, because of consumer preferences, substitutes, etc. Lower real (inflation-adjusted) beef prices are the result of increased beef supplies and decreased demand. Lower beef prices have forced many ranchers to scale down their operations or go out of business altogether. Consequently, demand for forage on the Forest has declined.

The demand analysis for livestock grazing on the Forest involves three important factors: forage consumption, forage value, and the dependency of livestock growers on national forest lands. The historical livestock forage consumption pattern provides a way to estimate upper limits for future forage consumption. The price of forage helps reveal the economic value of forage to the local livestock growers and establishes a range investment level that is economically justifiable for the Forest. Dependency shows the importance of the forage to the local livestock growers by estimating how much of the total livestock feed is obtained on the Forest.

**Figure 3-18. Five-Year Averages of Actual and Permitted Use of Livestock AUMs 1940-1984**



### Dependency on Forest Rangeland

Forage produced on the Forest has always been an important source of feed to local livestock growers. Currently, livestock from ranches in Modoc County account for over three-fourths of the AUMs on the Forest. Livestock in adjacent counties account for the remainder (Figure 3-19).

Local ranchers have always been dependent on public ranges, particularly for summer grazing. In order to raise winter hay, ranchers must move livestock off their home ranches during the summer. A change in Forest forage supply would also affect other forage sources. For example, reducing forage supply would force ranchers to move livestock to lands that currently are producing hay for winter feeding, or place increased demands on the other forage sources, thus bidding up the price of these feed supplies.

### Opportunities

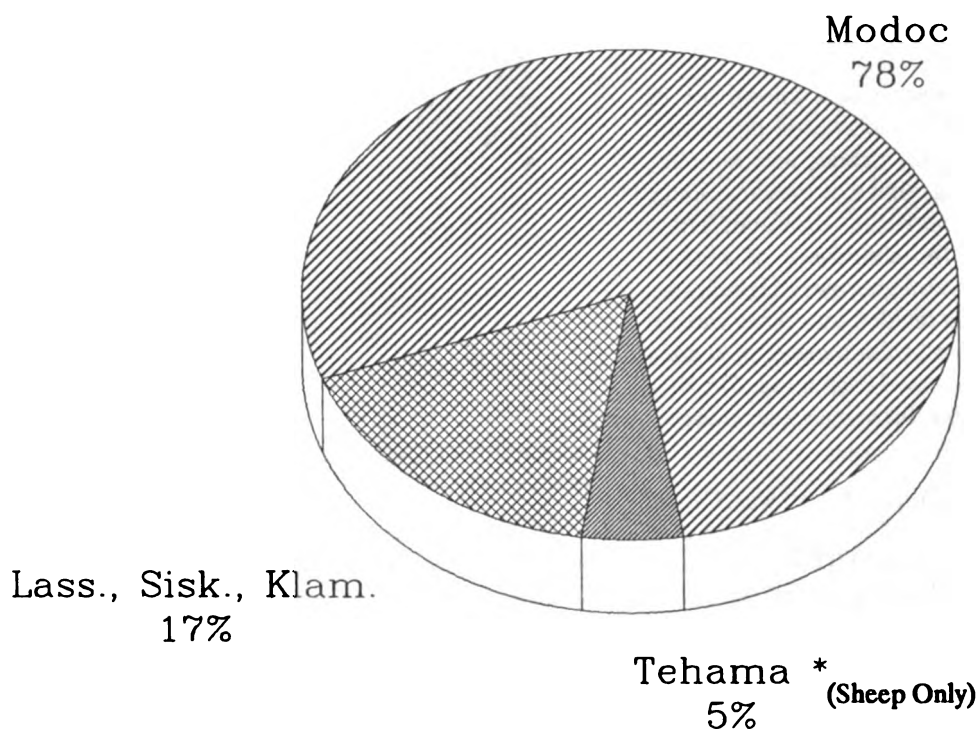
Opportunities exist to improve rangeland vegetation and its management. This will depend primarily on four

factors: 1) cost-effectiveness of implementing allotment management practices; 2) coordination with other resources such as timber, wildlife, watershed, and fire management; 3) coordination with the livestock permittees; and 4) stability of the livestock industry.

Opportunities exist for increasing forage production on the Forest, primarily on permanent rangelands. Although shallow soils and low precipitation produce low forage yields, better livestock distribution combined with improved grazing strategies, and structural and non-structural improvements could increase forage production available for use.

To achieve vegetation management objectives through livestock grazing, the Forest will develop, implement, and update allotment management plans. In addition to applying appropriate grazing strategies, developing water sources to disperse livestock, and fencing to protect sensitive areas will improve forage production over time.

Non-structural improvements can rapidly increase forage production. Prescribed fires and herbicides re-

**Figure 3-19. Distribution of Current Grazing Use**

move competing juniper, rejuvenate some species of decadent brush, and stimulate growth of herbaceous material. Firewood cutting projects also reduce juniper competition and boost forage production. Cultural practices or seeding projects on more productive sites can yield abundant forage.

Transitory range contributes 18% (or 38% when < 20 timberlands are included) of the forage base. In the future, poorly stocked stands now providing 100-200 pounds per acre will be clearcut and planted to well-stocked stands. In addition, site preparation prior to tree

planting and release treatments will reduce the amount of palatable shrubs, forbs and grasses. In those allotments heavily dependent on transitory range, modified site preparation methods could be tested. Those methods include single-pass disking, masticating and broadcast burning, light brushraking and burning, windrow piling and burning, and light herbicide applications. Using intermediate harvests to maintain an open stand condition would also maintain production of palatable forage although timber volumes could be reduced over time.

## 14. Recreation

### Introduction

The Modoc National Forest is best known for its remote location and uncrowded recreation opportunities. Most visitors enjoy hunting, fishing, and camping, while others delight in touring, hiking, horseback riding, swimming, picnicking, and gathering firewood. These activities are enhanced by the abundance of wildlife, variety of landscape settings, and uncrowded conditions. National Forest recreation is divided into three categories: developed, dispersed, and wilderness. This section discusses developed and dispersed recreation. The Wilderness section of this chapter discusses wilderness recreation.

In 1981, total recreation use on the Forest was 377,400 recreation visitor days (RVDs) and wildlife and fish user days (WFUDs). An RVD or a WFUD is equal to 12 visitor hours of recreation or hunting use which may be aggregated continuously, intermittently, or simultaneously by one or more persons. Of the 122 forests across the nation, the Modoc ranked 117th in terms of recreation use.

### Current Management

Recreation management has a low profile here, compared to other forests in the Region. This is due primarily to low public use, and dominance of hunting and fishing activities (managed by the State of California). Developed sites are maintained and access to different forest settings is provided through the road and trail system.

Forest recreation is currently managed under District Multiple Use Plans. The Medicine Lake Unit Plan supersedes the Multiple Use Plan for that area of the Forest. Off-highway vehicle (OHV) use is administered through the Forest off-highway Travel Plan completed in 1980. This plan divides the Forest into zones with varying degrees of restriction of OHV use. All these plans will be superseded by the Forest Land and Resource Management Plan.

### Developed Recreation

Developed recreation sites are managed by the Forest Service or the private sector, and amounts to less than 20% of the total recreation use. The average for other forests in the region is 42%. Use on the Modoc is lower



because of less private development, and the popularity of dispersed activities such as hunting and fishing.

**Public:** The Forest has 20 developed campgrounds, two picnic sites, two boat ramps, and a swimming beach. Camping is the major activity, representing more than 80% of the developed use. Most of the use is concentrated at Blue Lake, Mill Creek, and Medicine Lake, which are large camping areas on the Forest. Blue Lake Campground and the 3 campgrounds at Medicine Lake are fee sites, all others have no charge. A total of 198 acres are developed.

Since 1983, all sites have been managed at the low standard level. At the low standard level, Forest personnel maintain campgrounds and provide signing, but generally do not collect trash, and may not furnish potable drinking water. While some campgrounds are well kept, most could be improved by increased maintenance, or reconstruction. Most structures, such as toilets, are in good condition due to little vandalism, compared to other forests in the Region. However, few are accessible to the handicapped.

Recreation supply is affected by the number of people developed sites can accommodate. The Forest provides a practical capacity of 165,000 RVDs. Practical capacity is 40% of theoretical capacity (all sites occupied for 100% of the time, all season long). Use levels between 50% and 100% of practical capacity are considered ideal (83,000-165,000 RVDs). Use at less than 50% is inefficient, while use of 100% will not maintain a quality recreation experience, prevent resource damage, and allow for peak use periods. Although use on the Forest as a whole is within this optimum range, sites at Lily Lake, Cave Lake, and Plum Valley receive well over 100% use.

The demand factors of population growth, past recreation use trends, disposable income, leisure time, and

available energy supplies were considered in predicting future recreation use. Overall developed recreation use is projected to rise from the current 50% of practical capacity (86,000 RVDs) to 80% (131,000 RVDs) by the year 2010 (Table 3-5). At this level, use at many popular campgrounds will exceed capacity. Expansion of these sites prior to overuse is desirable. Use at Medicine Lake is expected to increase faster because of recent road improvements, unique opportunities, and displaced use from the Shasta-Trinity National Forest. If less popular, small campgrounds are closed to improve overall efficiency, demand at remaining sites will increase proportionately, while overall capacity is reduced. This will hasten the need for expansion. Additional recreational opportunities are available at reservoir sites on the Devil's Garden District as the need and demand arise.

**Table 3-5. Projected Recreation Use by ROS Class in Developed and Dispersed Recreation. (Thousand RVDs and WFUDs)**

Year	Dispersed			Developed
	SPNM	SPM	RN	RN
1980	24	34	223	86
1990	30	41	269	101
2000	36	48	313	116
2010	41	54	359	131
2020	46	61	404	146
2030	51	68	449	162

Source: USDA Forest Service (1980).

NOTE: This chart uses the 1982 inventory data and assumes that acres (capacity) will remain constant for each ROS class.

**Private:** Recreation use at privately managed sites accounted for about 5% of the developed recreation use in 1981. The private sector manages three developments for public use: a youth camp at Blue Lake, a pack station at Pepperdine, and a ski hill at Cedar Pass. Three recreation residences are located at Medicine Lake and four at Blue Lake. All privately owned facilities are managed through special use permit authorizations. Cedar Pass Ski Hill is currently being upgraded from a single rope tow to a T-bar.

The practical capacity of all private facilities is 11,800 RVDs. Blue Lake Youth Camp receives the most use of the private facilities, at 72% of its capacity (2500 RVDs). Cedar Pass Ski Hill has the largest seasonal capacity at 4,240 RVDs, but has only used about 25% of it in the past. At 42 acres, it can accommodate 100 skiers at one time.

During the next few decades, use at these private facilities is not expected to increase significantly. Current improvements at Cedar Pass Ski Area should adequately accommodate local demand into the next century.

## Dispersed Recreation

More than 80% of the recreation use on the Forest occurs in dispersed areas (areas that are not developed for intensive recreation use). Big game hunting and driving for pleasure are the major dispersed recreation activities. From 1977 to 1981, an average of 17,000 deer hunters per year visited the Forest. Visitors who enjoy "getting away from it all" have ample opportunity to do so. Primitive roads access vast areas where it is possible to experience nature for days without seeing other humans. However, one may see wild horses, bald eagles, osprey, antelope (pronghorn), redband trout, and other more common varieties of wildlife. The Forest has no designated wild and scenic rivers (Appendix T).

Dispersed area management has always been at or below the low standard level, except during deer hunting season. At that time, visitor contacts increase and trash is collected. The Forest often gives popular dispersed recreation sites special consideration to retain their values during other resource management activities such as timber sales.

**Trails:** The current trail inventory for the Forest includes 118 miles of trails, 79 miles of which are in the South Warner Wilderness. Forty-nine miles of trails have been abandoned recently so that maintenance efforts may be focused on trails receiving the most use. In most cases, abandoned trails have little recreational value. They were used for access before roads were built. Hiking and horseback riding opportunities exist even in areas without trails because much of the terrain is flat and open.

The Forest has two National Recreation Trails (NRT). The Highgrade Trail traverses an historical gold mining area in the North Warner Mountains. Use is light, but plans to interpret its historical values may increase use. The Blue Lake Trail circles Blue Lake in the South Warners. It receives moderate use which is generated by the nearby developed sites.

**Off-Highway Vehicles (OHVs):** This Forest has more land available to OHVs than any forest in the Region.

Ninety-four percent of the land is open to OHV use, and flat to gently sloped topography allows easy access. In addition to cross-country travel, more than 1,000 miles of primitive roads provide challenging routes. Gathering firewood and hunting are the primary activities associated with OHV use. People are creating additional trails to access firewood areas. Although past use has not been significant, some resource damage is occurring. Even if large areas of the Forest are closed to OHV use in the future, outstanding OHV opportunities will still be available. In developing its OHV plan, the Forest will coordinate with the State OHV plan.

**Demand:** Consumptive recreation activities such as big game hunting, fishing, and firewood gathering are affected by availability of the resource. Availability is dependent on how the resources are managed. Competition among users for a limited resource will probably increase as use increases in the future. Some opportunities that are taken for granted now, will not be readily available in the future. Demand for most dispersed recreation activities can easily be met for the next fifty years, although some popular locations will experience overuse. To prevent resource damage, the Forest can develop the sites or apply restrictions for use. New opportunities can be made available by constructing trails or roads. Information services can inform the public of opportunities and distribute use, thereby preventing overuse at specific places. The following section discusses dispersed recreation in relation to various Forest settings, and includes a quantitative assessment of recreation demand.

### Recreation Opportunity Spectrum

In 1980, the Forest conducted a Recreation Opportunity Spectrum (ROS) inventory to identify recreation opportunities on the Forest. The ROS inventory evaluated all land and water areas by their physical, social, and managerial settings. The six main ROS classes are: primitive, semi-primitive non-motorized, semi-primitive motorized, roaded natural, rural, and urban (Appendix K of the Forest Plan).

Sixty-one percent of the Forest land base is classified as roaded natural (RN), and 27% is classified as semi-primitive non-motorized (SPNM). SPNM land is characterized by a predominantly natural environment and no roaded access. Many of these areas have primitive roads or vehicle trails. They were included in the SPNM category because the roads are not Forest system roads and were not actually constructed. They are wheel tracks worn by repeated use. Eleven percent of the Forest is classified as semi-primitive motorized (SPM). These areas are accessible by more permanent primitive roads. Several isolated areas (1%) meet the small size criterion for rural ROS class. No areas, including the South Warner Wilderness, are categorized as primitive (P), because such areas must be at least three miles from roads and a minimum of 5,000 acres.

Many areas on the Forest that currently have motorized use were inventoried as SPNM in the ROS inventory, which was based on 1974 aerial photos. Existing motorized use occurs on primitive roads and trails that were not considered significant at the time of the inventory. These areas, most of which are on the Devil's Garden District, should have been inventoried as SPM. Although 27% of the Forest was inventoried as SPNM, less than half of that may actually qualify. The ROS inventory should be reanalyzed and possibly redone.

Roaded natural areas receive 79% and semi-primitive motorized areas receive 12% of the recreation use because the most popular activities are associated with vehicles (camping, hunting, fishing, driving for pleasure, picnicking and gathering forest products). The main activities in semi-primitive non-motorized areas are hunting, fishing and picnicking, which account for 9% of the total dispersed recreation use (Table 3-6).



**Table 3-6. Recreation Use by ROS Class.**

Major Activities	ROS Class		
	SPNM	SPM	RN
Camping	6%	10%	84%
Hunting Big Game	18%	19%	63%
Fishing	19%	5%	76%
Driving for Pleasure	1%	33%	63%
Picnicking	12%	7%	81%
Gathering Forest Products	2%	18%	80%
Percent Use for All Activities	9%	12%	79%
Total Dispersed Use (M RVD & WFUD)	26.0 <sup>1</sup>	35.0	230.0
Total Acres (M Acres)	449.2 <sup>1</sup>	183.0	1031.4
Existing Use Per Acre (RVD & WFUD/Acre)	.058	.191	.223

<sup>1</sup> Includes Wilderness Acres

Maximum capacity is the most use that each ROS class could sustain while maintaining the type and quality of recreation characteristic of the class. It varies from 380,000 RVDs for semi-primitive non-motorized areas to 2,578,500 RVDs for roaded natural areas. The capacity of roaded natural areas exceeds existing use more than 11 times; semi-primitive non-motorized areas have a capacity of 15 times the existing use; and semi-primitive motorized areas provide capacity for eight times its existing use (Table 3-7).

**Table 3-7. Maximum Recreation Capacity Compared to Existing Use.**

ROS Class	MRVD of Existing Use	MRVD of Capacity	% of Capacity
SPNM	26.0	380.8	7%
SPM	35.0	274.5	12%
RN	230.0	2,578.5	9%
<b>Total</b>	<b>291.0</b>	<b>3,233.8</b>	<b>X = 9%</b>

**Demand:** Each of the three main ROS classes currently receives less than 12% of its recreation capacity. If acres within each of these ROS classes remain the same throughout the planning period, by 2030 use will not exceed 18% of capacity (568,000 RVDs) (Table 3-5). If the acreage is significantly reduced, then projected use could exceed capacity. This is more likely to occur in SPNM areas outside the Wilderness than in any other ROS class. Activities that will cause a shift from SPNM toward SPM and RN include timber harvest, road building, utility developments, mining, etc.

Since no primitive class exists on the Forest, future demand for this setting must be met elsewhere. However, the South Warner Wilderness (which is SPNM) can be managed to provide primitive opportunities satisfying some of the demand. Future demand for rural and urban recreation settings can be met by opportunities outside the National Forest.

## Opportunities

The Forest has opportunities to improve many areas of recreation, including management, interpretive programs, developed sites, winter sports, trail networks, and off-highway vehicle use. The unique resources, low use, and relatively undeveloped state of the Forest create an opportunity to avoid many of the problems that exist elsewhere.

**Management:** The Forest can develop a cooperative program for northeastern California which would provide the public outstanding recreation experiences. This corner of the State is dominated by the Modoc National Forest, but has lands managed by many federal and State agencies. The Bureau of Land Management (BLM), Lava Beds National Monument, Lower Klamath/Tule Lake/Modoc National Wildlife Refuges, the State of Cal-

ifornia, Bureau of Reclamation, and other agencies are all involved in recreation management. A cooperative effort could improve efficiency and increase the quality and quantity of recreation opportunities (e.g., providing for scenic byway development).

Maintaining semi-primitive environments will insure that many existing unique opportunities are available in the future. Future overuse of the Wilderness can be reduced by sustaining the semi-primitive character of other lands, and encouraging visitors to use them.

**Interpretive Services:** Maps, publications, signs, and programs could be used more extensively. These services are important tools for the management of dispersed recreation, and they increase visitor satisfaction. Self-guided tours and opportunity guides are very cost effective.

**Developed Sites:** Many campgrounds could be rehabilitated to accommodate new types of recreation vehicles, correct or prevent resource damage, and replace worn out facilities. Operation and maintenance costs would decrease as visitor satisfaction would increase. Heavily used sites could be expanded and new sites could be developed where increased capacity is needed. To reduce expenses, less popular sites could be maintained by volunteers or closed. Larger campgrounds could be run by private concession operators.

**Winter Sports:** The Medicine Lake Highlands and Cedar Pass area could be developed to increase opportunities for winter sports. Parking areas, signed snowmobile and cross-country ski trails, and sanitation facilities would be needed.

**Trail Network:** Unique geologic features of the Medicine Lake area and the difficulty of cross-country travel offer opportunities for interpretation and trail development. The Highgrade area offers similar potential for a trail system which interprets the historic mining activities that occurred in the North Warners. Linking the Highgrade NRT with the South Warner Wilderness trail system would increase opportunities on the Forest for long-distance trail users, and would provide an extension and destination point for the Oregon trail network.

**Off-highway Vehicle Use:** The existing primitive road system provides an opportunity to identify and sign special routes. Self-guided tours with interpretation of resources along these routes will attract users who might otherwise cause resource damage by driving cross-country.

## 15. Research Natural Areas

### Introduction

Research Natural Areas (RNAs) are typical and distinctive natural ecosystems and habitats that are generally retained in an unmodified condition. They provide unique opportunities for scientific research on plant and animal communities and associations in environments free of human intervention. RNAs provide a baseline for comparison with ecosystems that have been disturbed. They also serve as gene pools and preserve endangered natural components of our environment.

To contribute to the national network of RNAs, the Pacific Southwest Region developed a system to preserve representative botanical types in California. The Devil's Garden RNA meets the requirements for a representative western juniper stand in the Modoc Plateau Physiographic Province.

The Forest nominated a potential RNA in the Warner Mountains which is within the North Basin Range Province. The Regional RNA Committee studies the nomination and subsequently approves the RNA as either a candidate or recommended area, or drops the RNA from further consideration. Before a candidate area is recommended, it is evaluated with other candidates to determine the best RNA. After the Regional Forester's concurrence, an ecological survey report and an establishment report is completed before classification as an RNA can be recommended to and approved by the Chief.

### Devil's Garden Research Natural Area

#### Description

The Devil's Garden RNA consists of open stands of western juniper in association with sagebrush, bitterbrush, rabbitbrush, bunchgrasses, and annuals on an expansive plateau littered with volcanic rock. This dry, rocky woodland provides forage for pronghorn, deer and wild horses. Because the RNA is not fenced, cattle are not excluded; but grazing by wildlife and livestock is limited by water shortage.

*Polygonum polygaloides* spp. *esotericum*, a Regional Forest designated sensitive plant, is known to grow in the Devil's Garden RNA (Keeler-Wolf 1983; Wheeler 1936).

#### Historical and Current Management

The Devil's Garden RNA is the only RNA currently designated on the Forest. It was established in 1933 to preserve a 1600-acre tract of western juniper in its natural state.

In 1959, efforts to control a 300-acre fire in the area included construction of fire lines by bulldozers and handcrews. In 1963, the area was redefined to exclude disturbed areas, and the remaining area was withdrawn from mineral prospecting, location, entry, and purchase. The RNA now encompasses 800 acres.

Signs were posted along the perimeter of the RNA in 1967 to help ensure the integrity of the area. To date, no research has been undertaken in the area.

In 1975 and again in 1980, a study group for the National Park Service (NPS) proposed the RNA for consideration as a National Natural Landmark (NNL) (Bostick, et al. 1975). The group felt the integrity of the area was in jeopardy because of continued grazing by livestock and wild horses.

Administratively, the entire area is on national forest land. It has not been monumented or surveyed, but the boundaries are adequately signed.

Management of the Devil's Garden RNA may face continued criticism for lack of fencing. However, rimrock on the eastern border virtually prevents accessibility by woodcutters and livestock from that side. A dramatic increase in the use of juniper for domestic firewood may result in unauthorized woodcutting and disturbance of the natural conditions in RNA.

If signing is not maintained, the RNA boundaries may be difficult to locate on the ground in the future.

### Opportunities

The Devil's Garden RNA could be fenced to exclude livestock and wild horses, and signed to warn firewood users not to damage the natural ecosystem set aside for study. The RNA has been proposed as a National Natural Landmark by the NPS. More information is needed to determine NNL status.

### Raider Basin

Raider Basin, nominated by the Forest as a potential RNA, lies within the North Basin Range Ecological Province. Approximately 25% of this 6,481-acre basin in the South Warner Wilderness is composed of pristine white fir forest. Ranging from 5,000 to 8,800 feet, the area is largely undisturbed by fire, grazing, or logging. California bighorn sheep were reintroduced into the Basin in 1980. Wilderness campsites and trails are used by backpackers and hunters in the summer and fall. Sensitive plant populations have been observed in adjacent areas, but not in the Basin itself. Opportunities exist for research studies of old-growth white fir, forest succession, forest structure, and wildlife habitat.

## 16. Riparian Areas

### Current Conditions

Riparian areas are found on almost 19,000 acres (1.2%) of the Forest, adjacent to streams (13,473 acres), springs and seeps (2,803 acres), lakes (122 acres), and in wet meadows (2,583 acres). Sixty percent of the riparian areas occur on the Warner Mountain Ranger District, 20% on Devil's Garden District, and 10% each on the Big Valley and Doublehead Districts. There are 552 miles of streams containing riparian habitat.

Forest riparian areas are generally three types:

- grass-forb understory with a willow midstory and no overstory (the most common and located Forest-wide);
- grass-forb understory with no midstory or overstory (usually in wet meadows);
- conifer overstory with a mixed deciduous midstory and no understory (adjacent to perennial streams).

In the past, logging practices, road construction, and improper grazing practices combined to contribute to riparian area degradation. Forest riparian areas generally lack desired vegetation expressions to achieve overall management objectives. Figures 3-20 and 3-21 display the current forage and ecological condition and trend of riparian areas on the Forest.

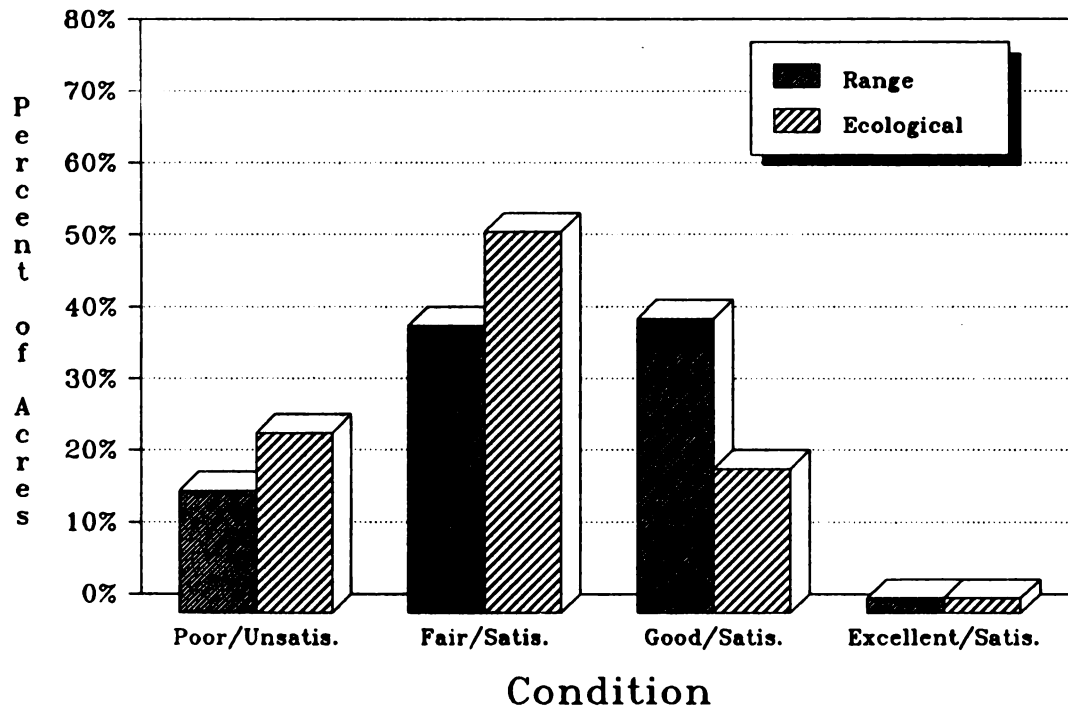
### Resources Dependent on Riparian Areas

Riparian areas in satisfactory ecological condition are vital for maintaining certain vegetation communities, water quality, fish and wildlife. Cottonwoods, aspen, willow, mixed deciduous species and certain grasses and forbs are descriptive of riparian areas in satisfactory condition.

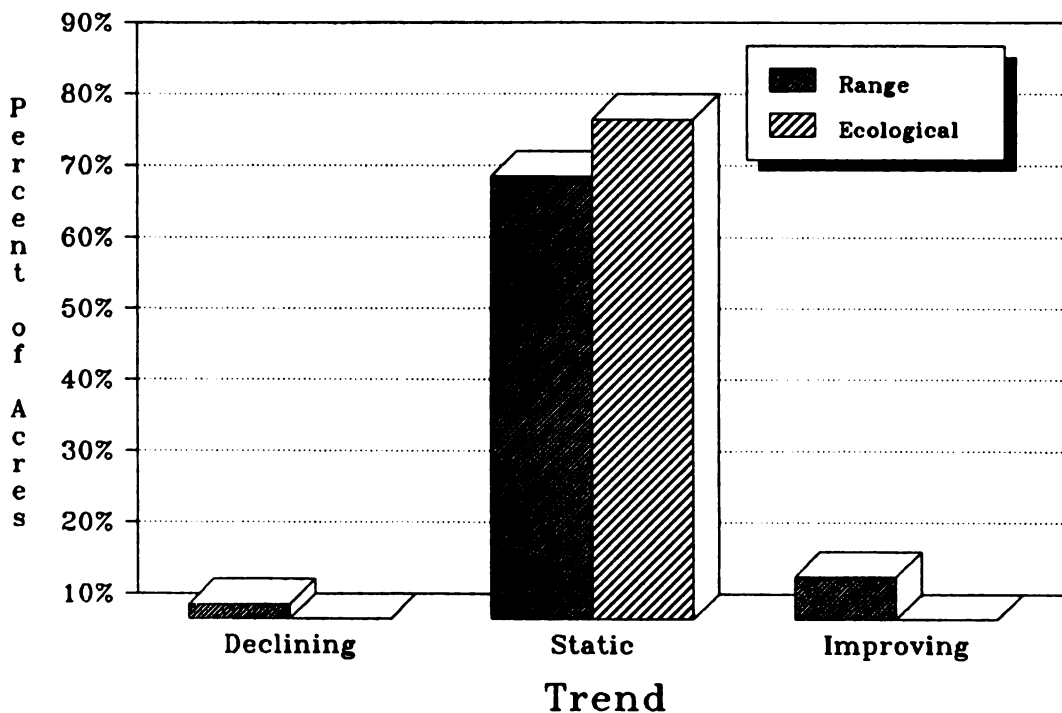
Riparian areas are important to the existence and productivity of fish. Streamside vegetation moderates water temperature by providing insulation against hot and cold temperatures which could harm or kill fish. Overhanging riparian vegetation is important as cover habitat for protection from terrestrial or avian predators, and the root masses or submerged branches of riparian vegetation provide instream cover habitat for protection from aquatic predators.

Riparian vegetation is also important for fish because it provides habitat for terrestrial insects, which can become drift for fish; habitat for the emergent adult stage

**Figure 3-20. Current Range and Ecological Condition in Riparian Areas**



**Figure 3-21. Current Range and Ecological Trend in Riparian Areas**



of aquatic insects, whose larvae are important for fish; and a source of organic detritus, used by many aquatic invertebrates.

The role of riparian vegetation as a filter of sediment and debris is important to the quality and quantity of suitable spawning habitat for fish as well as invertebrate forage productivity. Healthy riparian vegetation communities in some cases filter nutrients from streams, reducing eutrophication in downstream fish habitats.

Riparian areas are some of the most productive habitats for wildlife because:

- food, cover, space, and water are often found together;
- plant species and structural diversity are increased because both moist and dry conditions exist together; and
- they provide cover and food for species moving between separated units of suitable habitat.

About 275 terrestrial species, including 195 birds, find suitable habitat in riparian areas for breeding, feeding, or resting.

## Current Management

Riparian area policy directs forests:

- to recognize the value of riparian areas during planning and when implementing management activities;
- to give preferential consideration to riparian area dependent resources over other resources in cases of unresolvable conflict; and
- to manage riparian areas under the principles of multiple use and sustained yield while emphasizing protection of soil, water, vegetation, and fish and wildlife resources.

The Forest riparian inventory was based on a 100-foot zone, but is actually managed by variable width Streamside Management Zones (SMZs). The widths of SMZs, which include an upslope distance of 50-250 feet plus channel width, depend on stream class and side slope gradient. The variable width SMZ is always increased by several feet to exceed the actual width of riparian vegetation to protect it with additional filtering. When the table SMZ width does not encompass the riparian vegetation, the width is increased during project planning (Appendix M of the Forest Plan).

Adverse affects to riparian areas from recreation use and fire suppression on the Forest are few. Management of riparian areas relative to these activities is minimal.

Past logging practices and improper grazing strategies have had the most impact on riparian areas. Management designed to prevent or decrease degradation occurs more frequently now than in the past.

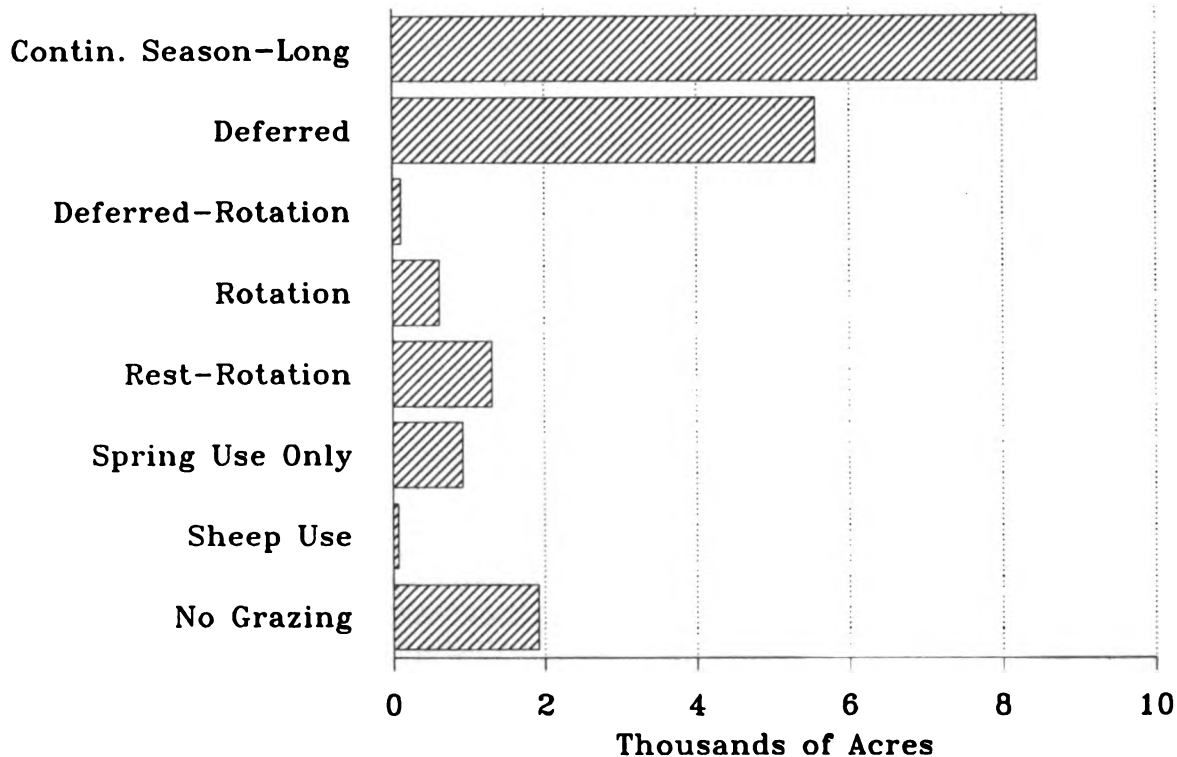
**Timber:** On-the-ground implementation of Best Management Practices (BMPs) and Forest-wide Standards and Guidelines (S&Gs) is ensured by timber sale administrators with the assistance of a watershed specialist when necessary. Timber sale contracts are the instruments through which sale administrators implement BMPs and S&Gs. Past timber harvesting within streamside management zones removed shade vegetation which increased thermal radiation and, in turn, raised water temperatures. As funding becomes available, these problems are corrected. Efforts are also made to correct poor road maintenance and blading which causes sedimentation in adjacent streams.

**Grazing:** With improper management, livestock often graze riparian areas heavily, especially in late summer and fall when little green forage exists elsewhere. Consequently, some uplands are underutilized. In implementing AMPs, two methods are used extensively on the Forest to improve riparian condition by controlling grazing: creating riparian pastures to which specific management systems have been applied; and excluding cattle through fencing (Figure 3-22). To properly manage these areas, additional opportunities include: implementing improved grazing strategies, installing fences to create pasture systems, and adjusting timing and duration of livestock use. While excluding cattle from riparian areas may result in the most rapid riparian improvement, it is the most costly. Riparian areas generally respond quickly to improved management, particularly if timing and duration of use are carefully controlled.

## Concerns

Riparian areas and associated vegetation are essential for dependent resources and water quality. Healthy vegetation along stream banks helps maintain low water temperatures, reduces suspended sediment levels and buffers the effects of animal wastes. If vegetation is removed, the ecological balance of riparian areas is disturbed. Where streambanks fail because protective riparian vegetation is removed, sediment levels in the streams can increase.

Poor livestock distribution and overgrazing in riparian areas is a greater problem than general overstocking of rangelands. Riparian conditions have not improved in

**Figure 3-22. Grazing Management Within Riparian Areas****Grazing Systems**

areas where livestock graze season-long and few or no structural improvements have been made. As riparian vegetation is removed, water quality and fisheries have suffered, water tables have dropped, and hardwoods have completely disappeared.

**Opportunities**

Grazing strategies and structural improvements offer opportunities to improve riparian condition. Grazing strategies which would relieve livestock pressure on riparian areas include (1) grazing livestock in spring or early summer when upland grasses are green and palatable (Ruyle 1977; Salwasser and Shimamoto 1981); (2) rest-rotation or deferred-rotation grazing, which moves livestock from one pasture to another; (3) double-rest rotation, which rests a pasture for two years; (4) substituting sheep for cattle (Platts 1981); (5) short-duration, high-intensity grazing; and (6) exclusion (Ames 1977).

Generally, strategies which sustain grazing are more cost effective in the long term.

Structural improvements include (1) fencing to control grazing; (2) streambank stabilization (Sheeter and Claire 1981); (3) log weir and boulder placement (Claire 1980, Alvarado 1978); (4) constructing check dams; and (5) planting hardwoods. Any structural improvements should be implemented in concert with a suitable grazing strategy. The effects of grazing strategies and structural improvements should be monitored.

Restricting timber harvest in fragile SMZs; applying best management practices in timber sale contracts; and improving road location, construction and maintenance all provide additional opportunities for riparian improvement.

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## 17. Sensitive Plants

### Introduction

The Regional Forester's sensitive plant list is prepared in conjunction with the California Native Plant Society (CNPS), the U.S. Fish and Wildlife Service, and the California Natural Diversity Data Base managed by the California Department of Fish and Game.

No threatened or endangered plants listed under the Federal Endangered Species Act occur on the Forest.

Ten sensitive plant species are known or suspected to occur on the Modoc National Forest (see following table).

The habitat of each sensitive plant species is unique, both geographically and ecologically. Detailed descriptions, population densities and distribution maps for each species are located in the planning records. Because no comprehensive surveys have been conducted, it is likely that additional populations of these and other plants will be located.

### Current Management

All sensitive plant locations are managed according to the policy direction of the Forest Service Manual and the R-5 handbook on threatened and endangered species.

Where known populations or sensitive plant habitats exist on the Forest, a botanical survey is conducted prior to any land disturbing or land exchange activity. Survey procedures and findings are documented in project environmental analysis records. Projects are modified to maintain the integrity of the habitat.

Many Forest activities modify the land or vegetation: recreation site development, land exchanges, timber sales, reforestation, mineral exploration, water impoundments, road and trail construction, livestock grazing, and utility line construction. All potentially disturbing activities are subject to current management policy protecting sensitive plants.

### Opportunities

The Forest will conserve sensitive plant populations by identifying their specific habitats and preventing their disturbance or destruction. The first step is to complete a comprehensive survey of all suitable and potential habitats. Care can then be taken not to adversely affect their habitats and thereby ensure species viability.

The Forest can maintain or increase sensitive plant populations by assessing all planned timber sales and other projects for sensitive plants. The Forest may also need to modify existing grazing uses, change proposed road locations, alter planned timber harvest units, relocate burning unit boundaries, or modify other habitat disturbances. The need for such action is likely only in occasional, isolated situations.

Scientific Name	Common Name	Location on Modoc National Forest <sup>1</sup>	Habitat	CNPS List <sup>2</sup>	R-E-D Code <sup>3</sup>	State/Federal Status <sup>4</sup>	Forest Priority for Species Mgt. Guides
<i>Antennaria flagellaris</i> (A. Gray) A. Gray	Creeping Pussytoes	DHRD DGRD BVRD	Shallow soils associated with low sage flats	2	3-3-1	None/ None	10
<i>Calochortus longebarbatus</i> Wats. Var <i>longebarbatus</i>	Long-haired Star Tulip	BVRD DGRD	Grassy meadows usually along the margin where it is wet in spring and early summer, but becomes somewhat dry in mid- to late summer	1B	1-2-2	None/C2	1
<i>Collomia debilis</i> (Wats.) Green var. <i>larsenii</i> (Gray) Brand	Larsen's Collomia	DHRD	Loose volcanic material	2	3-2-1	None/C3c	9
<i>Eriogonum prociduum</i> Reveal	Prostrate Buckwheat	WMRD BVRD	Dry, rocky volcanic slopes and hills mostly in yellow pine or pinyon woodlands.	1B	2-1-2	None/C2	4
<i>Eryngium mathiasiae</i> Sheikh	Mathias' Coyote Thistle	DGRD	Vernal pools, swales.	4	1-2-3	None/C2	3
<i>Galium glabrescens</i> (Ehrend.) Demp. & Ehrend ssp. <i>modocense</i> Demp. & Ehrend	Modoc Bedstraw	WMRD	Gravelly slopes and under rocks.	1B	2-2-3	None/C2	7
<i>Galium serpenticum</i> Demp. ssp. <i>wamerense</i> Demp. & Ehrend.	Warner Mountains Bedstraw	WMRD	Steep serpentine talus slopes.	1B	3-2-2	None/C2	6
<i>Ivesia paniculata</i> Nelson & Nelson	Ash Creek Ivesia	BVRD	Open volcanic ridges	1B	2-1-3	None/C2	5
<i>Mimulus pygmaeus</i> Grant	Pygmy Monkey Flower	BVRD	Moist soil areas in meadows, along streams and on the muddy soil of desiccating pools or flats.	1B	3-1-2	None/C2	8
<i>Polygonum polygaloides</i> Meissner ssp. <i>esotericum</i> (Wheeler) Hickman	Modoc Knotweed	DHRD	Vernal pools, swales	1B	3-3-3	None/ None	2

\*Footnotes on next page.



## Footnotes for Table of Sensitive Plants:

- <sup>1</sup> BVRD - Big Valley Ranger District  
DGRD - Devil's Garden Ranger District  
DHRD - Doublehead Ranger District  
WMRD - Warner Mountain Ranger District

<sup>2</sup> California Native Plant Society (CNPS) Lists:

- 1A - Plants presumed extinct in California  
1B - Plants rare, threatened, endangered in California and elsewhere  
2 - Plants rare, threatened, endangered in California; more common elsewhere  
3 - Review List - need more information  
4 - Watch List - plants of limited distribution

<sup>3</sup> CNPS R-E-D (rarity, endangerment, distribution) Code

- R (Rarity)  
1 - Rare, but found in sufficient numbers and distributed widely enough that the potential for extinction is low at this time.  
2 - Occurrence confined to several populations or to one extended population.  
3 - Occurrence limited to one or a few highly restricted populations, or present in such small numbers that it is seldom reported.

E (Endangerment)

- 1 - Not endangered  
2 - Endangered in a portion of its range  
3 - Endangered throughout its range

D(Distribution)

- 1 - More or less widespread outside California  
2 - Rare outside California  
3 - Endemic to California

<sup>4</sup> State/Federal Listing:

- CE - State listed, endangered  
CR - State listed, rare  
CT - State listed, threatened  
FE - Federally listed, endangered  
FT - Federally listed, threatened  
C1 - Enough data are on file to support the federal listing  
C1\* - Enough data are on file to support federal listing, but the plant is presumed extinct  
C2 - Threat and/or distribution data are insufficient to support federal listing  
C2\* - Threat and/or distribution data are insufficient to support federal listing; plant presumed extinct  
C3a - Extinct  
C3b - Taxonomically invalid  
C3c - Too widespread and/or not threatened

## 18. Soils

### Introduction

Soil directly or indirectly supports all other resources. It serves as a growth medium for plants, filters biological and chemical substances and regulates water transmission. Long-term productivity of most Forest resources is dependent upon the soil resource.

Soils on this Forest are of volcanic origin consisting of basalt, andesite, tuff, pyroclastic pumice, cinders, and ash of various geologic ages. About two-thirds of the Forest is situated on the Modoc Plateau Geomorphic Province which is primarily composed of basalt-capped plateaus with nearly level to gently sloping topography. The remaining third is on mountain uplands. Over one hundred soil types have been identified on the Forest at the series, family, or higher taxonomic level, and have been grouped into 207 soil mapping units (Luckow 1984; USDA-SCS 1974).

### Current Management

Direction for soils and watershed management are contained in many federal laws. The Organic Act of 1897 requires protection of natural resources including soils and water. A major goal for soil resource management is long-term maintenance of soil productivity and watershed protection. This requires avoiding management actions that would irreversibly impair soil productivity, and monitoring soil productivity to detect significant changes caused by management actions. Maintaining soil productivity also requires restoring or improving soils in areas where they have been degraded.

The Resource Planning Act (RPA) of 1980 directs the Forest Service to restore all backlog restoration lands in the National Forest System by the year 2000. The Forest interprets the RPA to mean that all actively degrading watershed (soil) acres must be corrected or restored by the year 2000. The Watershed Improvement Needs (WIN) Inventory on the Modoc shows almost 17,000 backlog acres which are in need of improvement.

Current management includes providing input into environmental analysis, normally through a field-verified Soil Resource Inventory (SRI) Order 3, and recommending proper Best Management Practices (BMPs) and other project-specific mitigation measures for soil and watershed protection. Controlling soil erosion and compaction and maintaining nutrient balance during timber harvest, reforestation, range grazing, vegetative manipu-

lation, and post-fire rehabilitation is vital to long-term timber and range productivity and protection of downstream water quality. The field-verified SRI 3 provides soil resource information to adequately document soil characteristics, their capabilities and limitations for most proposed work on the Forest.

Current management focuses on reducing soil erosion and compaction and maintaining nutrient balance. Practices include maintaining ground cover to reduce soil loss, limiting heavy equipment use on moisture sensitive soils, prescribing low- to moderate-intensity fires to reduce during wet weather, loss of nutrients and soil structure, and applying fertilizer to timbered soils with low nutrients.

### Productivity

About 67% of the Forest (approximately 1,121,190 acres) is capable of producing primarily forage for livestock and wildlife. The soils are non-forested or produce < 20 cubic feet per acre per year of timber at culmination of mean annual increment (CMAI). Over 776,300 acres are shallow (4-20") soils: Pass Canyon, Deven, Bieber, Puls, Bakeoven, Roval, Stukel, Indian Creek, and Packwood soil families, and Lithic Xerorthents. Most of these soils are located on the vast Modoc Plateau Geomorphic Province. Table 3-8 lists the potential soil productivity of major soil types found on the Forest.

The average yield of forage, on an air-dry weight basis, is 300 pounds per acre per year.

Shallow soil areas often have rocky surfaces with low sagebrush, poorly growing western juniper, and short season bunchgrasses. Most of these shallow soils receive an average annual precipitation of 10-18 inches, and are incapable of commercial timber production.

Over 100,000 acres of rangeland soils are moderately deep (20-40") or deep (> 40"), and located primarily on the Modoc Plateau. They are also incapable of commercial timber production because of insufficient precipitation, poor drainage, or prolonged spring flooding. These acres are composed of Supan, Los Gatos, Ridd, Simpson, Cowiche, Cardon, Aikman families, and Aquolls, and Xerfluvents.

About 200,000 acres of rangeland soils are located in the uplands of the Warner Mountain and Big Valley Ranger Districts. These soils are not capable of commercial timber production because of (1) shallow or rocky soils which do not hold enough water; (2) warm and dry aspects (exposure); (3) low precipitation; (4) short growing season; (5) severe windswept exposure; or (6) soil

**Table 3-8. Potential Soil Productivity.**

Major Soil Families or Higher Soil Taxa	Timber Productivity in Cu. Ft./Ac./Yr. at CMAI <sup>1</sup>	Average Yearly Range Forage Production in Lbs./Ac. (air dry)	Forest Acres	% of Forest
Alcot-loamy phase; Germany; Sadie	120-165	50-100	7,800	0.5
Smarts; DeMasters; Lamondi; Stonewell; Yallani	85-120	50-100	106,950	6.4
Lawyer; Elmore; Jacket; Menzel; Holland	50-85	50-150	206,450	12.4
Hiibner; Fordice; Kinzel; Wuksi; Wapal; Supervisor	20-50	50-150	171,250	10.3
Aquolls; Cryoborolls-wet	0	1,160	22,550	1.4
Cardon; Gallatin; Behanin-moderately deep	< 20	610	28,100	1.7
Supan; Los Gatos; Manilla	0	450	109,850	6.6
Anatone; Deven; Bieber; Pass Canyon; Gwin; Cheadle	< 20	300	776,300	46.6
Aikman; Puls; Indian Creek; Lithic Xerorthents	0	170	184,250	11.1
(Nearly barren miscellaneous land types)	0	< 50	39,650	2.4
Water	0	0	10,200	0.6
<b>Total Acres</b>			<b>1,663,300</b>	<b>100%</b>

<sup>1</sup> CMAI - Culmination of Mean Annual Increment

which remains too wet. Soil types in these areas include Anatone, Bearskin, Cheadle, Gwin, Behanin, Gallatin, Manilla, Merlin, Deven, and Pass Canyon families, Cryoborolls wet, and the Supervisor family (above 8,000 feet).

Nearly 50,000 acres (3% of the Forest) are classified non-productive barren or nearly barren miscellaneous land, such as rock outcrops, rubbleland, lava flow rock, or large open areas of water.

About 492,480 acres (30% of the Forest) are capable of producing timber of at least 20 cubic feet per acre per year at CMAI. The Germany, Sadie, and Alcot (loamy

phase) families are the most productive timber soils on the Forest and comprise about 7,800 acres. These soils are located on the south end of the Medicine Lake Highlands between 4,200 and 5,300 feet where the growing season lasts 100-120 days and precipitation is about 25 inches. These soils support mixed conifer and can produce 120-165 cubic feet per acre per year at CMAI.

The next best timber producing lands occur at 5,300-7,500 feet in the Medicine Lake Highlands on the Doublehead Ranger District, and on the Warner Mountain and Big Valley Districts. Comprising 107,000 acres, these soils support predominantly true fir or mixed conifer, and can produce 85-120 cubic feet per acre per year

at CMAI. Yearly precipitation ranges from 20 to more than 30 inches, and the frost-free growing season lasts 60-90 days. Major soil types associated with these areas are the Smarts, DeMasters, Lamondi, Stonewell, and Yallani families.

About 206,470 acres of timbered land are on the Modoc Plateau Geomorphic Province. Annual precipitation ranges from 16-25 inches, and the frost-free growing season lasts 80-110 days. Physiography ranges from nearly level to undulating topography of 0-10% slopes. Vegetation is typically eastside pine. The major soil types (Lawyer, Elmore, Jacket, Menzel and Holland families) are deep and can produce 50-85 cubic feet per acre per year at CMAI.

Soils capable of producing 20-50 cubic feet of timber per acre per year at CMAI are scattered throughout the Forest over 171,000 acres. Soil productivity is severely limited by (1) low precipitation; (2) short growing seasons; (3) warm, dry southerly exposures; (4) little capacity to hold water; or (5) low nutrient supply. Major soil types in these areas are the Hiibner, Fordice, Kinzel, Wuksi, Wapal, and Supervisor families, and the moderately deep Lawyer, Elmore and Jacket families.

## Soil Concerns

Primary concerns for sustained soil productivity on the Forest include:

**Erosion**—Without adequate soil cover, about 350,000 acres have a high or very high Erosion Hazard Rating (EHR). Most of this acreage is located on the Warner Mountain and Big Valley Ranger Districts. Currently, almost 10,000 acres are experiencing various kinds of accelerated erosion (see WIN Inventory in the Soils Analysis of the Management Situation, Planning records).

Many opportunities exist to minimize soil erosion, such as tractor yarding only on slopes less than 40%; yarding unutilized material; lopping and scattering; broadcast burning slash on soils with high EHR; limiting livestock grazing; and restricting OHV use.

**Demand**—The demands for those yields directly dependent on soil productivity are discussed in the Wildlife, Range and Timber Sections of this chapter. Soil erosion also affects water quality and, therefore, recreation demand. Degraded water quality lowers recreational experiences associated with water such as boating, fishing, camping and swimming.

**Cumulative Watershed Impacts**—About 290,000 acres have a high potential for cumulative watershed

impacts. This represents 28 third or fourth order watersheds, mostly on the Warner Mountain Ranger District.

**Mass Movement**—About 16,000 acres have been rated as having a high potential for mass movement.

**Compaction**—When wet, nearly all soils are subject to compaction by heavy equipment operation or livestock use. Many pine plantations and some of our rangelands have serious compaction problems.

**Fertility**—Recent timber stand soil and foliar analysis data suggests that perhaps 150,000 acres of timber land may have low amounts of plant available nitrogen, phosphorus or sulfur, or a combination of these in low amounts. Current Regional guidelines predict a 30% to more than 100% increased growth response to nitrogen fertilization. Over the past two years about 3,500 acres of timber lands have been fertilized.

**Conifer Seedling Survival**—Over 150,000 acres of timberland has been rated with a low or very low chance of conifer seedling survival. Most of these acres are on lower elevation soils in areas of low precipitation and long, hot and dry summers.

**Soil Displacement**—Two to eight inches of topsoil is displaced on about 6,500 acres in 10- to 30-year-old ponderosa pine plantations. That means the topsoil has been removed from planting sites and windrowed nearby. Soil chemical analysis and direct tree growth measurements indicate a 20-50% loss in productivity. The more topsoil that is displaced, the greater the loss in soil productivity. Recently over 500 acres of these plantations have had windrowed topsoil redistributed to regain productivity.

## Opportunities

Opportunities exist to mitigate these impacts by implementing Forest-wide Standards and Guidelines (Plan Chapter 4) designed to minimize potential erosion or compaction, and enhance soil production.

## Data Availability and Reliability

By November 1981, all Forest land had been surveyed SRI Order 3 level, the most intensive level of reconnaissance soil survey. The draft report was completed in 1984. A separate soil survey mapped by the Soil Conservation Service (SCS) (USDA SCS 1974) includes 105,000 acres of the Forest on the east side of the Warner Mountain District. These acres received approximately the same Order 3 level of survey intensity. Reports are available at the Supervisor's Office.

For broad Forest planning, the SRI Order 3 and the SCS soil surveys provide resource managers with sufficient information. More detailed surveys, such as SRI Order 2, are needed for projects which may significantly disturb the soil. Such projects include timber sales, reforestation, road construction, and vegetation manipulation projects.

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## 19. Special Interest Areas

### Introduction

Special Interest Areas (SIAs) are those recognized by the Forest Service as having special significance for recreational, scientific, cultural, or educational use. These areas are set aside and protected for their scenic, historical, geological, botanical, zoological, paleontological or other special characteristics with an emphasis on public use, study, and enjoyment.

Officially designating an SIA begins with the Forest Supervisor's recommendation. The Regional Forester's approval of the Forest Land Management Plan signifies approval of recommended SIAs. Each formally designated area is managed with its own set of standards and guidelines which may range from no special management to seasonal restrictions on certain activities to year-round prohibitions on all activities.

### Cultural Resource Special Interest Areas

The Modoc National Forest has areas with potential for designation as Cultural Resource SIAs. The goals of the Cultural Resource SIA program are to prevent loss or damage to cultural resources, to integrate the cultural resource program with multiple use management, to facilitate scientific study in an effort to gain knowledge of past human behavior, and to provide interpretation so the public can gain understanding and perspective of our heritage.

Currently, the Modoc National Forest has no designated Cultural Resource SIAs. However, seven cultural resource sites are listed in the National Register of Historic Places (NRHP). Eight additional areas of cultural resource value qualify for nomination to the NRHP. All 15 sites could be considered for designation as Cultural Resource SIAs. Numerous other areas have been inventoried for cultural resource values, and may qualify as candidates for SIAs. As future inventories or studies are completed, they may reveal more candidates.

Seven cultural resource (archaeological) sites are on the Devil's Garden Ranger District, and were entered in the NRHP between 1974 and 1976:

- Anklin Village Archaeological Site
- Black Cow Spring
- Cuppy Cave
- Mildred Ann Archaeological Site
- Seven Mile Flat Site
- Skull Ridge
- Skull Spring

Appendix N offers detailed cultural and historical information as well as the geological and biological setting for each site.

Numerous areas are eligible for both nomination to the NRHP and for recommendation as Cultural Resource SIAs. Chief among those areas which have had previous cultural resource inventory work or study are the following:

- Big Sand Butte: Modoc War and Archaeological District
- Fairchild Swamp Archaeological District
- High Grade Mining District
- Battle of Dry Lake: Modoc War and Archaeological District
- Battle of Scorpion Point: Modoc War and Archaeological District
- Captain Jack's Capture Site
- Boles Creek Rock Art District
- Blue Mountain Obsidian Quarry

Each area is also described in Appendix N.

Land management activities in the vicinity of properties listed in the NRHP are generally conducted in a manner that will not cause degradation to the properties.

No conflicts with other resources exist on the Forest, primarily because there are currently no designated Cultural Resource SIAs. However, conflicts could be created as a result of increased firewood activity within areas of potential designation. Scientific information from the sites could be lost through surface disturbance by woodcutters. Surface artifacts could be illegally collected in conjunction with wood gathering. The Forest could close potential SIAs to firewood gathering activities to protect sites. Another protection measure is assigning firewood

cutting areas in dispersed patterns outside potential SIAs.

Many potential Cultural Resource SIAs could have interpretive facilities such as information stations and self-guided tours. The Forest could offer pamphlets and maps to encourage public awareness, education and enjoyment of cultural resources.

## Geological Special Interest Areas

The Regional Forester has approved three designated Geological Special Interest Areas on the Modoc National Forest for their unique geologic features: Burnt Lava Flow, Medicine Lake Glass Flow and Glass Mountain Glass Flow. All are located within the Medicine Lake Highlands geomorphic province (Figure 3-23).

### Burnt Lava Flow

The Burnt Lava Flow, encompassing 8,760 acres, is situated in Siskiyou County. The Burnt Lava Flow is an excellent example of very recent vulcanism (less than 200 years old) appearing as chaotic jumbles of basaltic blocks. Geologically, the Burnt Lava Flow is composed of three separate flows. One is a highly oxidized lava, another is a fairly smooth pahoehoe, and the third is a broken pahoehoe flow. The flows were very viscous at the time of eruption and merged together without forming discernable boundaries. As the lava flowed onto the surface, it surrounded three older cinder cones.

These cinder cones are now islands in the flow area, covered with conifer vegetation. High Hole crater is a semi-barren cinder cone rising 386 feet above the lava flow. The crater itself is approximately 150 feet deep. These islands of timber, undisturbed by human activities and protected from outside fires by the lava flow, should become valuable for future study of the mixed conifer type.

### Medicine Lake Glass Flow

The Medicine Lake Glass Flow, encompassing 570 acres, is also located in Siskiyou County. The Medicine Lake Glass Flow is a recent stony to glassy black dacite flow that is located on the floor of the Medicine Lake caldera. The thickness of the flow varies from 50 to 150 feet. Although the exact source of the flow is not known, it exhibits the dynamics of low-viscosity lava. The margin of the flow is very blocky and gives a talus slope appearance.

### Glass Mountain Glass Flow

The Glass Mountain Flow, encompassing 4,210 acres, is primarily situated in Siskiyou County with a small

portion in Modoc County. The Glass Mountain Glass Flow is geologically unique for North American geology. It exhibits the results of multi-stage volcanic activity so recent that there has been no modification by weathering, erosion, or vegetative cover.

The first eruption was along fissures that run north and northwest which ejected pumiceous material in the lapilli and ash sizes. This eruption produced steep-sided cones followed by pumice eruption lava extrusions. The first was a stoney to blocky dacite succeeded by glassy dacite and rhyolite, followed by a rhyolite obsidian. Volcanic lava extruded from the walls of the pumice cones, destroying the cones except those located at the extreme southern edge of the flow.

All three Geologic Special Interest Areas could have interpretive facilities such as information stations and self-guided tours. Access to the areas should be visible to visitors from Medicine Lake, as well as surrounding highways. In addition, pamphlets and maps could be prepared by the Forest for public distribution at all Forest offices.

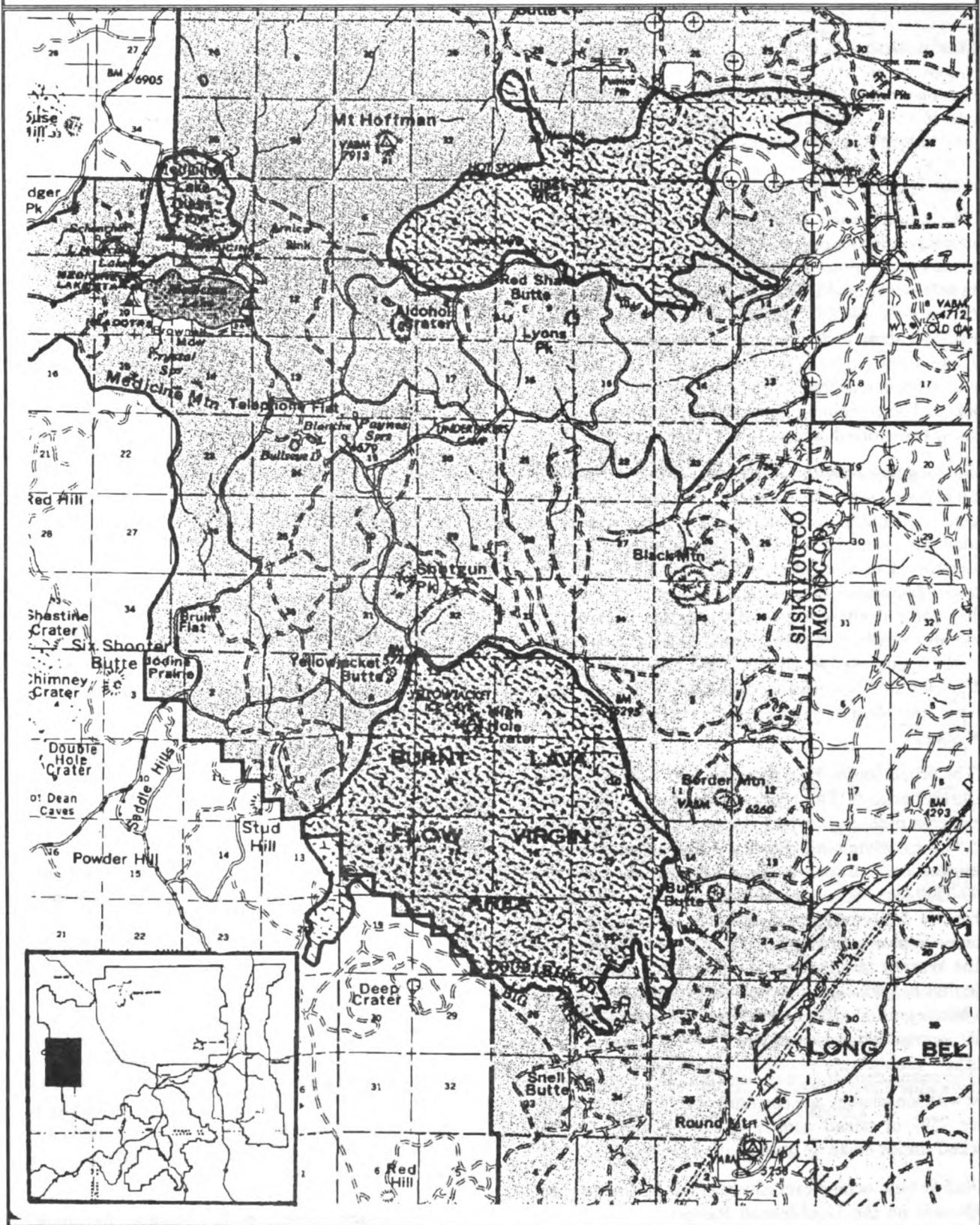
The Forest will maintain an open file for any future Geologic Special Interest Area. The source of information may be from Forest personnel, the general public, special interest groups, or the scientific community.

The National Natural Landmark (NNL) program and Research Natural Area (RNA) obligations for geologic elements are two other programs which affect the Forest's three Geologic Areas. Administered by the National Park Service (NPS), the NNL program accepts areas possessing national geologic or ecologic significance (Appendix F). All three areas were identified through NPS Theme Studies as potential NNLs.

## Botanical Special Interest Areas

Areas on the Modoc NF with potential for designation as Botanical Special Interest Areas include Dismal Swamp in the north Warner Mountains. This meadow/marsh/riparian forest complex boasts an assemblage of riparian plant communities unique to California. The most notable plant community is the birch (*Betula glandulosa*) riparian shrub community. Bog birch is common in northerly habitats, but unknown in the rest of California.

Figure 3-23. Geological Special Interest Areas





## 20. Timber

### Introduction

Commercial conifer types are found on 40% of the Forest (639,942 acres). Eastside pine, mixed conifer, red fir and lodgepole pine comprise the four major types.

### Timber Type Descriptions

The *eastside* pine type, growing at 4300-5500 feet, contains ponderosa pine and Jeffrey pine. Associates are incense cedar, white fir, western white pine and sugar pine with occasional California black oak. Eastside pine occupies 64% (405,422 acres) of the Forest's timberlands, with about half of the stands averaging 70-90 years old and mostly poorly stocked. Another third of the stands are older, averaging 120-130 years old, also poorly stocked. The remaining lands (14%) are either plantations or two-storied older stands (Table 3-9).

Past logging activities in the eastside pine type have left it in poorly stocked condition. Some cutting practices which contributed to understocking many stands included sanitation and overstory removal with insufficient understory. These activities, in addition to fire and other natural phenomena, have created an open appearance. Other stands occur in this condition naturally. However, these are usually clumps of heavily stocked trees separated by openings of shrub vegetation. Some examples of old-growth stands consisting of yellow-plated bark trees are present. Most large trees are scattered remnants of past stands.

The *mixed conifer* type occupies 31% (200,401 acres) of the timberlands. This type consists of white fir, red fir, ponderosa pine, Jeffrey pine, incense cedar, sugar pine, and western white pine. Black oak and aspen are found in association with these conifers. Mixed conifer grows at 5500-7500 feet. Stands are composed primarily of ponderosa or Jeffrey pine and white fir, although species composition varies throughout the Forest. Mixed conifer in the Warner Mountains contains much western white pine, but has no sugar pine or red fir. Mixed conifer in the Medicine Lake Highlands, however, contains sugar pine, incense cedar and red fir.

The mixed conifer type is older than the eastside pine type with a narrower age class distribution (Table 3-10). Over 75% of mixed conifer is 120-130 years. Poorly stocked stands make up about half of the type.

*Red fir* type occurs exclusively in the Medicine Lake Highlands on the Doublehead Ranger District higher than 5500 feet. Red fir comprises the smallest component

of the timber types (2%, 13,425 acres). Most red fir stands are heavily stocked (Table 3-11).

*Lodgepole pine* type, occurs mostly in pure stands starting at 6000 feet, but sometimes is associated with true firs and western white pine. The lodgepole pine type occupies only 3% (20,694 acres) of Forest timberlands. Size classes are not differentiated for this type.

In summary, the significant features of Forest timberlands are:

- About two-thirds of the land base is poorly stocked;
- 10% of the land base is plantations; and
- About two-thirds of the land base is 70-120 years (Table 3-12).

### Land Classification for Timber Management

Tentatively suitable timberlands are:

- forested and currently producing or capable of producing crops for industrial wood;
- not withdrawn from timber production by Congress, the Secretary of Agriculture, or the Chief of the Forest Service;
- not prone to irreversible soil, productivity, or watershed damage when the appropriate technology is used; and
- capable of being adequately restocked within 5 years after final harvest.

Of the Forest's 639,942 acres of timberland, 611,396 acres plus 7,862 acres of nonstocked land (97%) are tentatively suitable for timber production (Table 3-13).

Of the suitable acres, 7,862 acres are non-stocked. Approximately 5,800 acres of non-stocked timberland are in soil types which are capable of producing commercial trees, but are dominated by other vegetation. Currently, the land is economically unsuitable for producing timber. Land managers will monitor non-stocked lands to determine their suitability for regeneration.

The remaining 2,000 acres are unstocked to provide diversity, wildlife forage, and fuel breaks in the Scarface and Gerig wildfire areas which burned in 1977. Habitat conditions in these areas will be monitored for change to determine an appropriate time for regeneration. The Minimum Management Prescription is applied to all 7,862 non-stocked acres.

The procedure to determine suitability for timber management is described in Appendix O of the EIS.



**Table 3-9. Eastside Pine Age and Size Class Distribution.**

Description	Stratum Label	Average Age <sup>1</sup>	Acres	(%)
Plantations, seedlings, saplings, good stocking	PLG	10 <sup>2</sup>	40,513	(9%)
Plantations, seedlings, saplings, poor stocking	PLP	10 <sup>2</sup>	16,001	(4%)
Poles and small sawtimber, good stocking	P3G	90	40,202	(10%)
Poles and small sawtimber, poor stocking	P3P	70	168,207	(42%)
Medium and large sawtimber, good stocking	P4G	130	28,069	(7%)
Medium and large sawtimber, poor stocking	P4P	120	109,967	(27%)
Two-storied stand	P6G	110-230	2,463	(1%)
<b>Total</b>			<b>405,422</b>	

<sup>1</sup> Average age is equal to the basal areas weighted age.

<sup>2</sup> Plantations are 1-50 years old. As a matter of convenience they were assigned ages of 10 years.

**Table 3-10. Mixed Conifer Age and Size Class Distribution.**

Description	Stratum Label	Average Age	Acres	(%)
Saplings	M1X	10	9,460	(5%)
Poles and small sawtimber, good stocking	M3G	120	54,840	(27%)
Poles and small sawtimber, poor stocking	M3P	130	64,198	(32%)
Medium and large sawtimber, good stocking	M4G	180	36,516	(18%)
Medium and large sawtimber, poor stocking	M4P	130	31,580	(16%)
Two-storied stand	M6G	90-490	3,807	(2%)
<b>Total</b>			<b>200,401</b>	

On suitable timberlands capable of producing greater than 20 cubic feet per acre per year (> 20 lands), full (Regulation Class I), modified (Regulation Class II), and limited (Regulation Class III) timber management can be practiced. Full or modified management can be used on 435,103 acres (70%) of the suitable timberlands where natural or artificial regeneration is used to achieve stocked stands. Even-aged regeneration cutting methods

are appropriate here, including clearcutting, seed tree, and shelterwood cutting. Intermediate cutting methods are also used, primarily for commercial thinning. Uneven-aged management may also be appropriate — either group selection (preferred) or single-tree. (Appendix P discusses silvicultural methods in detail.)

**Table 3-11. Red Fir Age and Size Class Distribution**

Description	Stratum Label	Average Age <sup>1</sup>	Acres	(%)
Poles and small sawtimber, good stocking	R3G	140	5,099	(38%)
Poles and small sawtimber, poor stocking	R3P	110	3,897	(29%)
Medium and large sawtimber, good stocking	R4G	160	3,208	(24%)
Medium and large sawtimber, poor stocking	R4P	170	1,221	(9%)
<b>Total</b>			<b>13,425</b>	

**Table 3-12. Timber Age and Size Class Distribution**

Description	Stratum Label	Average Age	Acres	(%)
Plantations, seedlings, saplings, good stocking	PLG, M1X	10	49,999	(8%)
Plantations, seedlings, saplings, poor stocking	PLP	10	16,001	(2%)
Poles and small sawtimber, good stocking	P3G, M3G, R3G, LXX	90-140	120,809	(19%)
Poles and small sawtimber, poor stocking	P3P, M3P, R3P	70-130	236,301	(37%)
Medium and large sawtimber, good stocking	P4G, M4G, R4G	130-180	67,793	(11%)
Medium and large sawtimber, poor stocking,	P4P, M4P, R4P	120-170	142,768	(22%)
Two-storied stand	P6G, M6G	90-490	6,270	(22%)
<b>Total</b>			<b>639,942</b>	

Suitable timberlands also include 184,155 acres (30%) of land producing less than 20 cubic feet per acre per year (< 20 lands). These lands were included as suitable because past experiences shows that it is possible to manage less productive lands on a sustained yield basis. Timber management on < 20 lands is basically opportunistic.

Trees are harvested only when sufficient understory trees are present, and when snag numbers and minimum management requirements (MMRs) are met. These areas are treated as non-interchangeable components of the allowable sale quantity, where outputs and allocations are not comingled with > 20 land outputs.

**Table 3-13. Timberland Classification**

Classification		Acres	% of Forest
<b>1</b>	<b>Total National Forest</b>	1,663,320	100%
<b>2</b>	<b>Non-Forest Land</b>	505,024	30%
	Includes rangeland vegetation, meadows, water, barren areas, rock, and developed areas.		
<b>3</b>	<b>Forest Land</b>	1,158,296	70%
	Item 1 less Item 2.		
<b>4</b>	<b>Forest Land Withdrawn From Timber Production</b>	28,604	2%
	Forest lands withdrawn by Act of Congress, the Secretary of agriculture, or the Chief of the Forest Service. Includes the South Warner Wilderness.		
<b>5</b>	<b>Forest Land Not Capable of Producing Industrial Wood</b>	492,594	30%
	Available forested land with species not currently utilized such as western juniper, aspen, black oak, and white-bark pine.		
<b>6</b>	<b>Forest Land Physically Unsuitable</b>		
	a. Irreversible damage to soils, watershed, or productivity likely to occur.	0	0%
	b. Cannot be adequately restocked within 5 years of final harvest	17,840	1%
<b>7</b>	<b>Forest Land For Which Information is Inadequate To Predict Response</b>	0	0%
<b>8</b>	<b>Tentatively Suitable Forested Land</b>	619,258	37%
	Item 3. less Items 4, 5, 6, and 7.		
	a. > 20 cu. ft. lands	435,103	26%
	b. < 20 cu. ft. lands	184,155	11%
<b>Note:</b> Additional acreage may be identified as inappropriate for timber production if (1) management requirements in 36 CFR 219.27 cannot be met, or (2) if use of these lands for timber production would not be cost efficient over the planning horizon (see Chapters 2 and 4.)			

### Site Productivity

Site productivity is a measure of volume produced at the culmination of mean annual increment (CMAI). Productivity is estimated by tree height and age.

Low productivity classes dominate the Forest (Table 3-14). The average site class for eastside pine and mixed conifer is R5 Dunning site class 4, and red fir is site class 3. Timber yield tables corresponding to these site classes are used in the analysis.

**Table 3-14. Distribution of Site Productivity Classes on Tentatively Suitable Timberlands (1980 Timber Inventory).**

R5 Dunning Site Class	Potential Growth MAI @ Culmination (Cu. Ft./Ac./Yr.	Suitable Timberlands <sup>1</sup> (Acres)	(%)
	Less than 20	184,155	30
5	20-49	156,432	25
3/4	50-84	229,780	37
2	85-119	47,634	8
1	120-164	1,257	< 1
1A	165-224	0	0
<b>Total</b>		<b>619,258</b>	

<sup>1</sup> Acreage estimates are based on the percentages of timber inventory plots found in various site classes.

### Current Management

Current direction for timber management was established in the Modoc National Forest Timber Management Plan and the accompanying Final Environmental Statement (1975).

### Land Use Classification and Programmed Allowable Harvest

The 1975 Timber Management Plan classified 557,000 acres as commercial forest land (CFL). CFL is further divided into four components: standard (48%), special (14%), marginal (26%), and unregulated (12%). Standard component refers to land where industrial wood production and harvest is emphasized with basic protection provided for soil productivity and water quality.

Special component refers to timberland where special timber management treatments are designed to achieve landscape or other resource objectives as well as basic protection for water quality and soil productivity. Marginal component refers to timberland not suitable for the standard or special components because of high costs, low product values, or intensive soil and water protection requirements. Unregulated component refers to timberland where recreation or administrative sites and front or crest zones are located.

The estimated CFL yield for the decade between 1975-1986 was an programmed allowable harvest of 62.3 MMBF per year (Table 3-15).

**Table 3-15. 1975 Timber Management Plan: Programmed Allowable Harvest Statement**

Yield Component & Treatment Category	M Acres	Harvest MMBF/Yr.	
<b>Standard – Total</b>	5.2	46.7	(75%)
Regeneration	1.8	22.7	
Intermediate	1.9	13.7	
Overstory Removal	1.5	10.3	
<b>Special – Total</b>	6.1	14.5	(23%)
<b>Marginal – Total</b>	12.0	1.1	(2%)
Steep Slopes	0.5	0.2	
Shallow Rocky Soils	2.5	0.9	
Unstable Soils	0.1	Nominal	
Hardwoods and Noncommercial Conifers	8.9	Nominal	
<b>Total</b>		<b>62.3</b>	

With improved forest management and analytical methods over the last decade, the Forest identified several shortcomings with the 1975 Timber Management Plan:

- It overestimated yield on lands which actually produced < 20 cu. ft. per acre per year, an error which was carried into targets for the 1980 Resources Planning Act (RPA) Program.

- It had no soil inventory to identify soils with low productivity. Therefore, low productivity soils were included in standard and special and marginal component lands.
- Potential yields for special and marginal components were not modeled. Rather, potential yield from the standard component (which was modeled in TIMBER RAM) was used for special component lands. Marginal component yields from the programmed allowable harvest were reduced to historic harvest levels.
- Because minimum management requirements (MMRs) were instituted after the 1975 Timber Management Plan, the Plan did not include them.

### Silvicultural Practices

**Harvest Practices** – Harvest practices under the timber management plan are based on even-aged management. Regeneration cuts (shelterwood and clearcutting methods), intermediate cuts, and overstory removal are used in the standard component. Selection cutting is used in other components.

Between 1976 and 1984, harvested acres and volume were very similar to the acres and volume planned in the 1975 timber management plan. Timber volume harvested exceeded planned volume by 4%, while acres treated were 10% fewer than planned. However, acres and volume harvested by component and treatment varied widely from the original plan based on four factors.

First, the Scarface and Gerig fires of 1977 created many acres requiring salvage logging (47,000 acres). These salvage acres are part of the 60,700 acres of regeneration harvest that occurred from the standard component between 1976 and 1984. Only 17,000 acres were planned for regeneration. This volume, however, was 10% less than planned (191.2 MMBF versus 211.8 MMBF) because of lower merchantable volumes per acre in salvage logging.

A second factor was the large acreages of overstory removal harvest. Overstory removal was used on 62,100 acres, which was 48,200 acres more than planned. This harvest contributed nearly half the volume harvested from standard component lands and was 142% higher than planned for that treatment type. In many cases the overstory removal treatment was applied incorrectly; residual stands were left understocked.

Another factor was the scheduled treatments for intermediate thinnings which produced much less volume than anticipated. While 33% more acres were treated than planned for, only 42% of the volume was generated.

The final factor was the scheduled treatments in the special and marginal component. Only 28% of the planned acres were actually harvested, but 89% of the volume was produced.

The cumulative effect of all these factors was to harvest nearly three times more acres in the standard component than planned, while only treating 28% of the special and marginal components. The residual effect left many acres of the standard component in an understocked condition, which will make future timber sales less economical.

In summary, the major concerns with the current harvest practices are:

- the effects of large, catastrophic fires;
- the low volumes per acre realized after harvesting in the standard component;
- the higher than planned number of acres entered in the standard component;
- the large volume of timber harvested through overstory removal; and
- the lack of reliable volume estimates for special and marginal component lands.

**Site Preparation** – After regeneration harvest or brush conversion, the land must be cleared to provide mineral soil for natural seeding when using the shelterwood system. Clearing also removes competing vegetation from planted seedlings. Site preparation is done mechanically, chemically, with prescribed fire, or by combining these techniques. Mechanical site preparation (typically tractor piling or brushraking) in combination with chemical treatments is most common. Brush crushing is sometimes done before broadcast burning.

Results from site preparation have been mixed. Site preparation practices during the 1950's and 1960's consisted of stripping grass and brush from the soil surface with a straight blade. When top soil disturbance was minimal, plantations grew successfully. When disturbance resulted in windrows, plantation growth was inhibited.

Site preparation to replant areas burned by the Scarface, Twin, and Gerig fires was the largest effort ever made on the Forest. Chemical use to control competing vegetation increased significantly. Annual grasses were controlled, but the chemicals used were not as effective on perennial grasses and brush on some sites. Where perennial grasses and brush thrived, tree seedling survival and growth rate were low. Planting one-year-old

seedlings instead of two-year-old seedlings also contributed to poor survival.

Before 1984, when Forests were ordered to stop herbicide application, chemical use in combination with mechanical site preparation improved plantation success. The Regional Forester released the final EIS for Vegetative Management for Reforestation in February 1989. He selected the alternative which emphasizes local management flexibility. In this alternative, all vegetation management methods including herbicides may be used for controlling competing vegetation to ensure adequate seeding establishment and growth of young trees. The Forest will also continue to use mechanical site preparation and broadcast burning.

Our experiences with site preparation have surfaced several concerns:

- Determining the minimum site preparation treatments necessary to successfully establish plantations is difficult. Over-preparation is always an option, but an unnecessary expense and impact to other resources. On the other hand, under-preparation and subsequent plantation failure are more costly than over-preparation.
- Burning is an effective method in combination with mechanical or chemical treatments. But days with appropriate weather conditions are limited.
- Gaining control of the site until seedlings are established and free to grow reduces or eliminates forage normally used by big game and livestock.
- Herbicides are often the cheapest and most effective treatments for site preparation.

**Reforestation** — One- or two-year-old ponderosa and Jeffrey pine seedlings are usually planted after clearcutting. Incense cedar, sugar pine, and white fir are planted less often. Planted seedlings are grown from seeds collected on the Forest according to zone and elevation.

Overall, establishing timber stands through planting has been successful. The only shortcomings have been high mortality of one-year-old stock and the infrequent occurrence of optimum weather conditions. Using two-year-old stock has reduced seedling mortality, and better planning and preparation has improved timing for planting.

Natural seeding can be used on lands managed under the shelterwood system. Successfully establishing a stand using natural regeneration depends on a well-prepared site, a good seed crop, and favorable weather conditions. To date, these conditions have been infrequent and the effectiveness of natural seeding poor. On this Forest

shelterwood cutting in combination with planted seedling versus natural seeding would be successful. However, clearcutting in combination with planted seedlings would be at least as successful and more cost-effective.

**Timber Stand Improvement** — Timber stand improvement (TSI) includes suppressing competing vegetation (release), thinning young stands (precommercial thinning), protecting seedlings from animal damage, and fertilization. TSI benefits include increased vigor, growth, and reduced susceptibility to insect damage and disease.

Applying herbicides is frequently the preferred method to suppress competing vegetation because it is less expensive and more effective than other methods, and is necessary for intensive timber management. But the Forest also hand-cuts brush in selected areas. From 1976 to 1985, the Forest released an average of 1,423 acres per year. From 1976 to 1984, six herbicides (Atrazine; Dalapon; Glyphosphate; Hexazinone; 2,4-D; and 2,4,5-T) were used during plantation site preparation and plantation release on 29,000 acres. Since 1984, herbicides have not been used.

Most TSI on the Forest is precommercial thinned by chainsaw. From 1976 to 1985, an average of 2,178 acres per year were thinned. In 1984, a mechanical shear, which leaves the cut trees piled in small bunches, was introduced in thinning operations. The method reduces total project costs and approximately one half of subsequent fuel treatment. Use of the mechanical shear is increasing.

Seedlings are frequently eaten by deer, gophers, and porcupines. Vexar tubes protect seedlings from deer, while gophers can be poisoned. No economical and effective means of porcupine control is available today, although many methods have been tried.

Fertilization is a new method of TSI for the Forest. In 1984, nitrogen and sulfur were applied to 2,600 acres at 200 pounds of nitrogen and 100 pounds of elemental sulfur per acre. Some of these acres were additionally fertilized with phosphorous. Results are inconclusive, although an economic analysis predicted a favorable cost/benefit ratio for the project.

**Salvage** — Salvage sales resulting from insect damage, drought and fire totalled 224 MMBF from 1976 to 1985. Eastside pine contributed the most volume (83%), with small amounts of white fir (9%), incense cedar (5%), lodgepole pine (2%), and sugar pine (1%). Because of the Scarface, Gerig and other fires, 199 MMBF were applied to the allowable sale quantity for the 1975 Timber Management Plan.

In addition to the allowable sale quantity, the Forest salvages insect-infested timber. From 1976 to 1985, 25 MMBF were sold as salvage. Two-thirds of the salvage timber was eastside pine, 21% lodgepole pine, 11% white fir, and 1.5% incense cedar.

From 1976 to 1981, an average of 3.5 MMBF per year was sold in contrast to 1.1 MMBF from 1982 to 1985. The decrease in salvage sales was a result of a 1981 snag management policy written by the Forest in response to a 1978 Regional directive setting minimum snag density requirements for dependent wildlife species.

Salvage operations will probably decrease because of snag requirements for wildlife. According to Regional minimum management requirements, suitable habitat in eastside pine types are deficient.

**Christmas Trees**—Christmas trees come from surplus trees found in sapling and pole stands that need thinning. Currently, the Forest offers only individual Christmas tree sales by permit. Personal use permit sales have remained relatively constant since 1980, averaging about 1,700 annually. Demand is expected to remain stable, and the Forest can accommodate it. However, the quality of trees will decline and accessibility will become more difficult. For those reasons, the Forest probably will not offer commercial Christmas tree sales.

**Big Valley Federal Sustained-Yield Unit (BVFSYU)**—Unique to Region 5, the BVFSYU was established on January 27, 1950 under the authority of the Sustained-Yield Act of 1944. The intent of the Act was to maintain stability in communities dependent on the sale of timber or other forest products from federal lands. In a sustained-yield unit, timber bidding is restricted to operators who manufacture lumber within a designated manufacturing zone. The BVFSYU lends support to Big Valley communities (Adin, Bieber, and Lookout) dependent on the timber industry.

The last formal review of the BVFSYU was held in March 1976. Based on the 1970 timber inventory, the annual allowable sale quantity was 13.3 MMBF for the period 1975-1985. According to Unit policy, this volume may change 20% without instituting special hearings or analysis.

In June 1982, another public hearing reevaluated the status of the BVFSYU. During the public hearing, comments addressed four alternatives: Alternative 1—to dissolve the Unit; Alternative 2—to maintain the status quo; Alternative 3—to modify the status quo by offering material other than sawtimber to manufacturers outside the Unit; and Alternative 4—to modify the status quo by offering sales for which no bids were initially received to

bidders outside the Unit who would meet the primary requirements of the Unit. Most testimonies and letters favored maintaining the Unit. A few letters favored the other alternatives, primarily to increase competitive bidding.

## Supply

### Economic Perspective

National forests in Region 5 produced an average of 1.9 billion board feet over the past 10 years. During this time, the Modoc's contribution to the Regional average was 3%. While this volume is small from a regional perspective, to local mills it is a resource of economic significance.

Of the timber harvested from the Forest, 84% is processed in Modoc and Lassen counties. This volume is 34% of all timber processed in the two counties.

Based on the amount of national forest land in each county, 25% of the payments received by the Forest from the sale of goods and services are returned to the counties. Payments fluctuate (Figure 3-8 in the Economic section of this chapter) because of variations in volume harvested each year and market value. Although the Forest can regulate the volume of timber offered for sale, the price paid and timing of the actual harvest is influenced by the market demand for wood products.

### Past, Present and Future Trends in Supply

Early administration of the Forest's timberlands consisted primarily of making sales from applications of interested private lumber firms. Volume was normally small: total volume cut in 1912 was only 3 MMBF.

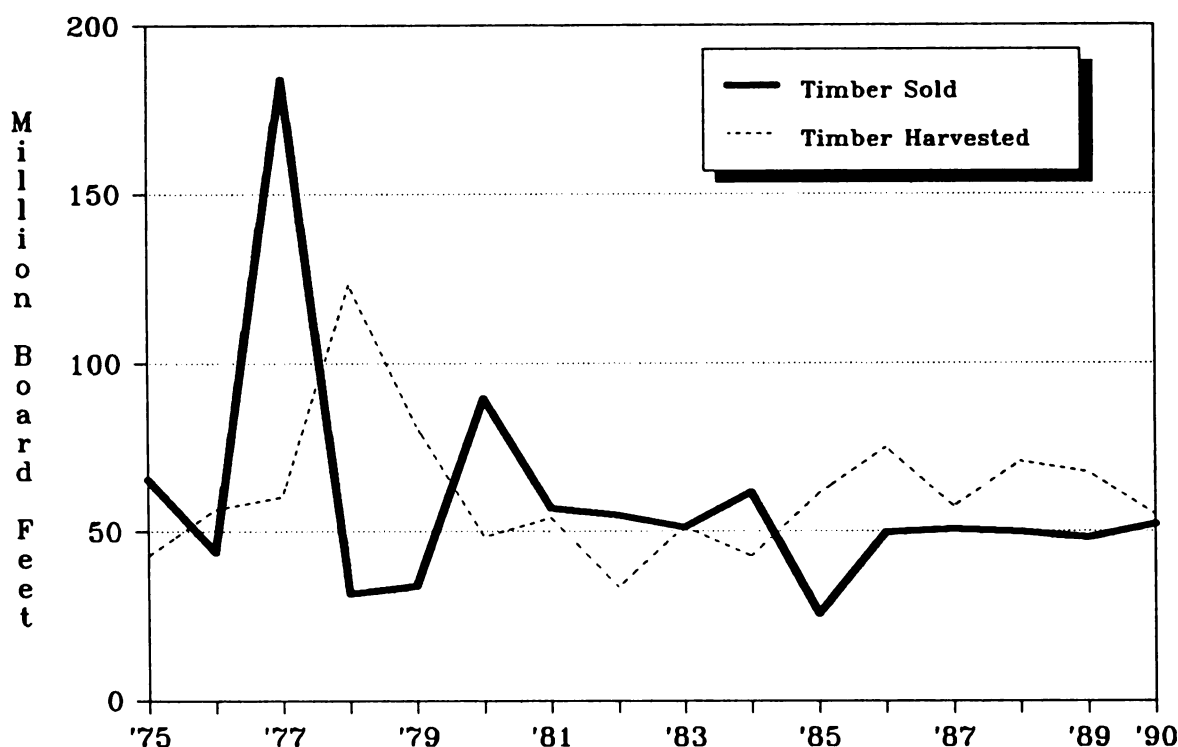
The 1960-1975 Timber Management Plan established the allowable sale quantity at 50.6 MMBF. In 1962 this figure was revised to 61.6 MMBF. The allowable sale quantity for the 1976-1985 timber management plan was 62.3 MMBF. During this time, however, land use classification has changed. In 1959, all timberland was classified as standard commercial forest land. In 1975, 61% (342,000 acres) of the timberlands were classified as standard, and the remaining 39% (215,000 acres) as marginal, special, and unregulated.

Today, 435,100 acres are classed as suitable for full or modified timber management (lands capable of growing > 20 cubic feet per acre per year), and 184,200 acres are classed as suitable for limited timber management (i.e., lands growing < 20 cubic feet per acre per year). Standing volume amounts to 4.95 billion board feet and growth averages 24 cubic feet per acre per year (Table 3-16). The Forest will base its new allowable sale quantity and 10-

**Table 3-16. Timber Area, Volume and Growth.**

Tentatively Suitable for Full or Modified Timber Management (> 20)						Tentatively Suitable for Limited Timber Management (< 20)			
			Volume		Growth <sup>1</sup>		Volume		Growth <sup>1</sup>
Timber Type	Timber Strata	Acres	MMBF	MMCF	CF/Ac./Yr.	Acres	MMBF	MMCF	CF/Ac./Yr.
Eastside Pine	PLG/PLP	51,568	Unestimated			5,011	Unestimated		
	P3G	39,960	308.9	48.8	20	0			
	P3P	84,394	192.4	30.4	7	82,916	189.0	29.9	7
	P4G	27,976	303.3	48.4	19	0			
	P4P	52,015	298.0	46.8	13	57,919	331.9	52.1	13
	P6G	1,859	12.1	18.8	14	0			
Mixed Conifer	M1X	8,733	Unestimated			674	Unestimated		
	M3G	49,452	956.4	159.2	64	0			
	M3P	30,705	230.9	38.4	11	26,540	199.6	33.2	11
	M4G	29,558	778.0	129.8	43	0			
	M4P	19,386	147.3	23.3	20	8,748	66.5	10.5	20
	M6G	2,654	54.2	8.8	37	0			
Lodgepole Pine	LXX	15,570	153.2	26.5	19	2,333	23.0	4.0	19
Red Fir	R3G	5,099	137.4	21.9	58	0			
	R3P	3,883	35.7	5.8	24	14	0.1	0.02	24
	R4G	3,208	95.0	15.2	73	0			
	R4P	1,221	26.3	4.4	58	0			
Subtotal		427,241	3,729.1	626.5	avg 24	184,155	810.1	129.7	avg 10
Nonstocked		7,862	0.0	0	0	0	0.0	0	
Total		435,103	3,729.1	626.5	avg 24	184,155	810.1	129.7	avg 10
<sup>1</sup> Last 10-year average annual growth from the 1980 timber inventory.									



**Figure 3-24. Timber Volume Sold and Harvested, 1975-1989.**

Source: Annual Harvest and Sold Reports

year timber sale schedule primarily on this information. Other factors which will influence timber supply are legal requirements for timber and other resources, economic efficiency, management intensity, and desired land use patterns.

Most of the timber harvested from the Forest is processed in Modoc, Lassen, or Siskiyou counties. From 1976 to 1990, about 1,008 MMBF of timber was harvested and averaged 67 MMBF per year. Harvest volumes during this period ranged from a low of 47 MMBF in 1979, to a high of 111 MMBF in 1978 (Figure 3-24). The large single volume represents salvage from the Scarface and Gerig fires.

Annual fluctuations in the harvest volumes represent the purchasers' harvest schedules and do not reflect how timber is sold from the Forest. When demand for lumber and wood products is low, purchasers refrain from harvesting the timber until demand increases. In 1985, the Forest had a backlog of 253.6 MMBF under contract to 17 purchasers. By the end of FY 1990, the Forest backlog

was reduced to 88 MMBF under contract to ten purchasers.

### Demand

Demand for timber from the Forest is determined by regional and national markets for wood products. Markets are primarily influenced by population and income levels, interest rates, number of housing starts, and the level of imports and exports in wood products. The size of regional and national markets is very large in comparison to the productive capacity of the Modoc. Increasing the Forest's timber offerings would have only a slight downward effect on timber prices; and decreasing the offerings would have only a slight upward effect. The demand curve is, therefore, elastic (horizontal).

If major suppliers of timber stumpage changed their volumes, a new equilibrium price would probably be established. Planners assume that all other producers will continue supplying timber stumpage near current levels. Consequently, a change in demand is not predicted.

However, a buyer could pay more or less for the same volume if substitutes, such as steel studs for framed buildings, changed in price.

The average high bid value for all timber species is \$811 per thousand cubic feet (\$133 per thousand board feet) in 1982 dollars. This value is the base price used for all amounts of timber. The equilibrium price for timber from the Forest was derived from cut and sold reports from 1984 to 1988.

The Forest timber program has consistently generated receipts greater than all timber program costs, including the cost of roads associated with harvest. From 1979 to 1986, total receipts exceeded total costs by more than \$25 million. In each year of that period, receipts exceeded costs, except in 1982 at the bottom of the last recession. In that year, little of the timber sold was actually harvested.

While the Forest does not significantly influence Regional demand for timber, the Forest timber program notably affects the local economy in Modoc County and, to a lesser degree, Siskiyou and Lassen counties. The sale of wood products generates employment and payments to counties. Appendix S discusses the State and Regional timber demand and supply situation.

Between 1975 and 1982, 25 mills bought timber sales from the Forest. Because of large fire salvage sales, new purchasers were attracted to the market. About 12 mills, mostly from Klamath Falls, Adin, Alturas, Bieber, Burney, Susanville and Weed, are the consistent bidders. By 1982, two of these mills had closed. The remaining mills have a combined annual mill capacity of about 291 MMBF. The combined mill capacity of primary local mills is about 48 MMBF annually on a single shift; this could increase to 75-80 MMBF on a double shift.

Local mills usually buy large-diameter ponderosa, sugar, and Jeffrey pine. Most local mills do not have equipment to efficiently manufacture many small-diameter logs (less than 14-inch dbh). This lack of mill capability is important because most of the available large trees will be cut in the next 30 years. Mills must convert to small log manufacturing if current harvest volumes on the Forest are to be maintained. Trees with long rotations necessary to produce large diameter logs have lower average annual growth rates than trees with shorter rotations. Also, commercial thinning harvests of timber stands, which contribute to the annual sale volume, will be of small diameter trees.

#### **Big Valley Federal Sustained-Yield Unit**

Agriculture and lumbering supports the present economic base in the Big Valley area. New industries are

deterred from the area because of its isolation from large population centers. The present composition of industries in the area will likely remain unchanged.

At present, two sawmills operate within the Unit. Big Valley mills rely on timber outside the Unit to maintain full single-shift operations; the allowable sale quantity of 13.3 MMBF, established for 1975-1981, accounts for 46% of the mill's capacity. Cutting records of these mills during this time indicate sawmill production averaged 22 MMBF annually. A comparison of weighted average bids reveals that the Unit has a bid ratio of 1.98, as compared to 5.23 for the remainder of the Forest. From 1981 to the present, one mill closed and a new mill was constructed. The 13.3 MMBF accounts for about 33% of the mill's capacity. Considering that the allowable sale quantity in the Unit decreased to 9 MMBF, that would comprise 23% of the reported mill capacity. Since 1982, bid ratios have become 2.57 for the Unit versus 5.13 for sales from the rest of the Forest.

The economic impact of the Unit cannot be measured directly. Whether the sawmills would continue to operate if the Unit were abolished is not known. The installed capacity of the Unit's sawmills is approximately twice the potential yield of 13.3 MMBF. Obviously, other sources of logs are essential for the continued operation of the mills. However, production has been 73% of the stated capacity. Testimony presented at a 1982 public hearing on the status of the Unit indicated that the timber base supplied by the Unit was essential to the mills in the Unit.

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## **21. Visual Resources**

### **Introduction**

The Modoc National Forest offers a wide range of scenic landscapes. The Medicine Lake Highlands in the northwest portion of the Forest provides the beauty of mixed conifer stands intermixed with geologic evidence of past volcanic action.

The Modoc Plateau, covering most of the Forest, is a combination of lava outcroppings with a diverse mixture of ponderosa pine stands, juniper, bitterbrush, sagebrush and mountain mahogany. The variety of vegetative color and texture and the distant views to mountain backdrops provide a unique scenic experience.

The Warner Mountains rise above the surrounding plateau on the east side of the Forest with peaks up to 9,800 feet. The Warners offer all the scenic amenities of the Sierra Nevada mountain range, and are covered by

broken and diverse patterns of coniferous forests, aspen stands, open shrub-covered patches, rock outcrops and numerous streams.

### Current Management and Future Opportunities

The public is becoming more aware of and interested in the management of the Forest, including the visual appearance of management activities such as timber harvesting, road construction, and utility corridors. Because of this awareness, the Forest Service has established the visual landscape as a basic resource, to be treated as an essential part of, and receive equal consideration with, other resources of the land. At the same time, public demand has increased for goods and services, such as timber and recreation, which are produced on much of the same land. Consequently, planners need inventories and standards for managing the visual resource.

The Visual Management System (VMS) (USDA Forest Service 1973) used to inventory the visual resource is based on the assumption that landscapes with high scenic values have the greatest variety of vegetation, landforms and waterforms. The VMS guides visual resource considerations in Forest projects to achieve initial visual quality objectives (IVQOs). IVQOs are based on the amount of diversity in the scenery (variety class), the level of public concern for scenic attractiveness (sensitivity level), and the viewing distance (distance zone). IVQOs are management guidelines for preventing unacceptable impacts while implementing other resource activities.

Resource projects where IVQOs have been used include timber sales, wetland developments, fence and road construction, geothermal test drilling sites and fuelbreak construction. The VMS has only slightly reduced the Forest timber sale program, because several large sales have been fire salvage sales in remote areas. In addition, little regeneration harvesting, other than shelterwood, has occurred on the other sales.

The main issue involving the VMS in past sales was the location of roads to access timber. Locating roads across steep slopes is a visual resource management concern, because much of the vegetation is open and the Forest has many distant vistas. In most instances, consideration of road location and design has minimized visual impacts.

The Forest's capability to provide scenic quality is measured by the current condition and variety of the visual resource. In the future, maintaining scenic quality

will be more difficult because of increased regeneration harvesting.

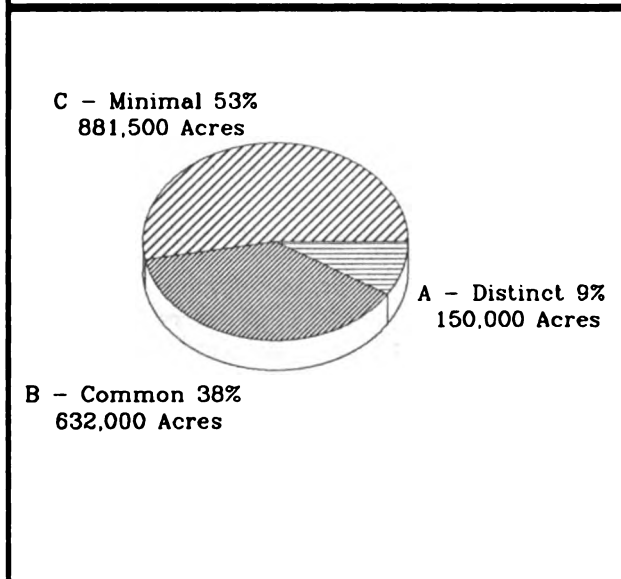
Opportunities exist to mitigate the effects of Forest management activities on visual quality:

- Shape timber harvest units to blend with existing openings.
- Schedule timber sales to avoid cumulative visual effects.
- Use foreground vegetation to screen background disturbances.
- Design structures (roads, utility towers and buildings) to blend with or complement the natural landscape.
- Emphasize visual resource management in areas where visual quality is important to recreation activities. In areas where enjoyment of recreation activity is not dependent on visual quality, management may be less intense.
- Coordinate visual management with other resource planning.
- Use vegetative manipulation to enhance and maintain visual quality for the long term.
- Rehabilitate areas which currently do not meet visual quality objectives through specific visual resource rehabilitation projects or other resource projects.

### Initial Visual Quality Objectives

Variety class, sensitivity level, and viewing distance are three inventories used to initially determine suitable visual quality objectives (VQOs). Landscapes with high scenic values have the greatest variety of vegetation, landforms and waterforms. Three variety classes characterize the Forest:

- A (9%): a distinctive landscape with varied water and landforms and vegetation;
- B (38%): a common landscape, less varied with moderate slopes, rounded ridges and broad valleys; and
- C (53%): a minimal landscape of one-species vegetation and little variation in size, texture or color (Figure 3-25).

**Figure 3-25. Visual Variety Classes.**

Most variety class A lands are found in the Warner Mountains in riparian areas or along the steep rocky slopes on the east side. Variety class A lands in the Medicine Lake Highlands are adjacent to lakes and streams or include the unique geologic features characteristic of this area. Variety class B lands are scattered throughout the Forest, while the variety class C lands are found primarily on the Devil's Garden Plateau.

Scenic attractiveness was measured by assigning three sensitivity levels to travel routes and recreation areas, with level one the highest and level three the lowest. The importance of each travel route or recreation area was evaluated on the basis of existing and anticipated types of use, quantity of use, and level of access. Areas were also inventoried based on three viewing distances: foreground (0-1/2 mile), middleground (1/2-4 miles) and background (4+ miles).

Variety class, sensitivity level and distance zone inventories were combined to determine IVQO. Visual quality objectives (Preservation, Retention, Partial Retention, Modification, and Maximum Modification) are graphically represented in Figure 3-26 and defined in Appendix Q.

The South Warner Wilderness, SIAs, and the RNA are the only areas on the Forest assigned a Preservation VQO. Retention or Partial Retention VQOs were assigned to all variety class A lands. Variety class B lands (those areas viewed from a sensitivity level one travel route, or within the foreground viewing distance of a sensitivity level two travel route) were assigned a Reten-

tion or Partial Retention VQO. Only those variety class C lands within the foreground or middleground distance zones (viewed from a sensitivity level one travel route) were assigned a Partial Retention VQO. All other areas on the Forest were assigned a Modification or Maximum Modification VQO which allows management activities to visually dominate the landscape with differing considerations.

Retention or Partial Retention IVQOs were assigned to 33% of the Forest. Most lands (63%) were assigned a Modification or Maximum Modification IVQO (Figure 3-27) because most of the Forest is variety class C or unseen.

### Existing Visual Condition

The current condition of the visual resource on the Forest was determined through an inventory of the existing visual condition (EVC). This inventory was done by aerial mapping and field verification. Based on degree of visual disturbance, the Forest was classified into six visual condition types: Untouched (I), Unnoticed (II), Minor Disturbance (III), Disturbance (IV), Major Disturbance (V), and Drastic Disturbance (VI) (Figure 3-26). Eighty-four percent of the Forest has few noticeable changes in the landscape; 14% is slightly disturbed, but changes do not attract attention (Figure 3-28).

Activities that have caused visual disturbances include site conversions in geometric shapes, mostly where the planted vegetation failed to establish itself, rock and cinder pit developments, high density roading, major transmission lines, electronic sites, and large-scale fire suppression. Activities in existing visual condition class VI have caused drastic disturbances on about 5,000 acres which are in glaring contrast to the natural appearance of the landscape. These areas should be considered for rehabilitation to reduce the visual degradation of past activities.

### Visual Quality Index

Visual Quality Index (VQI) quantifies the overall visual quality of the Forest. It reflects both the inherent scenic value of the Forest landscape and the amount of human modification to it. A VQI can be calculated for the existing visual condition as well as for the future visual condition that would result from implementing each alternative.

The VQI for the Forest's existing visual condition is 62.56. Assuming that in 1900 the entire Forest was in visual condition class I (appeared essentially untouched),

**Figure 3-26. Visual Condition Types and Visual Quality Objectives**

NATURAL APPEARING LANDSCAPE IS DOMINANT

**VQO Preservation****VC I Untouched**

Predominately ecological changes.

**VQO Modification****VC IV Disturbance**

Changes are easily noticed and attract attention.

**VQO Retention****VC II Unnoticed**

Changes are not evident.

**VQO Maximum Modification****VC V Major Disturbance**

Changes are very strong and attract attention.

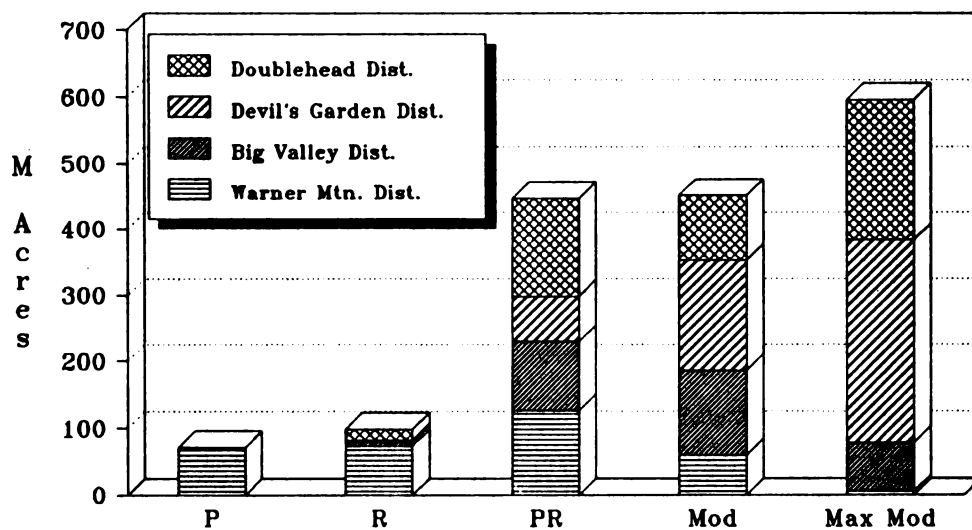
**VQO Partial Retention****VC III Minor Disturbances**

Changes are noticed, but do not attract attention.

**VQO Unacceptable Modification****VC VI Drastic Disturbance**

Changes are in glaring contrast and disharmony with natural patterns.

HUMAN ACTIVITY WITHIN LANDSCAPE IS DOMINANT

**Figure 3-27. Initial Visual Quality Objectives.**

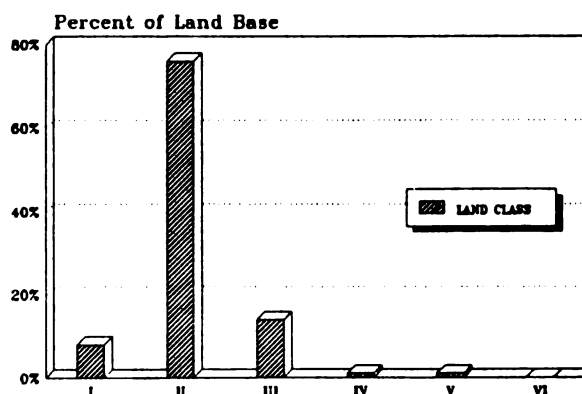
P = Preservation; PR = Part. Retention

R = Retention; M = Modification;

MM = Maximum Modification

**Figure 3-28. Existing Visual Condition.**

Class	Acres	% of Total
I	126,800	8
II	1,264,400	76
III	231,600	14
IV	21,100	1
V	14,400	1
VI	5,000	0



the VQI would have been 68.80. This figure then provides a benchmark from which to compare the VQI since the turn of the century (Figure 3-29).

The VQI of 68.80 is not the maximum visual quality the Forest can achieve. Variety class C lands have little variation in size, color or texture. In an untouched condition (VC I) they offer little visual distraction. By minor changes to the characteristic landscape, the overall visual quality in variety class C lands can improve. Because 53% of the Forest is class C lands, managing these lands to the VQO of partial retention (VC III) will maximize the VQI at 103.65. This significant increase over untouched conditions is an anomaly based solely on the high percentage of class C lands.

### Demand

Although demand for the visual resource is difficult to measure, it can be inferred from: (1) increased participation in recreation activities associated with viewing sce-

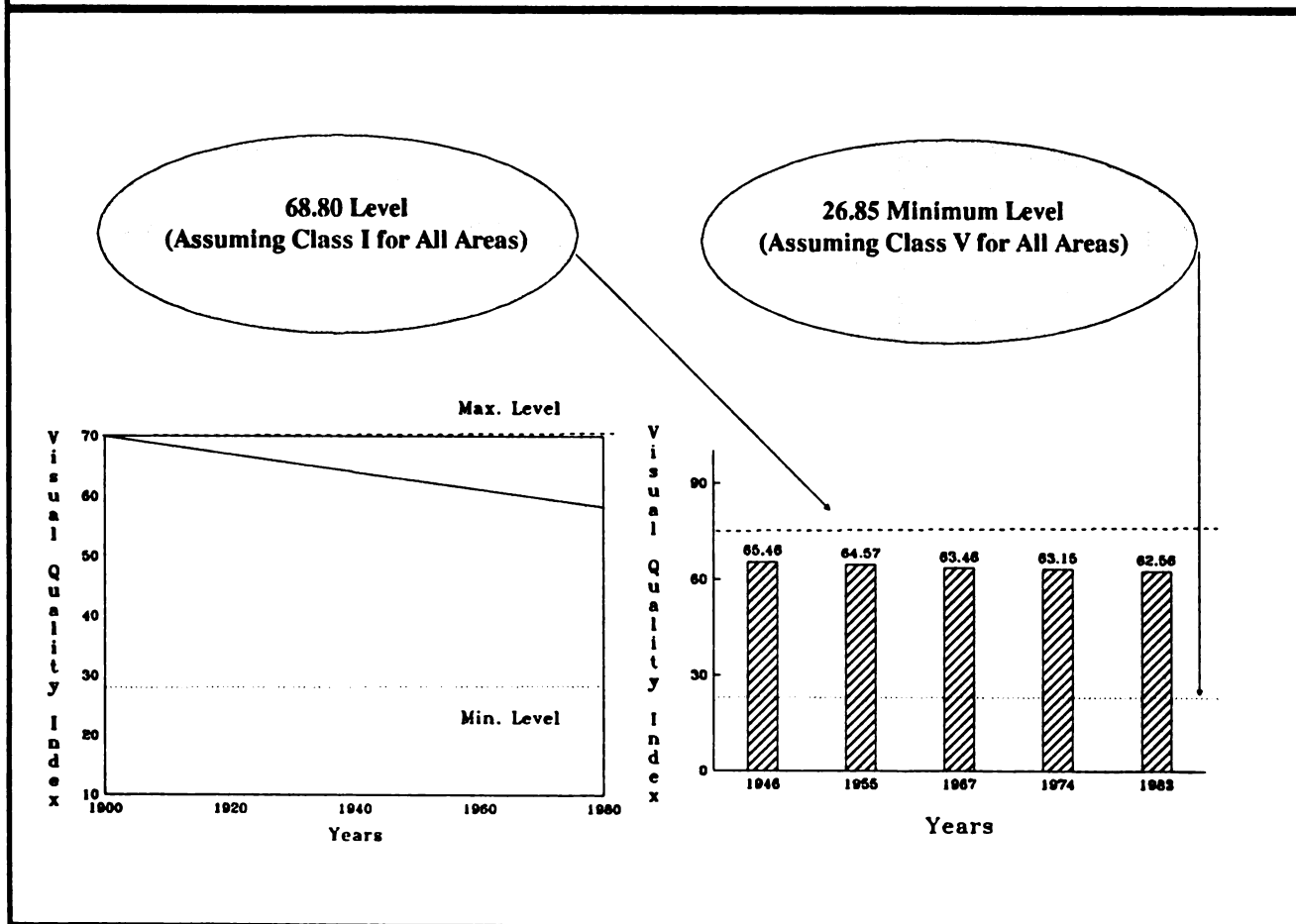
nery; (2) increased population; and (3) enactment of laws and policies addressing visual quality.

Between 1982 and 1990, California projects a 34% increase in driving for pleasure, walking for pleasure, and sightseeing. The State also anticipates a 31% increase in nature appreciation, visiting scenic areas, and other visual activities between 1980 and 2000 (State of California 1980b).

Concern for visual resources will probably increase as the population increases. Projections indicate that the population in California Planning District 2 (northern non-metropolitan counties) will grow faster than the State average, as it has since 1960. The majority of recreationists using the Forest live within District 2 (State of California 1980b).

Associated with increasing populations and recreational participation is an increasing number of laws which have cited visual quality, aesthetics, and scenery as their primary purpose or as a resource to be considered during

**Figure 3-29. Visual Condition Trend.**



enactment. The Visual Resources Analysis of the Management Situation (Forest planning records) lists major legislation pertaining to the resource from 1960 to 1980.

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## 22. Water

Proper management and use of water resources, combined with care for the watershed lands from which they originate, are fundamental to managing all other resources on the Forest. The goals are to maintain the soil mantle and to provide water for human, wildlife, fish and vegetative needs. Water is used on the Forest for livestock, dust abatement on roads during timber hauling, human consumption, maintenance of instream flows, and wildlife needs, including wetland habitat. Outside Forest boundaries, water is used primarily for agricultural irrigation, hydroelectric power generation, livestock, recreation and wildlife.

An analysis of the water resource requires separating the topic into its major parts: water quantity, water quality, and cumulative watershed effects. The following sections address each topic and its role in water resource management.

### Water Quantity

#### Supply

Twenty watersheds on the Forest produce a cumulative annual yield of 565,800 acre-feet of water per year, not including water yield on private lands within the Forest boundary. Appendix J displays the existing watersheds and presents average annual yields of water in acre-feet. The values were extrapolated from data collected at gaging stations operated by the California Department of Water Resources and the U.S. Geological Survey located on or near the Forest.

Watersheds are grouped into four hydrologic regions (Figure 3-30): Central Valley Region, Lahontan Region, North Coast Region, and Pacific Northwest Region. Potential to increase existing water yields from the Forest through manipulation of vegetation was found in three of four hydrologic regions.

**Central Valley Region** — Approximately 92,000 acres of land have potential for water yield increase. Manipulation of these lands for increased water yields would advance timing of water flow by as much as one month. Advancing the timing of flows could cause lower yields in July and August, the most critical months for local irriga-

tors in Modoc County. Advancing timing of water would not be beneficial unless adequate storage was developed.

**Lahontan Region** — Approximately 52,000 acres of land have potential to increase water yield in the Surprise Valley Watershed. Most of the spring runoff enters alkali lakes where it is unusable because of high mineral content. Summer runoff is used heavily for irrigation; therefore, early spring flows would not be beneficial unless adequate storage was developed.

**North Coast Region** — Approximately 21,000 acres of the Clear Lake Watershed has potential for increasing water yield. Most of these lands are in old-growth ponderosa pine. Much of the land supports active commercial timber and firewood sales, and the remaining lands have timber sales planned. Water yield should increase as timber is harvested.

### Current Management

#### Water Rights

The Forest manages distribution and use of water through the Forest water rights program. Currently water is used and managed under reservation rights, riparian rights, and State appropriated water rights.

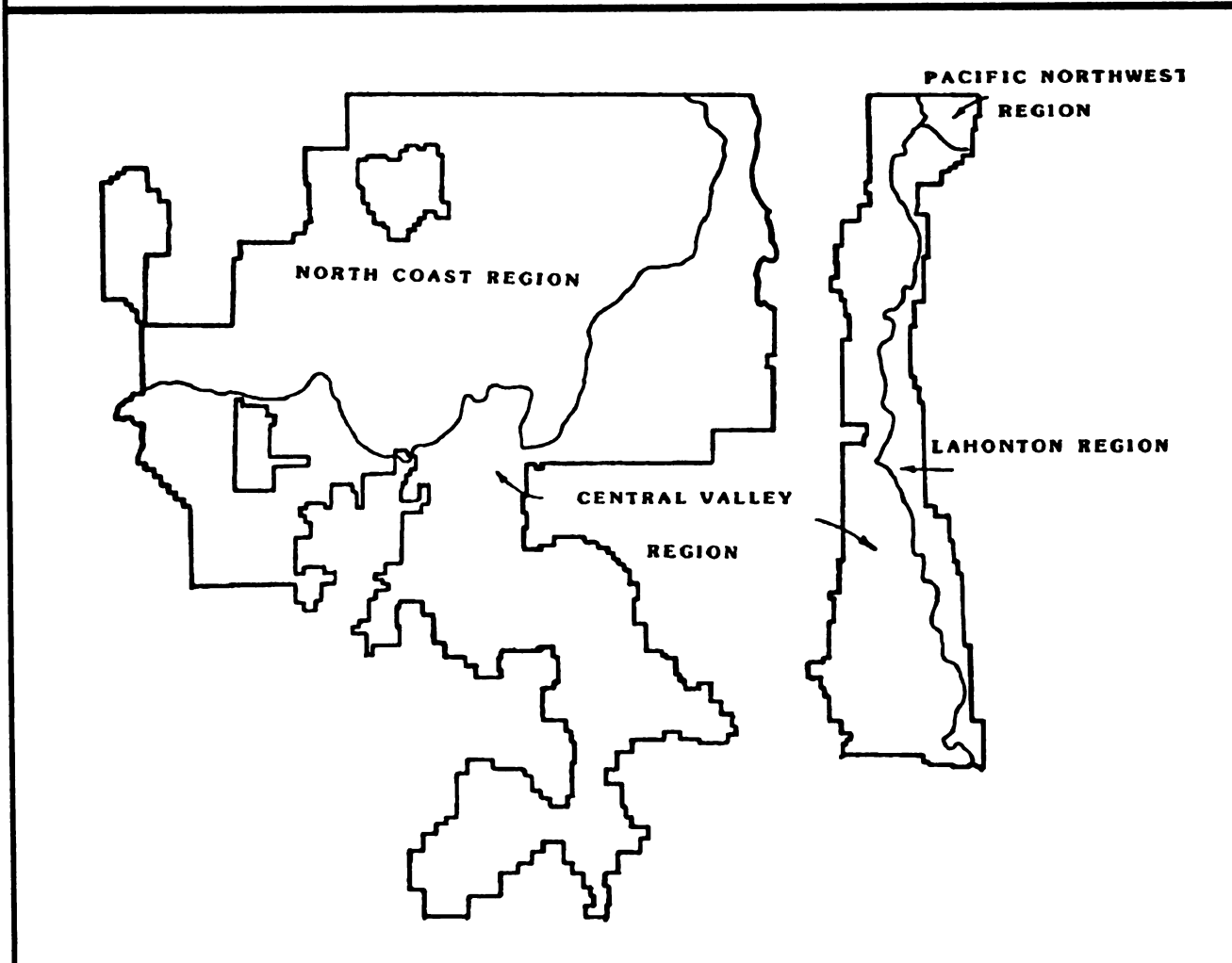
#### Demand

Since the area was settled in the late 1800's, water use has steadily increased so that present demand exceeds the supply of natural surface runoff. Various water adjudication proceedings and Bureau of Reclamation reports indicate the water supply from most of the Forest's watersheds do not meet off-site demands.

In some watersheds, agricultural irrigators have drilled ground water wells to supplement their appropriated and riparian water supply. The Forest has drilled several ground water wells, primarily to meet road water needs during timber harvesting. Wells were drilled when Forest reservation rights were superseded by longer standing adjudicated water rights held by downstream users.

Much effort is expended to ensure that downstream water users with superior water rights are protected while removing water from streams for roads. Full use of range-land forage by livestock is limited by shortages in water and by downstream appropriations which make water rights difficult to obtain for stockpounds. Insufficient stockwater in some allotments has created livestock distribution problems. Dam construction for wetland development is nearly impossible with water supplies fully appropriated by downstream users.



**Figure 3-30. Hydrologic Regions.**

Instream water needs within the Forest boundary for wildlife, fish and maintenance of riparian vegetation are basically intact because most water diversions to other users occur outside the Forest boundary.

### **Opportunities**

The Forest has few opportunities to add to existing water supplies. Increases from vegetative manipulation will be undetectable because yearly climatic variations will mask them.

Other opportunities exist, however, to help alleviate Forest and downstream shortages through continued negotiations with other users like the Bureau of Reclamation and Pacific Gas and Electric Company, and through drilling additional wells to tap groundwater sources. Where water is available, additional stockponds could be developed on grazing allotments to improve livestock distribution and forage utilization.

Protection of instream flows and riparian dependent resources will be the first priority for water use before off-stream diversions or uses are permitted. Both law (National Forest Management Act) and policy (Forest Service Manual) direct land managers to consider riparian-dependent resources over other resources in cases of unresolved conflict. Therefore, sufficient instream flows must be maintained.

### **Water Quality**

Water use on and off the Forest has many beneficial uses. Although no municipal watersheds or whole communities use this water, several individual domestic uses are scattered throughout or downstream from the Forest on many streams. Wilderness travelers use surface water from lakes and streams in the South Warner Wilderness for drinking or cooking.

Water in streams, lakes, and reservoirs provide habitat for cold- and warmwater fisheries, endangered species, and waterfowl. Numerous stockponds and reservoirs provide water during the summer months for livestock.

Water leaving the Forest is put to beneficial use by irrigating fields in the Pit River, and Surprise, Goose Lake, Langell and Big Valleys. Much of this water is reused for hydroelectric power generation at reservoirs. Water quality also affects downstream riparian-dependent species. Water is also used downstream by recreationists.

### **Current Management**

Water quality is currently maintained and improved through the application of State certified and EPA approved Best Management Practices (BMPs) for controlling non-point sources of pollution to surface water (USDA Forest Service 1983). Methods and techniques for applying appropriate BMPs are identified during on-site investigation of Forest projects that have the potential to degrade surface water quality. More detailed discussion of BMPs and the implementation process is presented in Appendix N of the Forest Plan.

BMPs have been developed for timber, road construction, mining, recreation, vegetative manipulation, fire suppression, fuels management, and grazing strategies. Implementing BMPs has resulted in protecting water quality in some areas, depending on the resource. Sometimes water quality problems occurred when BMPs were not implemented. The following assessment of water quality relates to various Forest resource management activities.

### **Water Quality Assessment**

#### **Timber**

Accelerated surface erosion from historic logging is pronounced in several Forest watersheds. Probable causes are inadequate or no streamside management zone designation and protection; poor skid trail and landing locations; and lack of erosion control on skid trails. Under old logging practices, some wet meadows were used for skidding and landing logs, which gullied and scoured perennial streams and converted wet meadows to dry uplands. These problems are now controlled or avoided on current timber sales through the use of BMPs.

Earth scientists, or other qualified personnel, can offer measures in timber sale planning to prevent degradation of areas susceptible to surface erosion and mass wasting.

Large organic debris helps determine the biological and physical character of streams in forested landscapes. When windblown trees fall into streams, the streams' energy is dissipated at relatively short, steep sections of the channel instead of over the entire gradient. Management activities directly alter debris loading by addition or removal of material. In the past, selection harvesting of larger, more valuable trees has altered the quantity and size of debris in the Forest's stream channels. Neither the extent of these alterations nor the long-term biological consequences are completely understood.

Opportunities to improve management include leaving natural debris in channels; introducing a minimum of additional logging-related debris; and leaving large volumes of mature timber within the streamside management zone.

#### **Road Construction**

Roads are a primary source of accelerated erosion and sedimentation (Gibbons and Salo 1973). Sediment from roads reaches streams through mass soil movement and surface erosion. Downstream sedimentation results from improper road location, inadequate road drainage, lack of energy dissipators at culvert outlets, road use during wet weather, and poor culvert alignment. Fisheries are probably the most adversely affected Forest resource. Many of these problems still exist because funds are insufficient to correct past problems. Construction within the past ten years has followed BMPs and has not significantly degraded water quality.

Opportunities exist to obliterate roads that are no longer needed or are causing water quality degradation, and to abandon old roads which were constructed in or adjacent to stream channels.

#### **Grazing**

Improper grazing management practices degrade water quality by accelerating erosion and sedimentation within stream channels. Stable stream banks; narrow, deep channels; and diverse and productive vegetation are hallmarks of properly managed streams. Stream systems in satisfactory condition provide vegetative cover for fish habitat, sustain water flows into the summer season, and offer low water temperatures. In contrast, streams in unsatisfactory condition exhibit altered stream banks, wide and shallow channels, and less productive and diverse vegetation than its properly managed counterparts. Streams in unsatisfactory condition can also suffer reduced flows into the summer season and higher water temperatures. Gravels important for fish spawning are often embedded with fine sediment from soil erosion and silting.

Improper grazing management practices have affected, to some extent, nearly all riparian areas on the Forest. Approximately 37% (208,700 acre-feet) of the water produced on the Forest does not meet State water quality objectives (Table 3-17), and may be adversely affecting beneficial uses. This estimate is based on visual observation and an assessment of beneficial uses; it is supported by temperature, sediment and fisheries sampling. Unstable and eroding stream banks, and inadequate filter and buffer strips for timber harvest and road building activities contribute to water quality degradation. Conversely, 63% (357,100 acre-feet) of the Forest

water yield exceeds State water quality objectives for beneficial uses.

Properly managed streams have improved rapidly; practices have included fencing to exclude livestock or to establish riparian pastures and early season growth. Timing and duration of grazing—particularly early-season and short-duration grazing—is important for ensuring proper riparian management. One of the best opportunities to improve water quality is implementing improved grazing strategies. In some cases, protective fencing, restoring riparian vegetation, gully repair, rip-rapping and juniper revetment may be needed. Water quality moni-

**Table 3-17. Streams Not Meeting Water Quality Objectives**

Watershed	Location	Volume (Acre-Feet)	Parameter Violation	Impacted Beneficial Use
Goose Lake (030)	Willow Creek	10,300	Sediment/Temperature	Fisheries
Goose Lake (030)	Lassen Creek	8,700	Sediment/Temperature	Fisheries
N.F. Pit River (040)	Joseph Creek	3,900	Sediment/Temperature	Fisheries
N.F. Pit River (040)	Parker Creek	13,700	Sediment/Temperature	Fisheries
S.F. Pit River (050)	S.F. Pine Creek	1,700	Sediment	Fisheries
S.F. Pit River (050)	West Valley Reservoir Tributary	600	Sediment	Irrigation
Ash Creek (070)	Dutch Flat Creek	3,600	Sediment	T&E Species
Ash Creek (070)	Johnson Creek	4,800	Sediment/Temperature	T&E Species
Ash Creek (070)	Ash Creek	12,300	Sediment/Temperature	Fisheries
Ash Creek (070)	Willow Creek	8,300	Sediment	Fisheries
Big Valley (090)	Turner Creek	20,400	Sediment/Temperature	T&E Species
Willow Creek (140)	Willow, Boles, Fletcher Creeks	190,000	Sediment/Temperature	Fisheries/Irrigation
Lost River (160)	Lost River	13,400	Sediment	Fisheries
Upper Surprise Valley (180)	Mill Creek	6,300	Sediment	Fisheries
Lower Surprise Valley (190)	Cedar Creek	3,400	Sediment	Fisheries
Lower Surprise Valley (190)	Granger Creek	3,800	Sediment	Fisheries
Lower Surprise Valley (190)	Silver Creek	3,500	Sediment	Fisheries
<b>Total</b>		<b>208,700</b>		

toring is an integral part of a program which ensures that water quality objectives are attained.

## Cumulative Watershed Impacts

Cumulative watershed impacts are the combined effects of land disturbing activities. They include all impacts to water quality and quantity occurring away from sites of primary development. Cumulative watershed impacts are transmitted from primary development sites to the impact site through water. The most common evidence of cumulative impacts is alteration of sedimentation and erosional processes within stream channels. These include channel scour, deposition, stream bank failure, mass wasting, or other undesirable occurrences such as flooding. Within-channel effects are caused by increases in peak flows due to compaction in the watershed.

Sedimentation and erosion within stream channels have adverse effects on fish habitat, riparian habitat, reservoir life expectancy, soil productivity, visual quality and other beneficial uses to which the water resource is applied (Seidelman 1981). In addition to natural occurring landslides, wildfires and floods, management activities that cause cumulative watershed impacts on the Forest are timber harvesting, road construction, and livestock grazing.

Threshold of concern is the level of disturbance beyond which off-site watershed degradation is very likely to occur. When management activities cause the watershed threshold to be exceeded, accelerated channel problems are likely and downstream beneficial uses, such as fisheries and reservoir life expectancy, are threatened.

## Current Management

Subwatersheds, consisting of second and third order drainages<sup>1</sup>, have been subdivided from larger National Forest System watersheds. The potential for cumulative watershed impacts to occur is within these second and third order watersheds, and not within larger watersheds (Chatoian 1983). A method to assess cumulative watershed impacts was developed to determine the off-site impacts caused by timber harvesting, road construction, and livestock grazing. All impacts are reported in percent

of equivalent roaded acres (ERA), a measure of the relative amount of disturbance in the watershed (see Analysis of the Management Situation for Water, Planning records).

Watershed thresholds were estimated from soil sensitivity information that includes soil depth, slope stability, erosion hazard rating, and water runoff potential. Three watersheds are estimated to have exceeded their threshold: 032 – Cottonwood Creek; 071 – Dutch Flat Creek; and 072 – Rush Creek. Cottonwood Creek is a very sensitive watershed with a relatively small amount of disturbance. Channel scour and stream bank erosion is extensive, the result of peak runoff in May 1983. Dutch Flat and Rush Creeks appear to have exceeded threshold due to past management activities such as timber harvesting, roading, and grazing. Dutch Flat Creek is now an intermittent channel that has been extensively gullied. Although Rush Creek shows signs of past channel scour, deposition and bank erosion, it is improving.

Beneficial uses in these watersheds have also been degraded. The quality of the fisheries in Cottonwood Creek watershed has been degraded. An endangered fish species has been affected in the Dutch Flat Creek watershed. A fisheries, including an endangered fish species, has been adversely affected in Rush Creek watershed.

Opportunities to improve these sensitive watersheds include designing activities so impacts to the channel are minimal; increasing buffer and filter strip width; installing erosion control structures; ripping or scarifying disturbed areas to reduce soil compaction; and deferring activities.

In the future, we do not expect the Forest to experience an increase in problems from cumulative impacts. Even with intensive timber management, the overall condition of watersheds should remain stable. In the past, the problem of cumulative impacts was never seriously considered; timber and grazing activities were planned without considering overall offsite potential impacts to stream channels. Now that the problem has been recognized, prudently scheduling activities and implementing watershed improvement or mitigation projects will help bring or maintain all watersheds under threshold.

<sup>1</sup> A first order stream originates at the top of a watershed. Two first order streams coming together create a second order stream; two second order streams coming together create a third order stream.

## 23. Wilderness And Roadless Areas

### Introduction

Encompassing 70,385 acres of relatively undeveloped land on the Warner Mountain Ranger District, the South Warner Wilderness contains rugged topography, expansive vistas, rolling hills, mountain meadows, clear streams, and the highest peaks in northeastern California (Figure 3-31). The South Warner Wilderness appears as a pristine island surrounded by rural human development, which offers excellent opportunities for solitude. Eagle Peak at 9,892 feet, Warren Peak at 9,710 feet and Squaw Peak at 8,646 feet are the conspicuous landmarks within the Wilderness. Vegetation on the precipitous eastern slope is generally sparse. The western slope is characterized by gentle, rolling topography. Vegetation includes ponderosa, Jeffrey, western white, whitebark, and lodgepole pines, white fir, western juniper, aspen, bitterbrush, mountain mahogany, sagebrush, grasses, and riparian species.

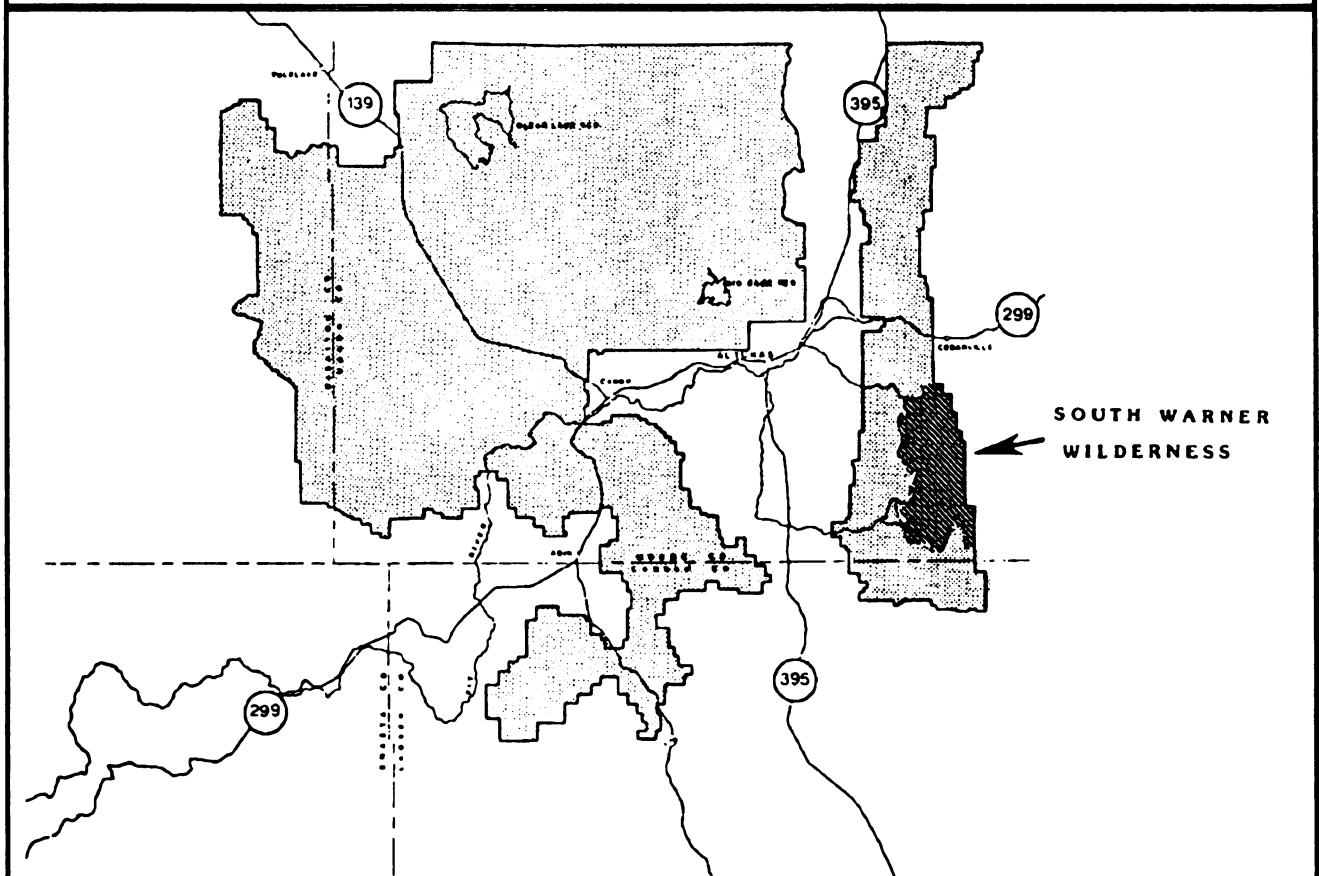
Of the seven lakes in the South Warner Wilderness, Clear Lake, Patterson Lake, and Emerson Lake are the most well known. They provide recreational fishing for rainbow, eastern brook, redband and brown trout.

Wildlife abounds in the Wilderness, affording recreationists opportunities to observe many interesting species in their natural surroundings. In addition to fish and mammals, the Wilderness provides splendid bird-watching for the casual or most seasoned observer.

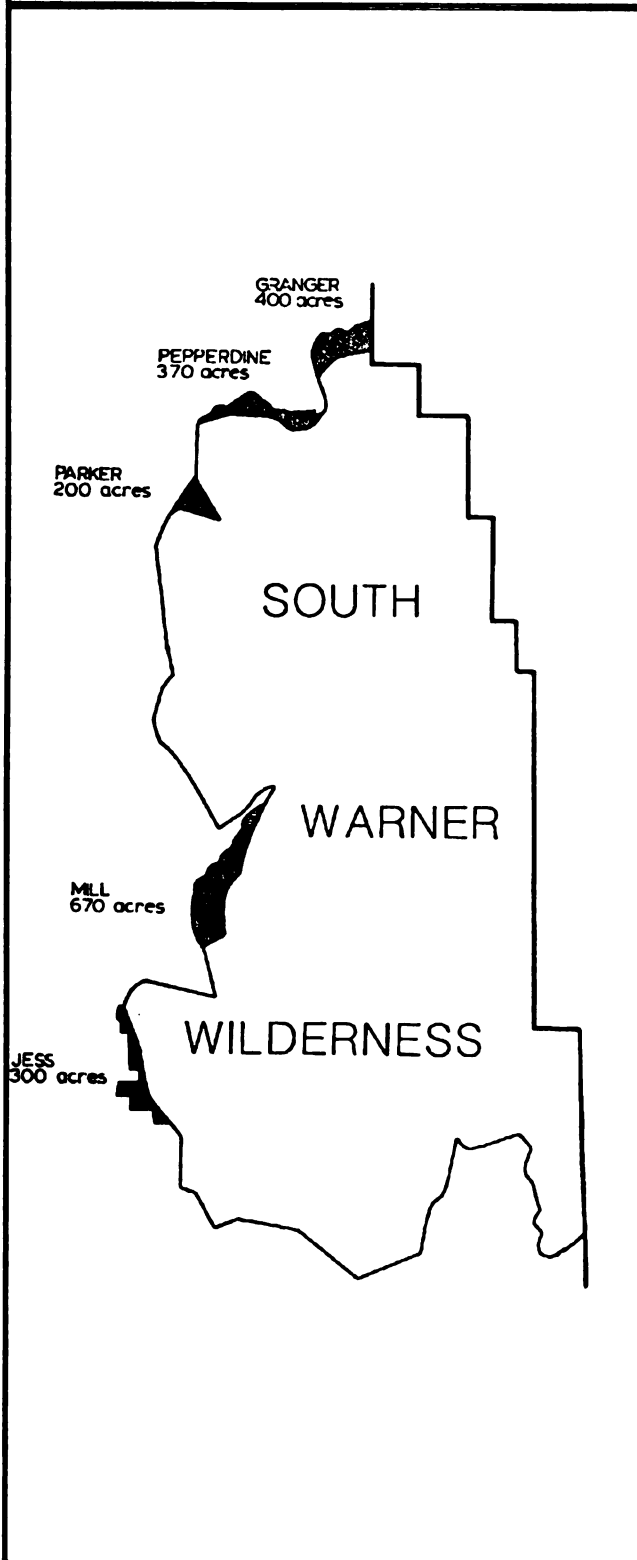
After the 1978 Roadless Area Review and Evaluation, the Forest Service recommended five areas for incorporation into the Wilderness: Granger (400 acres), Jess (300 acres), Mill (670 acres), Parker (200 acres), and Pepperdine (370 acres) (Figure 3-32). On September 28, 1984, the California Wilderness Act (Public Law 98-425) added these areas (1,940 acres) to the South Warner Wilderness.

All other roadless areas were released from wilderness consideration for this planning period (Appendix E). No other wilderness planning areas exist on the Forest.

**Figure 3-31. South Warner Wilderness.**



**Figure 3-32. California Wilderness Act Additions**



## Current Management

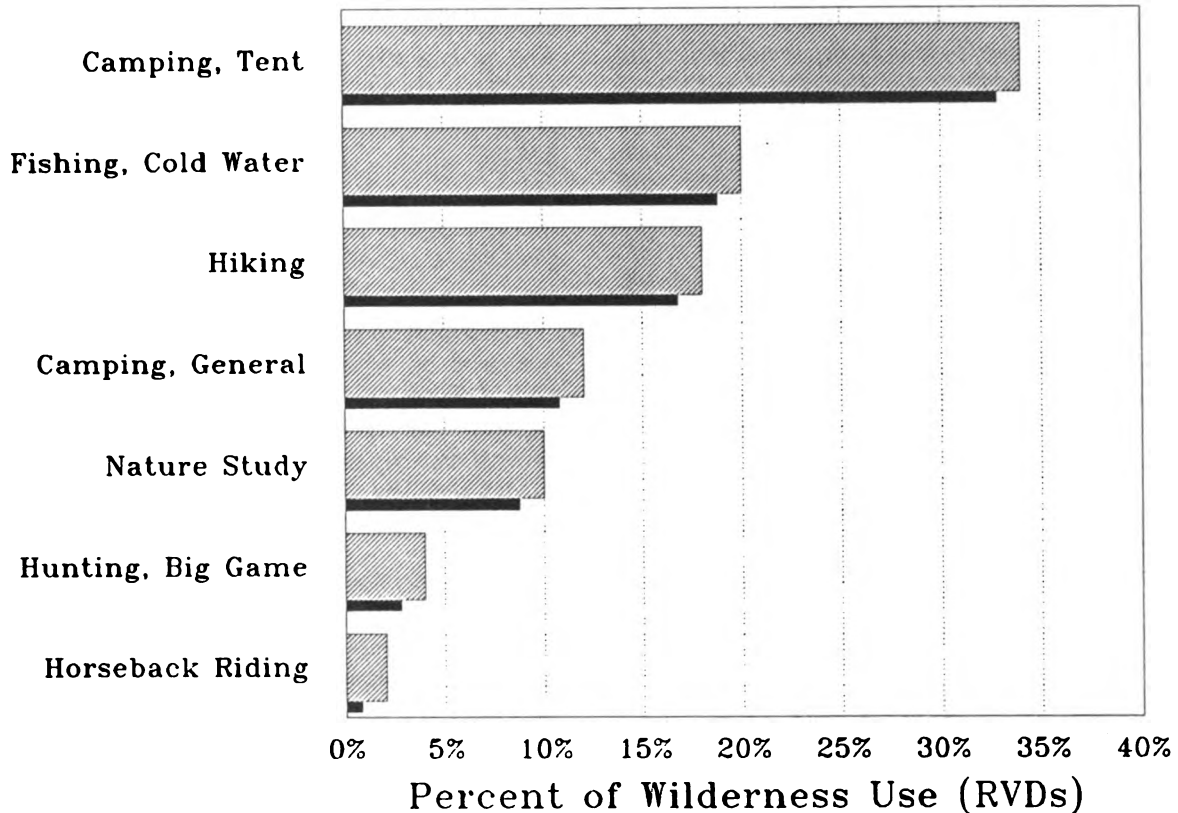
### Recreation

During the peak recreation use season, rangers periodically travel the Wilderness to help visitors comply with regulations while providing information or assistance to those who need it. Because Forest involvement and interaction with visitors has decreased over the last five years, user compliance with regulations regarding permits, litter, and recreational stock has declined. In addition, Wilderness rangers have fewer opportunities to share information about recreation and environmental education with Wilderness visitors.

In 1980, a Recreation Opportunity Spectrum (ROS) inventory was conducted to identify recreation opportunities on the Forest. The ROS inventory evaluated the physical, social and managerial setting of land and water areas. The South Warner Wilderness is classified as a semi-primitive non-motorized area. This means it is a natural or natural-appearing environment of moderate to large size. Users are evident, but interaction between them is infrequent. The probability of being isolated from the sights and sounds of humans and experiencing challenge and risk is high, but not as great as within areas classed as primitive.

The Wilderness is not classified primitive because its physical setting does not meet remoteness and size criteria. However, it does meet the criteria for primitive classification when assessed for its social and managerial setting (Appendix K of the Forest Plan). Regardless of classification, the Forest manages the Wilderness to provide a primitive recreation experience. However, management areas outside the Wilderness are not modified to achieve the primitive ROS condition inside the Wilderness. To meet that condition, the Forest would have to close all roads within three miles of the Wilderness.

Far from major population centers, the South Warner Wilderness has a low level of visitor use. Visitor use in 1981 was estimated at 12,100 recreation visitor days (RVDs), of which 40% were local users. Visitor activities include backpacking, day hiking, bird-watching, nature study, photography, trout fishing, cross-country skiing, snowshoeing, horseback riding, hunting and camping (Figure 3-33). Two main areas of concentrated use are the Clear Lake and Patterson Lake areas. While Clear Lake is used almost exclusively by day, Patterson Lake is used for both day and overnight activities.

**Figure 3-33. Wilderness Use by Recreation Activity****Trails**

The Wilderness trail system consists of 79 miles of maintained trails. An additional 23 miles exist in the Wilderness but are neither maintained nor considered system trails. Any part of the interior served by the trail network can be accessed in a long one-day hike. Cross-country travel is not difficult in most areas, except on the precipitous east slopes.

Trail density and locations adequately provide access to most of the Wilderness. Under the supervision of a Wilderness ranger, volunteer trail crews annually maintain trails. Developing additional trails into primitive areas could detract from the Wilderness character and preclude a primitive experience for those users seeking solitude and remoteness.

**Fire**

Wilderness terrain, elevation, open vegetation patterns, and natural barriers are generally favorable to fire control. Only three fires larger than 100 acres have occurred in the last 70 years. The visual impact of recent fires is evident, but vegetation has generally masked the effects of older fires.

Upon detection, all fires are evaluated by the District Ranger for appropriate initial attack by suppression forces. Non-mechanized means of suppression are used if the fire does not threaten resources outside the Wilderness. If fire behavior warrants immediate suppression measures to prevent an escape, then authorization to use mechanical measures (e.g., helicopters, air tankers, chain saws) is requested from the Forest Supervisor. Formerly, fire management policy required immediate and aggressive suppression of all fires regardless of location or

cause. Currently, the policy emphasizes cost-effective suppression.

Although the Wilderness has been relatively free of large fires since the early 1900's, Vale's (1977) work indicates pre-settlement times may have been different. Fire scars, vegetation age structure, and species composition suggest a change from an environment with more frequent fires to one with essentially none. Vale believes wildfire suppression has prevented natural vegetative succession, and allowed white bark pine to dominate lodgepole pine, white fir to overtake its associates, and aspen reproduction to diminish. A recent amendment to wilderness management permits lightning-caused fires to play, as nearly as possible, their natural ecological role within Wilderness. The Forest will prepare a Wilderness Implementation Plan to guide the use of unplanned ignition managed under prescription to reduce hazardous, unnatural accumulations of fuel.

### Grazing

The South Warner Wilderness was grazed long before it was classified as a Wilderness. Grazing in Wilderness areas was legally established under the 1964 Wilderness Act (P.L. 88-577). Approximately 1,655 cattle and 3,000 sheep graze these allotments, generally from July 1 to September 30.

Watersheds have deteriorated because of overstocking, uneven distribution, and drift from adjacent allotments. Heavy cattle use has degraded portions of recreation trails. Where cattle congregate near lakes, springs and stream banks, water quality is impaired. However, over the past few years range condition and vegetation of the Wilderness has improved through improved grazing management.

### Visual Quality

Current direction for managing the visual resource in the Wilderness comes from the Wilderness Act. Only ecological changes are permitted, except for very low visual impact facilities, such as trails. Changes can be made to existing visual impacts, however, to make them appear more natural. The Forest Service Visual Resource Management System's initial visual quality objective (IVQO) is Preservation which conforms with the above direction.

### Fish and Wildlife

Stocking of lakes and streams began early this century. Because natural reproduction does not occur in these lakes, fish are brought in by backpack, horse-packing, and aerial drops to maintain the fishery resource. Patterson and Clear Lakes provide the best, most consistent

fishing in the Wilderness and also attract the most visitors.

In 1980, fourteen bighorn sheep were transferred from the Lava Beds National Monument to the Raider Canyon area (see Wildlife section of this Chapter). By 1984, herd numbers increased to approximately 31 animals. However, in late 1987 and early 1988, the entire bighorn population died from a pneumonia bacteria (*Pasteurella haemolytica*), probably transmitted from domestic sheep or goats.

### Supply

The supply of the Wilderness resource can best be measured by Wilderness carrying capacity, i.e., the amount of use allowable while still maintaining long-term opportunities for Wilderness-dependent experiences. Physical capacity (ability of the environment to sustain use) tempered by social capacity (human preference) are the two components of carrying capacity.

Physical carrying capacity is principally determined by campsite availability. Campsite solitude is one of the major components affecting social carrying capacity. Campsite solitude is assumed to be the limiting component of social carrying capacity for all of the South Warner Wilderness except major day-use areas (Mill Creek Falls/Clear Lake, Pine Creek Basin, and Emerson Lake).

The average use for the South Warner Wilderness in the early 1980's was 15,060 recreation visitor days (RVDs) with the lowest being 12,100 RVDs in 1981. Comparing this average use to the maximum practical carrying capacity (34,561 RVDs) indicates that the South Warner Wilderness capacity is approximately 2-1/2 times greater than its current use.

### Demand

Projections by California Statewide Recreation Plan (State of CA 1980a) and the Statewide Recreation Needs Analysis (State of CA 1982) for increases in backcountry activities indicate that recreation use in the South Warner Wilderness could increase over 60% by the year 2000. These documents predict that the three main activities enjoyed in the Wilderness—backpacking, hunting, and fishing—will increase at a rate higher than the projected population growth. However, those increases may not occur because of long distances between the Wilderness and major population centers.



Although use may not exceed the capacity of the entire Wilderness prior to the year 2030, use of preferred areas may exceed the capacity much sooner. Popular areas such as Patterson Lake are currently used beyond capacity during peak periods.

## Opportunities

Many opportunities to improve the Wilderness involve management of trails, visual quality, public information, recreation, fire, grazing, wildlife, and fish. Maintenance of existing trails and trailheads could be improved. New trails and trailheads, bridges, and signs could be designed to blend with the Wilderness environment. The Forest could provide Wilderness information at entry points. Wilderness carrying capacity could be

broadened by encouraging recreationists to seek a more primitive wilderness experience.

Through standards and guidelines in the Plan, the Forest could allow lightning-caused fire to play its natural role in restoring vegetative succession in the Wilderness. Prescribed burning would reduce hazardous accumulated fuels.

Wilderness water quality and riparian vegetation could improve by reducing or excluding livestock and achieving balanced distribution. Instream structures and livestock exclusion from riparian zones could improve fisheries. Bighorn sheep herds could be reintroduced into the Wilderness and protected from domestic livestock diseases by excluding livestock from grazing in Wilderness areas adjacent to bighorn territories.

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## 24. Wildlife

### Introduction

The Forest is home to more than 350 species of wildlife which live in a wide variety of habitats (see the *Diversity* section and Appendix K). Each requires a particular combination of food, water, and shelter to exist. Some wildlife species occur in all vegetation types on the Forest, while others are very limited in their habitat needs. Each species plays a role in the balance, persistence, and evolution of the ecosystem of which it is a part.

The Forest Service is responsible for managing wildlife habitat, while the California Department of Fish and Game (CDFG) manages wildlife and fish populations. Habitat and population, however, are inextricably intertwined, because the mix or diversity of vegetation and habitat components determines the kind and amount of wildlife that will occupy a specific area.

Wildlife plays an important role in the natural processes of the Forest's ecosystems. Some birds and mammals help distribute seeds and, along with amphibians and reptiles, consume harmful forest insects and rodents. On the other hand, some species of mammals may prey on livestock, eat tree seedlings, damage young saplings, or damage recreation facilities.

Wildlife provides recreation opportunities for both consumptive and non-consumptive uses. Deer, pronghorn, upland bird, and waterfowl hunting, as well as fishing, are the most popular consumptive recreational uses of the Forest's wildlife resources. Viewing mammals, bird-watching, and catch-and-release fishing are the most common non-consumptive uses.

Wildlife also has aesthetic and intangible values for society that are not associated with direct use. For many persons, just knowing various wildlife species live in the Forest gives wildlife and fish conservation high value.



*Dan Delany*

## Management Indicator Species

Three categories of MIS have been developed, covering 32 species of wildlife and fish (Table 3-18):

### Threatened and Endangered (T&E)

T&E species are federally designated because low population levels and loss of habitat may eventually render them extinct. The Forest Service must manage habitat to achieve recovery levels of T&E species. The Forest is required to consult with the U.S. Fish and Wildlife Service (USFWS) whenever the Forest initiates any activity which may affect a federally listed T&E species. The Forest has six T&E species.

### Sensitive Species

The Forest Service lists as sensitive those species needing special management emphasis to ensure their viability and to preclude trends toward endangerment that would result in their federal listing. The Forest has four MIS that are sensitive.

## Other MIS

Other MIS include harvest species, ecological indicator species, and special interest species. *Harvest species* are important because of their contribution to local economies, and hunting opportunities. *Ecological indicator species* are used as barometers to assess the effects of Forest activities on their habitats and other wildlife species requiring similar habitats. *Special interest species* are those that were identified as important because of Resource Planning Act (RPA) goal, state or local concerns, or because of their limited distribution. Goals for RPA species include maintaining or exceeding 1982 populations.

RPA Species	Population Goal
Mule Deer	20% above 1982 level
Resident Trout	20% above 1982 level
Cavity-Nesting Species	Maintain 1982 level

**Table 3-18. Forest Management Indicator Species.**

T&E	Sensitive	Other MIS
Bald Eagle Peregrine Falcon Northern Spotted Owl Modoc Sucker Lost River Sucker Shortnose Sucker	Goshawk Willow Flycatcher Calif. Bighorn Sheep Pine Marten	Waterfowl (Canada Goose and Mallard) Golden Eagle Osprey Prairie Falcon Swainson's Hawk Greater Sandhill Crane Blue Grouse Sage Grouse Pileated Woodpecker Hairy Woodpecker Red-breasted and Red-naped Sapsuckers Yellow Warbler Western Gray Squirrel Mule Deer Pronghorn Rainbow, Brown and Brook Trout Goose Lake Redband Trout Largemouth Bass

## Species

### Bald Eagle

#### Supply and Habitat

The bald eagle is our national symbol. From 1940 to 1960 a dramatic decline in populations caused concern for the future of this bird. Today, about 1,500 pairs nest in the lower 48 states; Northern California supports at least 66 pairs.

During winter, the Klamath and Tule Lake Basins (adjacent to the Modoc NF), and winter roost areas on Forest land take on national significance. The area boasts one of the largest populations (up to 1,000) of wintering bald eagles outside of Alaska. Northeastern California provides habitat for approximately half of all the bald eagles wintering in the State (Detrich 1981, 1982).



Bald eagles in northeast California prefer nesting in eastside pine in the tops of large, overmature trees with an open canopy and large limbs. Nesting sites must be near streams or large bodies of water for fishing, and snags for perching or feeding (Shimamoto and Newman 1982).

The Forest has 52,000 acres of suitable bald eagle habitat. This acreage encompasses ten active territories, three winter roosts, and 11 highly suitable potential nesting habitats.

#### Current Management

Direction for bald eagle management and its habitat comes from the Endangered Species Act of 1973 (P.L. 93-205). The bald eagle is a federally listed endangered species and an emphasis species for the RPA program. The Forest Service has the responsibility to manage T&E species at recovery levels. The population recovery goal for this Region is 92 pairs, almost twice the current situation. The Forest recovery goal is 21 nesting pairs.

Some constraints have been placed on timber management activities within bald eagle habitat to minimize disturbance during the critical nesting period. Direct habitat improvement has not been emphasized, and winter roost areas are in particular need of attention.

#### Opportunities

By developing wetlands near existing nest territories, the Forest could increase waterfowl and fish populations, and enlarge the eagle's prey base. Nest sites could be improved or created through vegetative manipulation, such as creating "windows" in large trees with closed canopies, or treating timber stands.

Management direction could be improved through plans for territory and roost areas which are mutually acceptable to the Forest, CDFG, and the USFWS.

### Peregrine Falcon

#### Supply and Habitat

Following World War II, peregrine falcon populations declined everywhere, and the bird was extirpated as a breeding species east of the Rockies and south of the Canadian boreal forest. The major cause of this decline was linked to DDT contamination, resulting in abnormally thin eggshells which often broke during incubation (Hickey and Anderson 1968). Known breeding numbers remain at critically low levels in the West.

In 1970, the species was listed as endangered by the USFWS. Ninety pairs of peregrine falcons were observed in California during the 1989 breeding season. A total of 117 wild and captive raised young were fledged from their nests (Monk, et al).

The Warner Mountain Ranger District and portions of the Devil's Garden and Doublehead Ranger Districts, together with the Fremont National Forest, form a peregrine falcon management unit. While no active nests are present, this management unit is targeted to support six breeding pairs. The Bureau of Land Management has been cross-fostering peregrine falcon chicks into prairie falcon nest sites since 1986. A total of 10 birds have successfully fledged.

Nesting habitat consists of cliff faces at least 150 feet high, and must contain a small cave or overhung ledge of at least 10 square feet removed from ground access. Nests must be located within six miles of abundant bird prey (Shimamoto and Airola 1982).

Historically, the peregrine falcon nested at several locations on the Warner Mountain Ranger District. The Forest has identified 21 potential sites as suitable nesting habitat, of which 16 are in the Warner Mountains and six

are in or near the South Warner Wilderness. Three sites with exceptional potential for reintroduction efforts are located in Dry Creek Basin, Emerson drainage, and at the mouth of East Creek.

#### **Current Management**

National direction for peregrine falcon management comes from the Endangered Species Act of 1973 and NFMA Regulations to maintain viable populations of all existing native vertebrate species. In accordance with those directives, a recovery plan for the Pacific peregrine falcon was completed in 1982. It included efforts to reestablish nesting pairs at suitable nest sites Statewide.

In 1983, Forest managers decided to introduce young peregrine falcons to establish two nesting eyries. The ability to proceed with this activity is dependent on the availability of young falcons. In 1986, the BLM began a cross-fostering program at Mount Dome.

#### **Opportunities**

As peregrine falcons are established, the Forest could enhance or develop nesting ledges to encourage occupation at additional sites. In addition, managing vegetative seral stages, wetlands, and riparian areas could enhance suitable habitat for prey species.

### **Northern Spotted Owl**

#### **Supply and Habitat**

The northern spotted owl was listed as threatened in June 1990. It is found in old growth conifer habitats in Oregon, Washington and northern California. As old growth habitats have been reduced, so have northern spotted owl populations.

Until 1989, only one spotted owl had been documented on the Forest, in the Warner Mountains. In 1989, portions of the Big Valley, Doublehead and Warner Mountain Ranger Districts were intensively surveyed for spotted owls.

Spotted owls were documented on the Doublehead Ranger District near the Medicine Lake Highlands. Responses were heard on four occasions. On two of those

occasions, a pair was suspected. No nest sites were located, and the birds could not be found during daytime surveys. No birds were located on the Big Valley or Warner Mountain Districts.

Habitats on the Modoc NF are considered marginal for spotted owls. Historical vegetation diversity has been reduced by intensive timber management. Spotted owls on the Modoc are probably extensions of birds from the Klamath and Shasta-Trinity National Forests. However, the owls' presence indicates the area may have habitat to support nesting birds. The nearest known occupied territory exists on the Goosenest Ranger District of the Klamath National Forest approximately four miles northwest of Medicine Lake. In addition, that District documented an additional pair (no nest site found) approximately three miles west of Medicine Lake.

#### **Current Management**

Until 1989, the Modoc NF did not manage habitats for the northern spotted owl. The Forest consulted with the U.S. Fish and Wildlife Service on two timber sale areas where owls were documented. These sales were modified pending further surveys.

The Forest will continue to survey the Medicine Lake area. Our goals are to survey habitats where owls responded in 1989, and expand surveys into areas that are planned for timber harvest activities in the future. Until further data regarding owl occupancy of this area is collected and analyzed, older seral stages will be retained. In addition, logging will be restricted to seasons when owls are not nesting.

#### **Opportunities**

Opportunities for managing northern spotted owls on the Modoc NF are limited. Data collected here could be used to further define the biological limits of the species. If a nest site or occupied territory are found, the Forest will consult with the U.S. Fish and Wildlife Service to determine the biological significance of the territory. Management direction for specific territories will be made on a case-by-case basis.

## Modoc Sucker

### Supply and Habitat

The Modoc sucker is a small sucker with an historic range that is limited to eight streams in the upper Pit River drainage in Modoc and Lassen counties. During spawning season, the species uses small to moderate-sized gravels at the heads of pools, tails of pools, and low gradient riffles (Chappell, CDFG, pers. obs.; Jones, McCarthy, Studinski, MNF, pers. comm.). During the remainder of the year, when flows in streams have dropped to intermittent levels, the species has been found in large, shallow, muddy-bottomed pools with partial shade and cool temperatures (Moyle and Marciochi 1975). It is also found in large, deep (4-5") pools with partial shade, cool temperatures, and cover in the form of boulders, undercut banks, or vegetation. They are part of a native cold-water fish assemblage that includes resident Goose Lake redband trout, speckled dace, Pit sculpin, and California roach.

Modoc sucker habitat is currently found in Rush, Johnson, Turner, Hulbert, Washington, and Dutch Flat Creeks. The current population was estimated at 5,000 (Ford 1977 and Moyle 1974) but has been reevaluated at 1,500 (J. Williams, BLM [former USFWS], pers. comm.).

Species survival is threatened because (1) summer habitat is limited; (2) quality of the habitat is degraded; (3) habitat on private lands is not managed; (4) access of historically isolated Modoc sucker streams by Sacramento suckers is resulting hybridization; and (5) predatory non-native fish species have been introduced into Modoc sucker habitat. Because most creeks which Modoc suckers inhabit are intermittent, the lack of suitable summer holding pools may be the most limiting factor on total population numbers.

### Current Management

Since the late 1970's, the Forest has managed the Modoc sucker in cooperation with CDFG and the USFWS. In 1980, CDFG upgraded the State species classification from rare to endangered. In 1982, the USFWS proposed the Modoc sucker for federal listing as an endangered species. In July 1985, the Modoc sucker was federally listed as an endangered species.

In 1980, CDFG and the Forest jointly developed a recovery action plan which identified major problem areas and actions necessary for species recovery. The Rush-Johnson and Turner-Hulbert-Washington Creek drainages were the only areas identified in which pure Modoc sucker populations would be maintained. In 1984, the action plan developed by CDFG, USFWS, and the Forest added requirements to establish pure Modoc

sucker populations in two creeks outside of the Turner and Rush Creek systems.

The Forest has also formally and informally consulted with CDFG and the USFWS on other Forest projects that may affect species habitat.

### Opportunities

Habitat improvement and control of non-native fish species would benefit the Modoc sucker. Habitat improvements include planting more hardwoods, stabilizing eroding banks, and changing management activities that affect riparian areas. Control of non-native fish species include installing a fish barrier on Rush Creek (the only current habitat that is still accessible to the Sacramento sucker) and removing predatory non-native fish species from Modoc sucker drainages.

## Lost River Sucker and Shortnose Sucker

### Supply and Habitat

The Lost River sucker and shortnose sucker are two large sucker species that inhabit lakes and reservoirs on the Lost River and upper Klamath River systems. On the Forest, habitat for the two species include the Clear Lake Reservoir drainage and the upper portion of the Lost River drainage. First classified by the State of California as rare in 1972, they were reclassified as endangered in 1973. In 1987, both species were proposed for federal listing as endangered, and in 1988 both species were listed as federally endangered. Because the species occupy the same drainages on the Forest and have similar habitat requirements, they are discussed together.

On the Forest, both species migrate from Clear Lake Reservoir to spawn in Willow Creek and Boles Creek, suckers found in reservoirs within the two drainages probably use the inflowing creek of the reservoir for spawning. Summer holding occurs in reservoirs as well as deeper pools within the channels. Stream miles and acres of reservoir habitat under Forest Service management are shown in Table 3-19.

Opportunities also exist for cooperating with private land owners by improving habitat on private lands adjacent to the Forest.

**Table 3-19. Lost River and Shortnose Sucker Habitat in Streams and Reservoirs.**

Streams	Miles
Fletcher Creek	5.1
Boles Creek	12.6
Lost River	10.1
North Fork Willow Creek	3.8
Willow Creek	3.9
<b>Total</b>	<b>35.5</b>
Reservoirs	Acres
Avanzino	126
Telephone	650
Bayley	25
Fletcher	560
Wild Horse	48
Four Mile	3
Weed Valley Reservoir	550
<b>Total</b>	<b>1,962</b>

The system is believed to contain pure Lost River suckers. The purity of the shortnose suckers in the system is less certain because of two mouth shapes that have been seen; however, this difference in itself is insufficient to determine if the population is pure or hybridized. Genetic analyses are being conducted in 1990 to determine the pure or hybridized status in the Clear Lake drainage. (W.Berg, U.C. Davis, pers. comm.).

Species survival is threatened by water manipulation projects which act as barriers to spawning habitat, reduce spawning and rearing habitat, and facilitate hybridization with other suckers in the system. Population estimates have been made only on the Upper Klamath Lake populations. In 1984, the spawning run of shortnose sucker out of Upper Klamath Lake was 2,650; while in 1985 and 1986, too few were found to make an accurate estimate of the population size. In 1984, the spawning run of the Lost River sucker was 23,123; however, in 1985, the spawning run was 11,861. The drastic decline in both species populations is attributed to a lack of successful spawning. The current population sizes of the species overall and of the Clear Lake drainage are currently unknown. A recovery plan for both species is being developed, and an action plan that tiers off the recovery plan will follow.

### Current Management

Lost River and shortnose suckers were on the Regional Forester's Sensitive Species List until they were federally listed as endangered, at which time they were placed on the T&E list. A Klamath Basin Sucker Working Group was created to identify problems facing the species, although most of the investigations have been on the Upper Klamath Lake populations. On the Forest, presumed problems include (1) intermittent streams courses and high summer temperatures; (2) turbidity in Boles Creek; (3) damage to banks, riparian vegetation, and instream habitat caused by overgrazing; and (4) dewatering of the Lost River after irrigation releases from Clear Lake Reservoir cease (Sonnevill 1972; Koch et al. 1973, 1975).

Habitat improvement projects on the Clear Lake drainage have just begun. In the early 1970's, a fence was built in conjunction with a bridge construction project on Willow Creek to protect a stream portion from livestock grazing. A fencing project on the remainder of Willow Creek as well as Antelope Creek and Rock Creek, tributaries to the Lost River, is currently under construction. A livestock enclosure on the upper portion of Mowitz Creek, a small tributary to Clear Lake Reservoir, was installed in 1987.

Livestock grazing is the primary Forest management activity within watersheds inhabited by suckers. The Devil's Garden and Doublehead Ranger Districts have revised allotment management plans to improve riparian and instream habitat conditions.

### Opportunities

Improving riparian zones and instream habitat for Lost River and shortnose suckers is the primary opportunity for species recovery. Improvement of riparian habitat would help maintain Forest sucker populations. Other habitat improvements include constructing additional pool habitats, deepening existing pools, improving summer-holding habitat in reservoirs, and improving spawning sites with water control structures.

### Goshawk

#### Supply and Habitat

The goshawk is the largest of the three North American accipiters (short-wing hawks). It is found in forested regions throughout North America. In California, they breed primarily in the northern third of the State and in the Sierra Nevada Mountains south to Kern County. Goshawks prefer nesting in medium to large trees in mixed conifer or eastside pine stands with a greater than 40% canopy closure.

The goshawk is identified by the Forest Service as a sensitive species, and by the CDFG as a species of special concern (Remsen 1978). Because its presence indicates the availability and condition of older forest ecosystems, the goshawk was selected as a Forest management indicator species.

A nest territory includes an active nest stand of 25-80 acres and a known alternate nest stand. The Forest currently supports 81 pairs and territories. About 75% of them are in the Warner Mountains where habitat is highly suitable. While the other districts also have suitable habitat, active nests have been located only within the last several years. Forestwide, 73 pairs would ensure population viability with each district supporting enough birds for adequate distribution. The Forest has the biological capability to provide suitable habitat for about 254 pairs, 181 pairs above the minimum (Table 3-20).

Goshawk nests on the Forest are protected through modification of silvicultural prescriptions or exclusion of the stand from harvest. During timber sale planning, nest territories are designated in various ways including:

- designating and protecting suitable habitat in areas where goshawks are seen but active nests are not located;
- substituting an active nest stand with an area containing suitable habitat but no goshawks; and
- designating areas with suitable habitat, even though no goshawks have been sighted.

The Forest is monitoring timber sales following harvest to assess the effectiveness of protection measures.

Within nest territories, access to areas associated with commercial timber sale and firewood gathering activities

<b>Table 3-20. Goshawk Status</b>			
<b>Ranger District</b>	<b>Current Territories</b>	<b>Estimated Minimum Territories</b>	<b>Estimated Potential Territories</b>
Warner Mountain	53 <sup>1</sup>	26	120
Big Valley	12 <sup>2</sup>	21	66
Devil's Garden	12 <sup>3</sup>	15	31
Doublehead	4	11	37
<b>Forest Total</b>	<b>81</b>	<b>73</b>	<b>254</b>
<sup>1</sup> Forty territories are managed as base territories outside the wilderness. Thirteen additional territories are assumed to be in the Wilderness.			
<sup>2</sup> An additional three territories are proposed for designation in EAs.			
<sup>3</sup> An additional three territories are proposed for designation in EAs.			

### Current Management

Ranger district inventories yielded the following results. The Warner Mountain District found 54 active nest territories. The District selected 40 nest territories outside the Wilderness to meet its target. Further validation of nest territory characteristics are necessary to determine habitat requirements. The Forest assumes an additional 13 territories in the Wilderness. The Big Valley District has located 12 of 21 nest territories. The Devil's Garden District has designated 12 of 15 nests needed to meet its minimum numbers. The Doublehead District has designated four of its 11 nest territories.

is restricted from March 1 through July 31. In addition, new roads are not constructed within nest territories.

### Opportunities

By systematically surveying goshawk use of habitat types, the Forest could remove some constraints on timber management (Camilleri 1982).

Populations could be enhanced by improving the goshawk prey base, by sampling nest stands more frequently and monitoring individual pairs, and by conducting field surveys with CDFG to assess fledgling success.



## Willow Flycatcher

### Supply and Habitat

The willow flycatcher is proposed for listing as an endangered species by the State of California. It is also listed as a Forest Service sensitive species. This bird breeds in willow thickets along streams and meadows. It was selected as an MIS because it depends on this vegetation and structural component within riparian habitat. Loss of suitable willow thickets for nesting, and nest parasitism by cowbirds have caused flycatcher numbers to decrease. The distribution of the willow flycatcher on the Forest is unknown, but it has been seen in the South Warners. One nesting site was confirmed on the Modoc National Wildlife Refuge. It probably occurs in willow stands associated with meadows throughout the Forest.

### Current Management

This species is not currently managed on the Forest. Livestock grazing can suppress, degrade, or eliminate willows from riparian areas. In some riparian areas, beavers have also depleted willows. Beaver populations have since decreased, but willows have not reestablished these areas. All ranger districts have planted willows in riparian areas to reestablish the species.

### Opportunities

Improved livestock management in riparian areas with objectives of meeting the riparian prescription for woody vegetation would increase habitat for the willow flycatcher. Planting and protection from livestock grazing would reestablish willows in areas from which they have been extirpated.

## California Bighorn Sheep

### Supply and Habitat

California bighorn sheep historically ranged in the rough mountainous areas of the Sierra Nevada, Cascades, and Warner Mountains. Populations began declining in the late 1800's from disease, market hunting, and forage competition with domestic livestock. By 1971, bighorn sheep were listed as a State rare species. Currently, they are established in the southern Sierra Nevada Mountains of California.

In 1980, ten California bighorn were introduced into the south Warner Mountains. By 1987, the Forest bighorn population was estimated at 60 sheep. In late 1987 and early 1988, the entire bighorn sheep population died. The suspected cause of the die-off was a pneumonia bacteria (*Pasteurella haemolytica*, Type A), most likely transmitted from domestic sheep or goats.

### Affected Environment



### Demand

The bighorn is highly valued by both consumptive and nonconsumptive users. Other states have auctioned permits to hunt bighorn and received bids as high as \$60,000. Viewing bighorn could be one of many opportunities offered visitors to the Warner Mountains.

### Current Management

California bighorn sheep are classified as a sensitive species. Evidence indicates their historic presence in the Warner Mountains. Currently, the Forest is working with several agencies and organizations to develop a reintroduction plan for northeastern California. Before a reintroduction effort is made, concerns about disease transmission on both Forest and private lands must be resolved.

### Opportunities

Potential habitat for approximately 400 animals exists in the Warner Mountains. Removing domestic livestock (sheep), which graze near all potential reintroduction areas, from one or more of these adjacent areas would enhance opportunities to expand the bighorn's range.

## Marten

### Supply and Habitat

The marten is found throughout the Forest in semi-secluded tracts of mixed conifer, white fir, red fir, lodgepole, and subalpine forests. Martens prefer older seral stage stands with many large snags, stumps, and logs near meadows and riparian areas. Once trapped for its valuable fur, the marten has been protected in California since 1953.

The Modoc National Forest used the habitat capability model for marten (1990 Furbearer Regional Literature Review) as applicable to the Forest. The following criteria were used to delineate habitat:

- All components of the habitat were met within an area of at least 2,100 acres.
- Adjacent territories were located within three miles of each other. If habitat suitability precluded territory distribution at this level, then territories were placed according to available habitat.
- Within each territory, 60% of the area was managed as 4G stands, and 20% was managed as 3G stands. If sufficient 4G stands were not available, then 3G stands were substituted for 4G stands.
- Red fir, white fir, mixed conifer, and lodgepole pine were considered suitable vegetation communities for marten.
- Sufficient habitat was assumed to exist along riparian areas and unmanaged stands to provide travel corridor opportunities.

A total of 18 territories were identified on the Forest: 4 on the Doublehead Ranger District, 5 on the Big Valley Ranger District, and 9 on the Warner Mountain Ranger District.

Marten territories on the Big Valley Ranger District may not be important for the network for the following reasons:

- Most territories on the District are at lower elevations and may not be important for marten.
- These territories are isolated from other marten territories by large acreages of unsuitable habitat.
- Most of this area has been rendered unsuitable as marten habitat because of logging practices.

Little is known about marten on the Forest. Surveys have been conducted only in the Medicine Lake Highlands on the Doublehead District. This portion of the District, in addition to the Warner Mountains, is probably the most suitable marten habitat.

Habitat on the Big Valley and Devil's Garden Districts are not contiguous and, for the most part, are marginal for martens. Adjacent lands on the Klamath and Shasta-Trinity National Forests provide additional habitat and opportunities for the animals to intermix.

### Current Management

The marten is on the Regional Forester's Sensitive Species List because of its dependence on older seral stage stands and its susceptibility to timber management practices. Conflict exists between timber harvest and maintaining older habitat for dependent species. A policy to retain older mature stands was written in 1980. Requirements for old-growth habitat are met with existing old growth in addition to recruitment habitat. Recruitment habitat refers to trees which are not currently old growth, but are designated on stand record cards as future old growth. Timber harvest is reducing marten populations on the Forest.

Regional MMRs require the Forest to maintain 5% of its lands in old-growth habitat. However, many timber compartments no longer contain 5% of the timbered areas in old growth. No compensation is made for areas with snag densities below MMRs.

Riparian areas are important to marten because the dense herbaceous ground cover supports its prey, particularly mice and voles. Consequently, improving these areas enhances the marten's prey base and, therefore, its population. The Riparian Areas section of this chapter discusses ecological conditions in detail.

### Opportunities

The Forest can provide a small territory network in the Medicine Lake Highlands; and a larger, discontinuous network in the Warner Mountains. These could be expanded to other national forests. Implementing the Riparian Area Management Prescription (Forest Plan Chapter 4) within these territories will enhance habitat suitability. The Forest can also inventory habitats to determine the extent of occupied marten habitat.

## Waterfowl

### Supply and Habitat

The Canada goose and mallard duck are the waterfowl selected as management indicator species for this Forest. Northeastern California is a critical portion of the Pacific Waterfowl Flyway. Each spring and fall, hundreds of thousands of waterfowl use the Modoc Plateau during migration from Alaska and Canada to Mexico. With the Tule Lake and Klamath Basins, this area is the largest

concentration point for waterfowl in North America (Bellrose 1976).

In 1965, a pilot program began at Spaulding and Beeler Reservoirs (on the Devil's Garden Ranger District) to increase Canada goose production. Metal nesting tubs and small earth mounds topped with tubs or tires were constructed to encourage geese to nest. In twenty years, development techniques have become more sophisticated. Islands are constructed in the wetland basin to provide secure nest sites for waterfowl. Seeding islands with a mixture of grasses and forbs provides dense nesting cover. Potholes blasted in wet meadows provide loafing habitat for duck pairs, and attract them to nest in adjacent areas.

The Forest has 42,785 acres of waterfowl habitat comprised of permanent and intermittent waters and associated upland habitat. More than 60% of the acreage is suitable for nesting and broodrearing by early and late nesting waterfowl; but only 17,000 acres are suitable for improvement under the wetland development program.

The Forest has 27 developed wetlands on 6,000 acres containing more than 600 waterfowl nesting islands and tubs, and an additional 24 undeveloped and 16 partially developed wetlands.

The Forest has identified an additional 1,600 islands, nine dams (eight reconstruction, one new construction), and six headgates that could be developed on another 11,000 acres of wetlands.

### Current Management

The need to provide water and dense nesting cover is the focus of current waterfowl habitat management. After they are built, islands are seeded with grasses and forbs, fertilized, and fenced. Fences restrict grazing and allow dense cover to develop and remain for use by nesting birds. The remaining portions of wetlands and adjacent uplands are usually open to livestock grazing.

Although wetlands provide most of the waterfowl habitat, lakes, meadows, and streamsides are also important. Managing these areas for waterfowl depends on our ability to manage the vegetation and livestock grazing within riparian areas.

The Forest is monitoring the effect of improvements on waterfowl, particularly Canada geese and minimally on ducks. Results indicate that each island annually produces 2-3 goslings and 5-6 ducklings. Data collected from upland sites is insufficient to estimate production.

### Opportunities

The success of waterfowl production on Forest wetlands depends on secure nesting cover and sufficient water through the summer to insure brood fledging. Opportunities to manage waterfowl include increasing water storage capacity where it is necessary for brood survival; constructing islands with secure residual nesting cover, managing habitat for cavity-nesting ducks; creating natural islands through channelling; and planting palatable waterfowl forage species.

### Golden Eagle

#### Supply and Habitat

The golden eagle is widely distributed throughout the northern hemisphere, including the Forest. It prefers to nest in relatively open-canopied eastside pine, western juniper, and sagebrush vegetation types. The bird selects either large trees or cliff faces overlooking open habitats. Nest trees are typically large diameter ponderosa pine.

Seventeen known active nests exist on the Forest, and an additional 37 locations are identified as potential nesting habitat.

#### Current Management

The golden eagle is recognized a species of special concern by the CDFG. Timber managers have modified green and salvage timber sales to protect the habitat and to limit disruption during the nesting period. Modifica-



tions include restricting logging operations to preserve nest stands.

Current management adequately protects known nesting territories.

### Opportunities

Recreationists, logging of nest tree stands, and wild-fire pose the greatest threats to the golden eagle and its habitats. The Forest could limit seasons of operations and restrict access to habitat areas. With prescribed underburning, the Forest could also limit the loss of nest stands from wildfire.

## Osprey

### Supply and Habitat

The osprey is a large fish-eating raptor which usually nests in the tops of dominant snags or broken-topped green trees. Osprey readily adapt to a variety of artificial platforms. Streams or large reservoirs well stocked with fish are required within one mile of the nest site.

Osprey are found primarily in the coastal and Great Lakes states. Many inhabit the Rocky Mountain states and Alaska. California's most dense osprey populations are in the northeastern portion of the State and along the Klamath River (Airola 1982). This bird is on the California Department of Fish and Game's list of species of special concern.

The Forest currently has seven active osprey nesting territories. Five nests are located at wetlands on the Devil's Garden District. These wetlands are surrounded by open pine and juniper stands, ideal for attracting nesting osprey. The Big Valley Ranger District supports the other nests around similar wetlands and open coniferous forest habitat.

Potential osprey nesting locations have been identified Forestwide. The Devil's Garden has ten potential locations, and the Warner Mountain and Big Valley Districts each have eight sites. Because of its limited water supply, the Doublehead District has only three potential sites. If all potential habitat on the Forest were occupied by nesting osprey, the Forest could increase its osprey population five-fold.

### Current Management

From the 1950's through the early 1970's, osprey numbers declined nationwide as a result of pesticide accumulation in body tissues. The most harmful pesticides have been removed from the market or their use restricted, and osprey populations in many parts of the country have recovered.

To provide for habitat needs, the Forest coordinates timber harvest activities, tops trees, and constructs nesting platforms. Efforts have been made to locate new nesting territories, and production surveys on known nest territories have been made on an irregular basis.

### Opportunities

The Forest could improve the prey base by developing fisheries in reservoirs near nesting sites. Retaining snags and recruiting future snags adjacent to water sources would ensure suitable nesting habitat.

## Prairie Falcon

### Supply and Habitat

The prairie falcon is found in western North America, and nests on cliff ledges called eyries. The cliffs are generally 30-400 feet high and overlook open rangeland country. Prairie falcons commonly feed in open rangeland vegetation such as western juniper, sagebrush, and grasslands, as well as in eastside pine. Other than movements to lower elevations in the winter, it is a non-migratory species.

In the 1960's, prairie falcon populations decreased from DDT contamination which resulted in thin eggshells breaking during incubation. Since DDT was banned, prairie falcon reproductive success has steadily increased. With recovery of the species in progress, the State lifted a ban on taking wild birds for falconry in 1978.

Currently, 21 known active prairie falcon eyries exist on the Forest, primarily in the Warner Mountains where 19 sites have been found. An additional 38 potential nest sites are scattered throughout the Forest, with the Warner Mountains having the the most potential.

### Current Management

The prairie falcon was listed as a sensitive species until 1984. It is still listed as a species of special concern by the CDFG. The Forest protects active eyries by restricting timber harvest and hauling activities within 1/4- to 1/2-mile around the site during the nesting season.

### Opportunities

The Forest can limit or prevent disturbance to active eyries by continuing seasonal road closures during nesting. Known nesting areas can be considered when new roads are planned.

Periodic monitoring of eyries in cooperation with the CDFG should provide better information for managing falconry permits.

By cross-fostering<sup>1</sup> with prairie falcons, the Forest might improve the population of peregrine falcons, an endangered species.

### Swainson's Hawk

#### Supply and Habitat

Swainson's hawks are found in open habitat throughout the western United States. In the Great Basin, Swainson's hawks prefer open sagebrush steppe habitats with scattered large junipers for nesting habitat (Bloom 1979, Woodbridge 1987, Estep 1989). Currently, most of the foraging habitat is on privately owned agricultural lands.

Historically, this species was probably much more abundant on the Forest than it is currently. Juniper encroachment, resulting from fire suppression and heavy livestock grazing, rendered much of the Forest unsuitable for nesting habitat. The decline in Swainson's hawks can be attributed to the following:

- Swainson's hawks tend to avoid dense juniper stands for nesting.
- With the decrease in perennial grass/forb understories, prey populations (small mammals) have also declined.
- Shift in vegetation communities favors species such as great horned owls, which prey on Swainson's hawk nests.
- Increased use of agricultural lands puts foraging birds at a higher risk from pesticide poisoning.

There are 11 known nest sites on or immediately adjacent to the Modoc National Forest. All are on the Doublehead Ranger District. An additional four nest sites are on agricultural or BLM lands adjacent to the Forest. Nest sites are also probable on or adjacent to the other ranger districts.

#### Current Management

The Swainson's hawk is listed as State threatened species. It is also listed as a Category 2 species by the U.S. Fish and Wildlife Service. The Forest has not actively managed Swainson's hawks. No information has been collected at existing nest sites. Ongoing studies in Modoc County by the Bureau of Land Management suggest that

great horned owls prey heavily on nest sites; and nest failure rates are high.

#### Opportunities

Additional work is needed on factors limiting Swainson's hawk nest productivity. Nest site protection should be ensured for projects occurring within Swainson's hawk nesting habitat. Nest site suitability would be enhanced by removing small diameter juniper trees, while leaving large diameter trees as nest sites. Research regarding the reestablishment of historic sagebrush steppe vegetation communities, important for Swainson's hawk nesting and foraging habitat, would also be beneficial.

### Greater Sandhill Crane

#### Supply and Habitat

Greater sandhill cranes nest throughout much of western North America. In the western United States the species is locally common. Sandhill cranes use marshes, wetlands, and large meadow areas for nesting and brood-rearing habitat.

Historically, nesting sandhill cranes occupied suitable habitats over much of northern and northeastern California. By the early 1900's, human settlement and habitat destruction significantly reduced breeding distribution and populations (Littlefield 1982). By the mid-1940's, as few as five pairs may have lived in the entire State. Sandhill crane populations increased as a result of predator control and habitat restoration and development. By 1988, at least 277 nesting pairs of cranes inhabited California, of which 164 were located in Modoc County (Littlefield 1989). The population is apparently still increasing.

On the Forest, sandhill crane nesting activity has increased as a result of wetlands development and management, and an increasing crane population in northeastern California. Approximately ten pairs of sandhill cranes nest on the Forest. Most of the suitable nesting habitat exists on the Devil's Garden Ranger District. However, the Big Valley and Doublehead Ranger Districts also have suitable nesting habitat. Sandhill cranes prefer wetlands and riparian areas that extend gradually into uplands (Littlefield pers. comm.). These ecotones provide foraging areas for broods. Wetlands that abruptly interface with upland areas are not preferred.

<sup>1</sup>

A technique using prairie falcons to raise and fledge peregrine falcons.

### Current Management

The greater sandhill crane is designated as a State threatened species. To date, little has been done to specifically manage cranes on the Modoc NF. Several wetlands have been fenced to exclude livestock grazing and enhance wetland values. Cranes have generally benefited from this type of management. In two instances, cranes have used islands developed for waterfowl nesting. On short emergent wetlands that are grazed, waterfowl nesting islands are fenced to prevent livestock use. As large meadows and wetlands are managed for riparian values, sandhill crane nesting densities are expected to increase on the Forest.

### Opportunities

Grazing can adversely affect nesting sandhill cranes because livestock eat herbaceous cover, important for nest sites and brood rearing habitat. Lack of cover renders nest sites and young vulnerable to predation. Livestock can also trample young cranes. Adjusting utilization standards to maintain dense herbaceous cover in meadows will help ensure that nest sites and young are protected. Changing seasons of use would also eliminate trampling of young birds by livestock. The Forest could support an estimated 20 pairs of cranes: most would be on the Devil's Garden Ranger District (15), with the remaining on the Big Valley and Doublehead Ranger Districts (5).

### Blue Grouse

#### Supply and Habitat

The blue grouse, found in western coniferous forests, is the largest wood grouse in North America. These birds utilize densely and sparsely stock timber stands, meadows, and dead and down logs. Approximately 112,000 acres of nesting habitat are available Forestwide.

Although its distribution is widespread, the blue grouse is not abundant anywhere in its range. Population numbers for this species are unknown on the Forest.

#### Current Management

The blue grouse is a game species in California and is hunted throughout the Forest, except within State Game Refuges.

Habitat management has been coordinated with only a few timber sales on the Big Valley District. Cull logs are left in harvested timber stands, and vegetation is not treated or is minimally treated along the periphery of large openings. Generally, blue grouse habitat improvement receives little emphasis.

### Opportunities

The Forest could maintain and improve blue grouse habitat through coordination with other resources. For example, livestock could be managed within or excluded from allotments providing blue grouse habitat. Instead of regenerating sparsely stocked tree stands, silvicultural treatments could maintain, improve, or create such stands in areas suitable for blue grouse. Ponds or guzzlers could be installed in areas where water is scarce in summer.

### Sage Grouse

#### Supply and Habitat

The sage grouse is the largest member of the grouse family. Native to the Great Basin sagebrush country, its existence is closely bonded to the plant for which it is named. Because its protective coloration, feeding and nesting habits are all adapted to this plant, the range of the sage grouse is limited to the distribution of big sagebrush. Populations throughout the Intermountain West are associated with foothills and fertile sagebrush flats bordering streams (Call 1979).

Hundreds of sage grouse inhabited local sagebrush vegetation from the 1920's to the 1950's. Strong cases for sage grouse decline include overgrazing before the 1950's, sagebrush control, conversion of habitat to agricultural uses, maturation and decadence of sagebrush communities, juniper encroachment, and indiscriminate hunting.

Forty historic leks (strutting grounds) exist on the Forest. Of those leks, most are currently inactive.

#### Current Management

Little is known about sage grouse except that numbers are extremely low and its historic habitat conditions have changed. Because the bird is consistently narrow in its habitat requirements, it is unable to adapt to or survive changes in sagebrush habitats. While mature big sagebrush stands provide cover and nesting habitat, the plants have lost much of their food value through maturation. In addition, the understories of sagebrush stands, important for cover and forage, have become unsuitable for nesting and early brood rearing. During late broodrearing, vegetation in meadows and along streamcourses provides insects and forbs for the sage grouse diet. Overgrazing and soil compaction by livestock reduce the value of these areas for sage grouse.

Although the sage grouse is currently classified as a game species in California, the hunting season has been closed since 1983 because of low numbers. The popula-

tion has substantially declined in the last decade. CDFG has classified sage grouse as a species of special concern in California. Spring surveys to count males strutting on known leks reveal that numbers have decreased annually. No surveys have been conducted on Forest leks in recent years.

Current direction allows low to moderate grazing in known sage grouse range and protects all active and inactive leks from habitat manipulation. The Forest will manage for viable populations.

Converting big sagebrush to grass seedlings through type conversions and prescribed burns were common up to ten years ago. These practices have greatly altered suitable sage grouse habitat on the Forest. Although fire is a useful tool for creating a patchy distribution of food and cover areas, its zealous use on sage grouse range has been detrimental to the population.

Fencing to exclude livestock grazing has been installed to improve sage grouse habitat in the Mowitz Springs and Goose Lake-Log Corral Springs areas. However, total exclusion of grazing can be detrimental to sage grouse diet because sedges and grasses overtake the forbs which the birds prefer.

The combined effect of Forest activities and natural succession on sage grouse habitat is not known. Populations continue to decrease despite attempts to change the situation. Sage grouse may be extirpated from the Forest unless the bird and its habitat are actively managed. However, no one has a clear understanding of the range of opportunities for increasing sage grouse populations.

### Opportunities

Many areas on the Forest have or could have suitable habitat, particularly the Doublehead Ranger District. To provide information for effecting change in habitat management, the Forest could annually survey known leks to establish current population and trends. In the meantime, the Forest could accommodate sage grouse habitat needs by protecting their habitat in riparian areas. In addition, research is needed to determine limiting factors for sage grouse populations and management techniques which could reverse current trends. Research regarding reestablishment of historic vegetation is essential for improving sage grouse nesting and brood rearing habitat.

### Pileated Woodpecker

#### Supply and Habitat

The pileated woodpecker inhabits mature conifer and deciduous forests of North America. In California, the species is found primarily in the coniferous forests of the

Sierra-Nevada and Cascade Mountain Ranges. On this Forest, the bird apparently prefers mixed conifer and red fir types.

The pileated woodpecker is an MIS representing cavity-dependent species using large snags and down logs in dense, mature forest stands. This woodpecker excavates a new cavity each spring, and consequently needs a continual supply of new snags. Abandoned nests are often occupied by secondary cavity nesting birds or mammals.

The Forest provides approximately 42,000 acres of potentially suitable vegetation for pileated woodpeckers: these acres are stands with trees greater than 24 inches dbh (diameter at breast height), with a greater than 40% canopy closure. These acreages do not account for other habitat needs like snag density, snag distribution and decadence, distribution of habitat, and proximity to water. These factors significantly reduce potentially suitable habitat on the Forest. For example, much of the woodpecker habitat is not near water, thus reducing suitable habitat to 35,000 acres for this criteria alone.

For nesting, pileated woodpeckers need at least 300 acres with average snag densities of more than 0.2 snags per acres (greater than 24 inches dbh). More than eight snags (greater than 30 inches dbh) per acres ensure nesting attempts, because all snags are not immediately suitable for excavation. An adjacent 300 acres should be managed as foraging habitat. Meeting seral stage and snag density criteria stated in the Forest-wide standards and guidelines should provide ample foraging habitat.

### Current Management

Current habitat management for pileated woodpeckers consists of snag and old-growth stand retention. The Doublehead and Big Valley districts have retained old-growth habitat in nesting territories, but the areas do not meet the minimum territory size of 300 acres. Suitable habitat acres, snag densities, or numbers of pileated woodpeckers have not been determined.

### Opportunities

The Forest has the opportunity to determine the extent of pileated woodpeckers habitat on the Doublehead, Big Valley, and Warner Mountain Districts. Establishing pine marten territories would also benefit pileated woodpeckers (except in lodgepole pine stands), by providing large areas of older seral stages. The Forest could also coordinate pileated woodpecker management with the Shasta-Trinity and Klamath National Forests.

Snag transects would determine vegetation types and strata for habitat requirements. Snag retention and re-

cruitment would ensure that this habitat component is met for pileated woodpeckers.

### **Hairy Woodpecker**

#### **Supply and Habitat**

The hairy woodpecker occurs in all woodland and forest types. It was selected as an MIS because it requires snags and dead parts of live trees for feeding and nesting. Hairy woodpeckers use smaller diameter snags (average diameter of 17 inches) and open conifer stands. Consequently, it represents the habitat of snags with diameters at the lower end of the suitable range. It also represents habitat of open timber stands which may be harvested and regenerated to increase wood production. Information about the hairy woodpecker is useful in assessing management activities following wildfires, because the bird heavily uses burned conifer stands.

Since the species depends on snags for both feeding and breeding, the Regional MMR of 1.5 snags per acre is extremely important. Currently, Forest-wide snag densities are less than 1 snag per acre, and less than .5 snag per acre in eastside pine.

#### **Current Management**

Populations or acres of suitable habitat and snag densities have never been inventoried. Inventories of existing snags are conducted in conjunction with timber sales only on the Devil's Garden Ranger District. Management for the hairy woodpecker generally involves retaining existing snags on timber sales and on wildfire reforestation efforts (see the Snag section of this chapter).

#### **Opportunities**

The primary opportunity for the hairy woodpecker is to increase snag densities Forestwide, especially in eastside pine. Increasing snag densities requires an overall reduction in timber volume from suitable timberland, as well as active recruitment and management of snags in all forested areas. Snag inventories could be conducted as part of all timber sales to assess actual snag needs.

### **Red-breasted and Red-naped Sapsuckers**

#### **Supply and Habitat**

Red-breasted and red-naped sapsuckers breed in all forest types, but reach their highest densities in riparian woodlands near conifers. On the Modoc NF, red-breasted sapsuckers are found over the entire Forest, while red-naped sapsuckers are found only in the Warner Mountains. These species will hybridize. They were selected as MIS because of their affinity for snags or live trees with heart rot in or near riparian zones. They also

prefer hardwoods for feeding, and reflect the management of hardwood vegetation within riparian zones.

#### **Current Management**

Neither the red-breasted and red-naped sapsuckers nor their habitat are actively managed on the Forest. Management conflicts for these species are similar to those of the yellow warbler, but also include conflicts regarding timber and snag management. Timber harvest may reduce suitable snags near riparian areas; lack of snag management in these areas reduces the amount of suitable habitat.

#### **Opportunities**

Opportunities for management include those identified for the yellow warbler and willow flycatcher. Creating snags and managing snag densities near riparian areas through timber sale coordination would also benefit red-breasted and red-naped sapsuckers.

### **Yellow Warbler**

#### **Supply and Habitat**

The yellow warbler breeds in deciduous shrubs or saplings associated with riparian areas, such as streams, meadows, seeps, bogs and lakeshores. Like the willow flycatcher, it was selected as an MIS because it prefers riparian habitat for breeding and feeding. However, the warbler is associated with a wider range of deciduous trees and shrubs than the willow flycatcher. Consequently, the warbler reflects management of all riparian areas on the Forest.

The species is included on the Audubon Blue List because of decreasing populations and declining riparian habitat. Agricultural conversion, water control, grazing and cowbird parasitism have created this situation. No inventory or census of this species or its habitat has been made on the Forest. Livestock grazing and encroachment of conifers into riparian zones are major factors reducing habitat for the warbler.

#### **Current Management**

Neither the yellow warbler nor its habitat is specifically managed on the Forest. Fencing and selective logging have improved the hardwood vegetation in some riparian areas.

#### **Opportunities**

Opportunities for management are similar for the yellow warbler and willow flycatcher. Deciduous shrubs and trees could be increased in many areas by (1) livestock management, (2) supplemental planting of desired



species, and (3) selective logging where conifers have encroached and suppressed the desired species.

### **Western Gray Squirrel**

#### **Supply and Habitat**

The western gray squirrel is found throughout the northern Sierra and parts of the Modoc Plateau and Warner Mountains. It is a popular upland game species found in oak woodlands and low to mid-elevation coniferous forests, with preference for old, dense stands. Gray squirrels depend on old forest stands for mast, cones, and fungi which grow in black oak, eastside pine, and mixed conifer.

Gray squirrels are commonly found on the Big Valley District in black oak and eastside pine-black oak habitat. On the remainder of the Forest, a few inhabit eastside pine-juniper and eastside pine habitat. With little black oak and pine-black oak vegetation, habitat on the Forest is limited. Less than 10,000 acres of these two vegetation types provide medium to high capability habitat for maintaining the existing population of western gray squirrel. The pine-juniper and pure eastside pine types also provide habitat, but are important only in localized areas.

#### **Current Management**

Current policy for hardwood retention on commercial timberlands requires maintenance of at least five square feet of basal area per acre. This requirement has posed little or no conflict with past timber harvest practices. Usually black oaks are left untouched because of their limited distribution.

On lands managed for timber, oaks have been protected during harvest of commercial conifers. However, conflicts could arise if clearcutting becomes more common in future timber sales. On land not managed for timber, no attempt has been made to manage habitat for gray squirrels.

Eastside pine vegetation is also important to western gray squirrels, because mature pine trees provide pine nuts for food. In addition, snags are used for nests commonly excavated in abandoned woodpecker cavities. Current and past timber management practices of overstory removal, salvage, and sanitation have reduced habitat suitability.

#### **Opportunities**

Maintaining the western gray squirrel on the Forest depends on the management of black oak and pine. Stands of both types can be managed to provide age diversity. Immature stages of oaks provide browse, while trees 80 years and older provide acorns and den sites.

Thinning immature oak stands can result in better growth and increased production of fruit in mature trees. If available, hardwood trees of seed origin should be retained over trees of stump sprouts. Where natural regeneration does not occur, or where stands are beyond the age for acorn production, black oak could be established by clearcutting, site preparation, and planting young oaks in containers.

To provide for squirrels' food, denning, and loafing needs, eastside pine could be managed to maintain structural diversity (variation in tree heights and tree ages), particularly when pine is adjacent to or intermixed with black oak. Through standards and guidelines, the Forest can establish the volume of hardwood retention needed to ensure viable populations of western gray squirrels.

### **Mule Deer**

The mule deer is a big game animal and an emphasis species for the RPA program. It is an excellent indicator of ecosystem changes because it needs and prefers diverse habitats.

In the early 1800's, resident and migratory populations probably were at or below current numbers. Severe winters, as well as high deer harvest by settlers, suppressed deer numbers during the early 1900's. From relative scarcity in 1915, deer numbers in the Interstate Deer Herd alone exploded to 20,000 animals by 1930. The exponential increase in deer numbers was the result of a combination of biological factors which had began 50 years earlier: logging and fire which created brushfields on the summer range; reductions in domestic livestock competition; and coyote populations naturally reduced by rabies. Game law enforcement as well as brushfields resulting from past heavy livestock grazing on the winter range further improved conditions for deer numbers. Deer numbers of all herds continued to increase into the early 1940's.

By 1943, winter die-offs were massive. Deer herds had soared, peaked, and crashed. The most severe decrease occurred between 1968 and 1971. Numbers have continued to decrease, but may now be stabilizing or even increasing in some herds.

Based on the work of Salwasser (1979) and researchers on other herds in California, key factors affecting populations are the changes in vegetation caused by natural and human-influenced succession. Appendix L discusses deer forage requirements and diet. Grazing, fire suppression and timber management contributed to the decline in habitat capability. The primary measurable effect of long-term change in plant communities has been a reduction in annual recruitment of yearlings into the

herd. Researchers have concluded from these findings that spring transition and summer range conditions are vital to sustaining deer populations.

### Deer Herds

Although administrative boundaries have changed, eight herds use the Forest year-round or seasonally: the Interstate, Glass Mountain, Lookout, Mt. Dome, Warner Mountain, East Lassen, Adin, and West Lassen deer herds. For purposes of analysis, they were grouped into four main herds: the Interstate, Glass Mountain, Warner Mountain and Adin deer herds. The current population estimate for the eight herds is 25,200 animals (Figure 3-34).

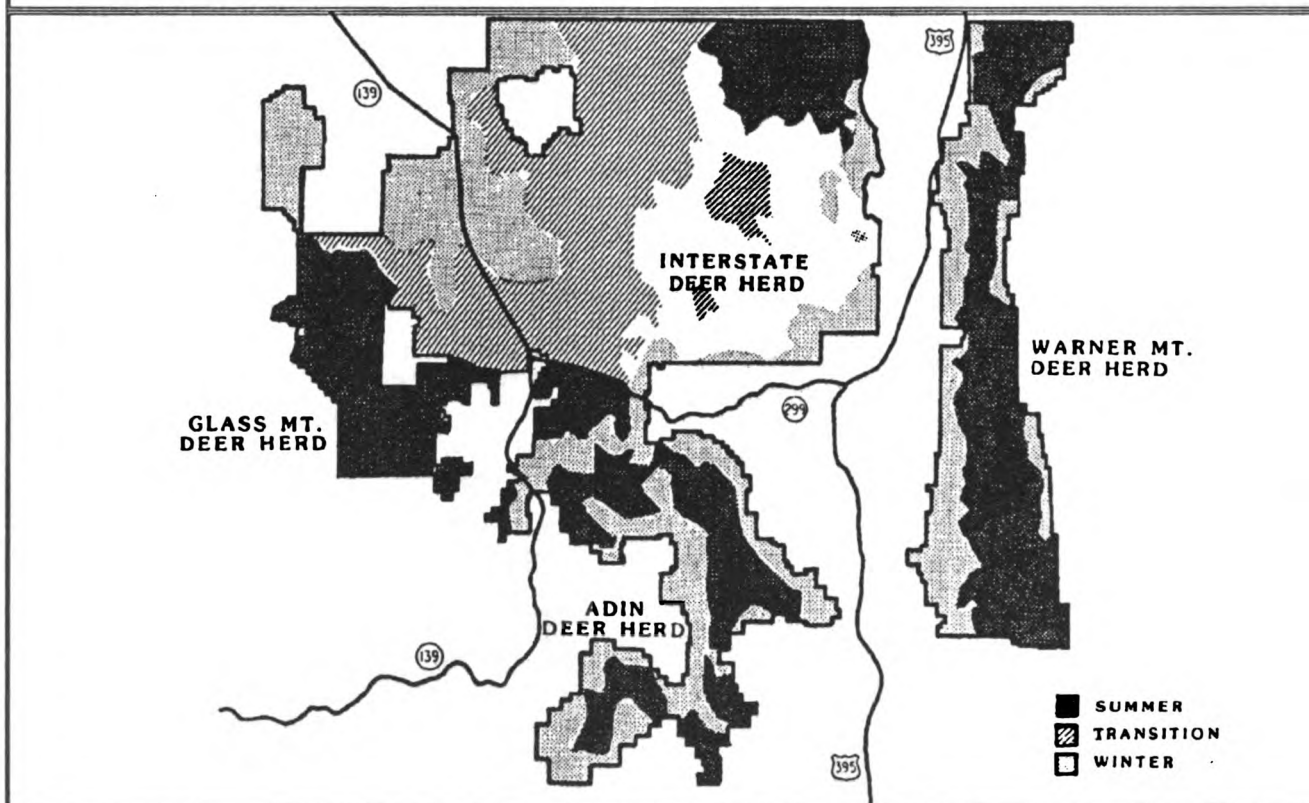
The *Interstate Deer Herd* range within the Forest roughly encompasses the Devil's Garden Plateau. The herd summers in Oregon and winters in California. Within the Forest, the winter range totals 153,046 acres and the transition range covers 401,305 acres. Most of the summer range is found within the Fremont National Forest. Forage needs for the current population is estimated at 9,600 AUMs. Mule deer forage requirements are discussed in Appendix L.

Three major groups of deer comprise the Interstate Herd. One group of migratory deer, currently estimated at 5,000 animals (Thayer pers. comm.), migrates from Oregon summer range to fall and winter ranges on the Forest. A second group of deer summers in Oregon, but restricts its migration to the east side of the Devil's Garden Plateau. The population of this second group of deer is about 2,200 animals. The third group of deer within the Interstate range are year-round residents, generally found within the forested areas of the Devil's Garden Ranger District. The population of the resident herd is estimated at 1,000 animals.

The *Glass Mountain Deer Herd's* range lies to the west of the Interstate's range. The CDFG considers this herd a subherd of the McCloud Flat Herd. Glass Mountain deer summer on the Forest in the Medicine Lake Highlands, the Long Bell area, and in the 1977 Scarface Burn area. A small portion of the herd summers in the McCloud Flat area. The Glass Mountain Herd, currently estimated at 5,500 deer, depends on lands administered by the Forest for habitat on each seasonal range. Forage needs are estimated at 8,885 AUMs.

Except for a group of low-elevation resident deer, the *Warner Mountain Deer Herd* summers entirely on the

Figure 3-34. Major Deer Herds and Their Seasonal Ranges



Warner Mountain Ranger District. The bulk of the herd, however, winters on private and BLM-administered lands on the east and west sides of the Warner Mountains. The current spring population is about 7,200 animals. Forage needs are estimated at 9,775 AUMs.

Most of the *Adin Deer Herd* range lies on the Big Valley Ranger District south of Highway 299. Seasonal range boundaries are generally not well defined for this deer herd, and seasonal migration patterns are not well known. The population is approximately 4,300 animals, of which about 3,225 animals use national forest land. Forage needs are estimated at 4,565 AUMS.

### Current Management

The Modoc curtailed annual treatment of large acreages directly or indirectly for deer about 1975. Since then, this Forest managed deer herds and their habitat through structural improvements; development and coordination of mitigation measures with other Forest resources; and coordination with CDFG in developing deer herd plans and population objectives.

Deer management is an issue on nearly all resource management projects because of weak management direction without clear objectives for deer, as well as CDFG's and the public's interest in deer. Current management is executed under generalized rules and regulations, none of which outweighs commodity-oriented regulation and direction nor emphasizes the species' needs or habitat.

### Habitat Improvement

Knutsen-Vandenburg (KV) funds collected from timber sales and the Deer Herd Management Plan Implementation Program (or Hill Bill) are major sources of habitat improvement funding. These funds have been used primarily for water development, prescribed burning, browse planting and brush manipulation.

Habitat types and conditions vary greatly within each herd's range. However, poor forage quality and quantity are limiting populations on all herd ranges. Insufficient and inadequate forage is caused by over-mature browse species, dominance by late successional stages, livestock distribution, and silvicultural practices.

### Coordination with Other Resources

**Timber**—Forest timber management activities have the greatest single effect on deer habitat, particularly on summer and transition ranges. Current emphasis on clearcutting eastside pine is causing conflict between timber and deer management. On dry sites dominated by eastside pine and bitterbrush, combining site preparation with herbicides may eliminate bitterbrush and reduce

forbs and grasses in these clearcuts. Site preparation in mixed conifer and red fir stands also causes conflict. Intensive reforestation practices often depress deer forage production in these habitat types which are particularly important for deer summer range. While thinning plantations benefits deer by maintaining open canopies and a vigorous understory, generally too few Forest plantations have been treated soon enough to enhance understory forage.

By changing vegetation to early successional stages, harvesting timber can improve deer forage and subsequently increase habitat carrying capacity. On the other hand, timber management without objectives for maintenance or improvement of forage and cover can detrimentally affect large portions of a herd.

**Burn Rehabilitation**—Under current Forest Service policy, all areas capable of growing timber are reforested. Intensive timber practices are usually used, such as spraying to reduce competition from brush and grasses, and planting high densities of conifers to ensure that stocking levels are met. If the plantation fails, the site may undergo total retreatment. Although some brush species, such as manzanita and snowbrush, are resilient to this treatment, more sensitive browse plants, such as bitterbrush, are destroyed. Some forbs and grasses are also reduced or eliminated from the plant community. If the plantation survives, forage may be lost through restrictive thinning practices.

Wildfires, like timber harvest, can greatly improve habitat for deer by promoting early successional stages of vegetation. Within three years following fires, forbs and browse seedlings dominate sites once covered by timber or decadent brush stands. Large fires on summer and transition ranges often promote such favorable forage conditions that fawn survival soars and herd populations explode. Conditions usually peak from five to ten years after a fire, and decline in 15 to 20 years. Managing for deer can improve the forage base, while intensive timber or range management can reduce or alter forage benefits gained from fire. Deer are a major emphasis species on nearly all major wildfire rehabilitation projects. However, the selected alternative for rehabilitation has varied greatly in the degree of mitigation or improvements for deer.

**Firewood Cutting**—Firewood cutting, like timber harvesting, can promote earlier successional stages of vegetation. Green western juniper is the primary firewood harvested on this Forest. Demand for this species has increased so dramatically that its removal may soon significantly impact deer habitat. On one hand, juniper removal could improve forage while retaining cover. On

the other hand, indiscriminate removal could reduce cover. Currently, only the Doublehead Ranger District manages green juniper cutting to maintain or improve habitat for deer on the Interstate winter range near Dry Lake.

**Range**—Livestock grazing, like timber management, can greatly alter deer habitat, although usually less dramatically. Major impacts include direct competition with deer for preferred browse or other forage species, reduction or elimination of suitable habitat in riparian areas, and possible physical displacement of deer on summer range. In the past, some direct improvements for livestock (grass seeding and vegetative manipulation to improve forage) have also degraded deer habitat.

Strategies to benefit deer have been implemented on few allotments because of inadequate knowledge of herd requirements. In addition, the Forest has maintained stocking levels to support community stability. A lack of clear, comprehensive objectives for vegetation and related wildlife species in range management has also prevented improvement of most riparian areas. Single-purpose livestock forage projects sometimes conflict with deer forage needs by suppressing forbs or browse species.

Under current management, range management provides some benefits to deer. Water developments for livestock provide water for deer in areas. In some cases, grazing systems provide additional forage for deer or maintain browse stands (primarily bitterbrush). Forage allocations have been made on some allotments through implementing AMPs. Some riparian areas have been improved for fish and wildlife.

**Roads**—Maintaining or constructing roads for resource activities often affects deer. Although some temporary roads for timber sales have been obliterated, virtually no permanent roads have been closed for deer habitat improvement. Conflicts occur in winter range concentration areas, spring and fall holding areas during migration, and fawning areas on summer range. Open roads in these areas tend to reduce habitat capability because deer are reluctant to use the areas if humans are frequently present.

## Coordination with CDFG

Under current management, CDFG usually works with Forest personnel to address issues, concerns and opportunities for resource projects, including timber sales, grazing allotment management, reforestation, wildlife improvements, and other projects which affect habitat. In addition, CDFG and the Forest are jointly implementing plans for each deer herd on the Forest.

Deer habitat maintenance or improvement is a major issue. CDFG and the Forest often disagree over resource management practices and their effect on deer habitat and populations. Differences in management philosophies and regulations for land use allocations account for much of the conflict. Major areas of disagreement center around reforestation and site preparation practices on timber sales, backlog reforestation sites, established plantations, and burn rehabilitation programs.

## Opportunities to Increase Deer Populations

The Forest can increase deer numbers by improving habitat and its management. To do this, the Forest can:

- Strengthen policy and direction for deer management.
- Establish population goals for all herds.
- Determine key habitats within each herd's seasonal range, and modify habitat in those areas to meet herd goals.
- Specifically allocate land important for deer habitats.
- Develop land management prescriptions which address deer habitat needs equally with other resource needs.
- Ensure that deer forage requirements are met on all grazing allotments by allocating sufficient forage (AUMs) to support current as well as future deer populations.
- Improve biological evaluation and coordination with other resource activities.
- Increase direct habitat improvement for deer through the use of KV, appropriated, and cooperative funds.
- Provide for deer needs when determining objectives for and management of riparian areas.



Because of unregulated hunting and changes in land use patterns which began in the 1840's, herds dwindled to about 1,000 animals by 1923. When hunting became regulated and livestock were reduced on public ranges, pronghorn numbers increased to 6,000 by 1936. The rise in population since then has been virtually constant.

The Forest selected pronghorn as an MIS because it is a popular game animal and an indicator of the ecological condition of rangelands on the Forest. The pronghorn is a popular game species throughout the western United States. In California, the demand far exceeds the supply. The pronghorn thrives in subclimax communities with diverse and abundant grasses, forbs and shrubs.

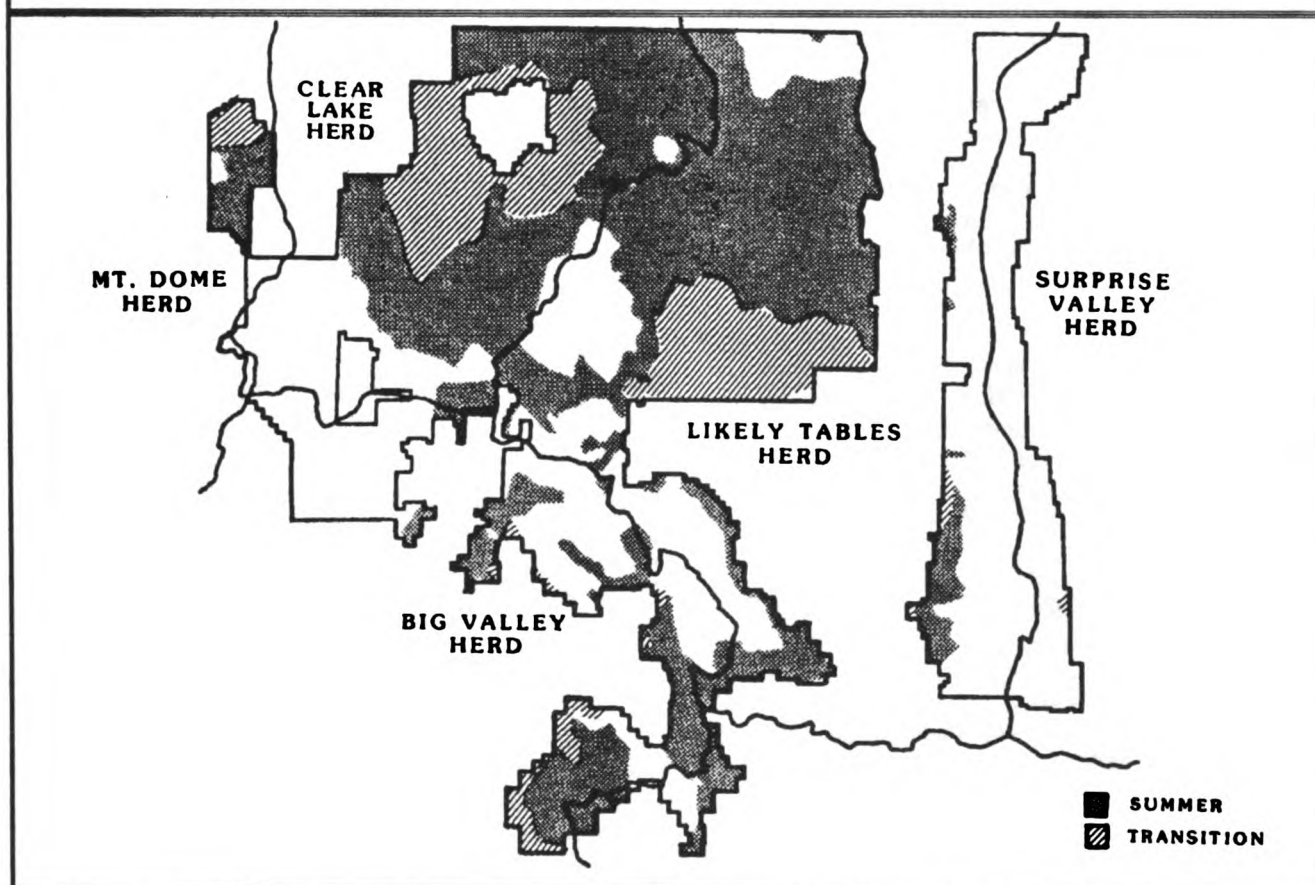
### Pronghorn

#### Supply and Habitat

In California, pronghorn inhabit Modoc, Lassen, Siskiyou, Shasta and Mono counties. The current California population is more than 7,000 animals with the majority in Lassen and Modoc counties.

The CDFG recognizes five resident pronghorn herds and two interstate herds in northeastern California (Pyshora 1982). This Forest provides habitat for three resident herds (Mt. Dome, Likely Tables, and Big Valley) and two interstate herds (Surprise Valley and Clear Lake) (Figure 3-35).

**Figure 3-35. Major Pronghorn Herds and Their Seasonal Ranges**



### Current Management

CDFG manages pronghorn populations while the Forest coordinates resource management activities to maintain habitat capability. The main thrust of habitat management is coordination with other resource activities. Direct habitat improvement has not occurred because: (1) little is known about site specific habitat needs; (2) pronghorn are extensive rather than intensive habitat users, and habitat improvements might not be cost effective; (3) pronghorn herds are growing or stabilizing; and (4) funds to identify limiting factors or improvement needs are scarce.

Because range management generally has the greatest effect on pronghorn habitat, it receives major emphasis in coordination efforts. Activities which affect pronghorn habitat capability are fencing, cultural practices, and forage utilization (stocking rates, season of use and length of season).

### Opportunities

Forage allocations in allotment management plans could be revised to include pronghorn as well as deer and wild horse AUMs.

Fawn production and buck ratios are declining in part of the Likely Tables herd. Research is needed to determine the cause of these declines and to determine if habitat or other improvements could reverse the trend in fawn survival. Cooperative programs could be initiated with the State to determine and resolve this problem.

Many riparian areas within pronghorn range are overgrazed. Management systems which promote optimum forb growth in these areas could be developed. Water in wetlands should continue to be managed for high quality pronghorn habitat.

Under current management, natural succession is moving toward climax vegetation on many permanent rangelands, and habitat capability has subsequently declined. Prescribed burns on brush and juniper stands would improve forage production and overall habitat capability.

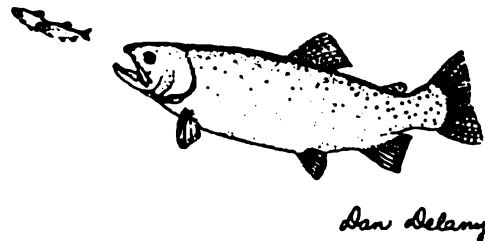
### Rainbow, Brown and Brook Trout

#### Supply and Habitat

Rainbow, brown, and brook trout have been selected as MISs not only because of their value as game fish, but also because they indicate the effects of management activities on (1) species dependent on coldwater streams and (2) overall water quality. Rainbow trout is the most common and widely distributed, and occurs in streams, lakes and reservoirs throughout the Forest. The brown

trout is found only on the Warner Mountain and Big Valley Districts, but is the second most common species in terms of numbers of streams and lakes occupied. The brook trout occurs on all districts, but is limited to only a few lakes and streams.

As a group, trout provide the basis for 70% of the fishing on the Forest. Rainbow trout provide the best opportunity for fishing because of stocking efforts by CDFG and its wide occurrence. Although stream fishing is still popular, reservoir fishing has grown in popularity. Reservoirs are stocked with domestic Eagle Lake rainbow trout, and can support increased angling pressure while providing large or trophy class fish.



Because of its importance as a game species and an MIS of stream and riparian condition, the trout is an RPA emphasis species. Current RPA goals call for an increase in habitat capability of 15% by 1995.

Habitat capability in streams and lakes is reduced by several limiting factors caused by humans or acts of nature (Camilleri and Shimamoto 1981). Lack of pools, stream barriers and low flows are naturally occurring conditions common to many streams. Sedimentation, insufficient cover and shade, and low water level are caused both naturally and by activities such as logging, grazing and road construction.

Several factors are associated with reduced habitat capability in lakes and reservoirs: (1) low summer pool levels, (2) winter kill, (3) low levels of aquatic vegetation and invertebrates, (4) poor bottom composition, (5) large populations of competitive nongame fish, and (6) poor stocking and coldwater species composition. Findings from stream and lake habitat capability studies have not been validated.

Approximately 270 miles of streams and 2,390 acres of Forest lakes and reservoirs provide habitat for rainbow, brook and brown trout. An additional 70.1 miles of stream contain Goose Lake redband trout (described in the following section). Of the stream miles, 9% has a high habitat capability, 50% is moderate, and 40% is low.

Lakes and reservoirs are in better condition with 24% of the habitat rated at high capability, 71% as moderate, and 5% rated low.

Based on current habitat capability and estimated fish biomass for each capability class, the Forest currently supports over 11,000 pounds of fish in streams and over 29,000 pounds of fish in lakes and reservoirs.

In general, the quality of the fishery (average size and numbers of catchable trout) in many streams is only fair. Although the standing crop in many streams may be high, there are few large fish. Angling pressure is generally not a problem on the Forest.

### Current Management

Trout habitat and fisheries are managed on the Forest in coordination with CDFG's stocking program, by integrating information with all resources, and through habitat improvement. Fish stocking programs consist of planting streams, lakes, and reservoirs with catchable and juvenile trout. The Forest is engaged in little direct species management. Harvest regulations follow general seasons and creel limits common throughout most of the State.

Until the 1970's, the Forest protected or enhanced trout habitat by coordinating with other resources only when the stream was valuable as trout habitat and the potential for project-related damage was high. Since 1983, a stronger effort has been made to coordinate with other Forest management activities to protect or enhance fisheries in streams, lakes and reservoirs. Increased recreational demand, improved information, and better direction on management of riparian-dependent resources have all contributed to this effort.

The Forest evaluates and employs Best Management Practices (BMPs) for conservation of water and soil quality during timber harvest, road construction, and other resource management activities. While fisheries are identified as a beneficial use of water and for which water quality should be conserved, recommendations for water quality do not always meet the needs of all riparian-dependent species, including trout. Other project coordination measures include maintaining streamside shade through selective harvest, scheduling instream construction projects to avoid spawning periods, and establishing minimum flow requirements for non-fisheries uses.

Instream habitat improvement projects are not emphasized on the Forest, except for sensitive species such as redband trout or Modoc suckers. Until recently, funds for instream work to increase pools or cover were not available because the work was not considered cost ef-

fective. Currently, however, installation of log weirs, boulder and juniper placement, and planting of hardwoods appear to offer relatively inexpensive methods for correcting limiting factors in many streams. These methods were used on Lassen Creek in 1984.

Habitat has improved through riparian management projects by implementing better livestock management and, in some cases, by reducing livestock numbers.

Operation Swimup, a Regional program completed in 1980, was designed to correct road crossing structures which prevented upstream fish passage. Although a few existing culverts still obstruct passage, designs for future stream crossing structures will allow for fish passage.

Management affecting Forest lakes and reservoirs is minimal. Some reservoirs are used as fisheries and sources of water for Forest wetlands, and minimum pool levels have been established. No trout habitat improvement structures have been placed on reservoirs. At Blue Lake, the Forest will replace a boat ramp with one that causes less sedimentation.

Conflicts exist between current management activities and trout habitat maintenance and improvement. Poor livestock grazing management suppresses recovery of woody vegetation, as well as revegetation and recovery of streambanks. Timber harvest may reduce shade and increase water temperatures. Older roads are a source of sediment deposits in many creeks. Cumulative effects of several activities and events may degrade overall water quality within some watersheds.

No small hydroelectric facilities currently exist on the Forest, and development is not a threat to fisheries at this time.

### Opportunities

Opportunities exist to improve habitat through data collection, management of other resources, improvement projects, and species management. Improved survey data on streams and riparian zones would aid fisheries management. Changes in livestock management on the Forest could result in the greatest gains in habitat improvement (Bowers et al. 1979, Behnke 1979, Marcuson 1970, Platts 1979). Habitat can be improved without elaborate watershed stabilization or structural stream habitat improvements. Studies show a 100 - 200% increase in fish biomass after only a few years of recovery.

Best Management Practices (BMPs) are implemented on all timber projects. Reduced timber harvest, shade requirements, and other objectives in the riparian prescription of the Forest Plan will strengthen BMPs. New road location and construction also follow pre-



scribed BMPs. However, many old roads, which remain open and continue to deposit sediment in streams, could be rerouted, closed or obliterated.

Improvement projects may correct limiting factors in many streams: (1) development of pools and cover; and (2) streambank stabilization with log weirs, boulder placement and juniper placement. Streams and riparian areas damaged by livestock could be rehabilitated by corridor fencing and improved grazing strategies.

Habitat improvements and management would increase trout production to approximately 15,000 pounds in streams and 40,000 pounds in lakes and reservoirs.

The Forest will coordinate with CDFG to combine species management with habitat improvement.

### Goose Lake Redband Trout

#### Supply and Habitat

Redband trout are a distinctive subgroup of rainbow trout that inhabit isolated headwaters of the McCloud, Pit, Klamath, and Columbia River systems of California, Nevada and Oregon (Moyle 1976). The trout is named for its bright, broad red stripe, and noted for its retention of parr marks into adulthood.

The species represents a diverse genetic stock of fish which have adapted to marginal headwater streams with low flows, high temperatures, and little shade. They may eventually provide a source of planting stock which could improve populations in many lower capability streams and lakes. Redband trout may also serve as predators or competitors in warm reservoirs and lakes containing high populations of forage fish (Behnke 1979).

Genetic analysis indicates that the redband trout can be separated into three distinct subspecies of rainbow trout. The subspecies found on the Forest is the Goose Lake redband trout (Berg 1987, and pers. comm.). Generally, redband trout are a category 2 candidate species for federal listing. The Goose Lake redband trout is on CDFG's list of Species of Special Concern.

The Goose Lake redband trout is the only native trout on the Forest; its distribution is limited to the upper Pit River and Goose Lake drainage systems. Pure Goose Lake redband trout inhabit 59.7 miles of streams on the Warner Mountain Ranger District, and 10.4 miles of streams on the Devil's Garden Ranger District. Possible hybrids of Goose Lake redband trout and coastal rainbow trout are found on the Big Valley District. Genetic analyses of all rainbow/redband trout populations have not been made on the Forest; therefore, the total distri-

bution of pure Goose Lake redband trout is not yet known.

In surveys on the resident Goose Lake redband trout populations, 3% of the habitat is rated as having high capability, 73% as moderate, and 24% as low. Factors limiting Goose Lake redband trout habitat capability are similar to those in other trout streams on the Forest: lack of pools, stream barriers, low flows, sedimentation, and insufficient cover and shade (Behnke 1979). (See also the *Rainbow, Brown, and Brook Trout* section of this chapter.) Based on current habitat capability and estimated fish biomass for each capability class, the Forest currently supports 3,100 pounds of Goose Lake redband in all streams, or 44 pounds of fish per stream mile.

Besides resident populations of Goose Lake redband trout, the Forest also supports the migratory population of Goose Lake redband trout. These trout live in Goose Lake then migrate into tributaries to spawn. The only streams still known to have successfully spawning migratory Goose Lake redband trout are Lassen Creek and, to a lesser extent, Willow Creek—both on the Warner Mountain District. Unlike their stream-resident counterparts, migratory Goose Lake redband trout can grow to a large size because of the lake's high productivity. In 1988, an estimated 1,000 migratory Goose Lake redband trout were seen in Lassen Creek; however, in 1989 only 22 were seen. A more systematic estimate of the population has not been made; however, because of the limited numbers of migrating fish seen and the lack of migratory runs in Oregon tributaries since 1978, a Goose Lake Redband Working Group was established in 1989 to investigate the decline in the migratory population.

#### Current Management

Goose Lake redband trout have benefited from habitat improvements and changes in management activities that were implemented for the Modoc sucker, which evolved with the Goose Lake redband trout. Portions of Washington, Hulbert, and Johnson Creeks were fenced in the early 1980's to exclude livestock; as a result, stream and riparian conditions are recovering. In 1984 and 1986, a major habitat improvement project, which included structural improvements and changes in grazing management, was implemented in Lassen Creek to improve habitat for resident and migratory Goose Lake redband trout. In 1988, habitat improvement structures were installed on East Creek, which contains a pure resident Goose Lake redband trout population (W. Berg, pers. comm.).

In addition, a test enclosure was constructed on Lassen Creek to assess the benefits of further control or elimination of grazing within the project area. To im-



prove conditions, several years ago a livestock grazing strategy was implemented which allows use of the riparian areas on Lassen Creek during the last two weeks of the grazing season; however, Goose Lake redband trout habitat conditions did not improve under this technique. Fall grazing on Lassen Creek apparently prevented streambank recovery and establishment of willows. In 1984, the strategy was changed to spring grazing every other year. Assessment of changes and comparison with the exclosure have not been made.

Other current management activities for Goose Lake redband trout are the same as for rainbow, brook, and brown trout. CDFG no longer stock streams that are known to contain pure Goose Lake redband trout. Lassen Creek, a migratory and resident Goose Lake redband trout stream, has a late-season opening to protect spawning fish and reduce early season fishing pressure on the population.

### Opportunities

Opportunities to manage Goose Lake redband trout are similar to other trout management opportunities. Change in range, timber, and transportation programs could correct factors which reduce habitat capability. Other opportunities include habitat improvement projects, cooperative programs, and inclusion on the Sensitive Species list.

With improved habitat management, 39% of the stream miles currently having moderate capability could attain high capability. This should result in known streams containing approximately 5,000 pounds of Goose Lake redband trout, or an average of 71 pounds per stream mile.

### Largemouth Bass

#### Supply and Habitat

The largemouth bass is the most popular warmwater gamefish in California. Bass were first introduced into Modoc County in the 1920's, and have since been transplanted to many other reservoirs, ponds and streams. Largemouth bass thrive in relatively warm waters at least three feet deep with emergent or aquatic plants and submerged logs, rocks, or brushpiles. Suitable bass waters have deeper pools to ensure overwinter survival, and water temperatures must not exceed 90°F. during the summer months.

The Forest is a major local supplier of warmwater fishing recreation. On the Forest, bass inhabit 21 ponds and reservoirs totaling over 9,500 surface acres, and six streams with over 37 linear miles (approximately 211 acres). About two-thirds of the existing reservoir habitat

has medium habitat capability, while the remaining one-third has low habitat capability.

### Current Management

The policy of the Forest Service is to provide habitat for stocked species and assist in stocking operations in coordination with state and federal agencies. The Forest has implemented national direction through an active wetland development program, rendering reservoirs suitable for waterfowl production and improving habitat for warmwater fish by increasing water storage capacity.

### Opportunities

The Forest is working with recreation anglers and CDFG to develop a warmwater reservoir fisheries program which will provide better largemouth bass habitat in reservoirs. Developing a warmwater reservoir fisheries program will also alleviate conflicts between largemouth bass and other resources. Because largemouth bass must be removed from Modoc sucker drainages, the Forest will improve habitat for largemouth bass in other reservoirs. To avoid conflicts between anglers who prefer largemouth bass and those who prefer rainbow trout, the program will identify the habitat potential of the reservoirs for each species or for both species together. Other potential conflicts (e.g., between bass fishing and bald eagle nesting, or between bass fishing and waterfowl production) could also be prevented by developing a Forest warmwater reservoir fisheries program. CDFG and the recreation anglers will be involved in the overall reservoir plans which will also evaluate the need for improved access and improved recreation facilities.

Surveys were initiated in 1990 to determine which reservoirs would be best suited for habitat improvements for largemouth bass as opposed to other gamefish, such as rainbow trout. The surveys will also determine what habitat improvements (hiding cover, rearing sites, forage production sites, spawning sites) would be most beneficial to the species.

### Special Habitats

#### Black Oak

Black oak woodlands provide nesting cavities for various birds and mammals, and enhance habitat diversity. Oak are particularly valuable for mast production, cover, and foraging sites.

The western gray squirrel is the major oak-dependent species on the Forest (discussed earlier). This animal dwells in mature black oak stands, in the transition zone between mature and young oak stands, and in the edge

between mature black oak and pine. Squirrels need uneven-aged stands for sustained habitat to ensure viable populations. Oak stands provide pathways, and denning, feeding, and loafing sites. Squirrels nest in snags or live tree cavities, and build leaf nests in oak trees. Black oak-pine stands typically have the highest squirrel populations. Without mature hardwoods, numbers of gray squirrels and other snag-dependent species would decrease.

As conifers invade oak stands, higher quality habitat for non-game species may result. However, continued growth of conifers may reduce the quality as they shade out oaks. High conifer density in the understory may limit accessibility for deer which use oak for cover and forage.

### Opportunities

Many opportunities exist to enhance oak for wildlife diversity on the Forest, such as retaining old trees for their acorn production capability. At about 200 years, production declines and trees begin to die. Removing pine competition in mixed sites would allow natural regeneration to replace old oaks. Leaving oak snags for nesting and cavity trees would improve habitat for snag-dependent species. Retaining immature oaks would improve browse and serve as replacement trees. Thinning conifer from oak stands would reduce competition, encourage oak growth, and increase acorn production.

Burning can enhance black oak by regenerating shrub stands, removing encroaching conifers, and thinning to improve mast production and longevity. Although most oak on the Forest are less than 80 years old, as they mature some stands may require regeneration to improve productivity.

On > 20 timberlands containing black oak, providing a density of 1.5 snags per acre would help protect viable populations of snag-dependent species. Snags are especially valuable around meadows, seeps and springs, and within habitat edges. On < 20 timberlands, a density of only .5 snags per acre is needed. Because trees are widely dispersed on these lands, there is no preferred location.

### Dead and Down

Dead and down wood on the Forest results from accumulations of natural fuels, and logging and thinning slash. Adequate data on the amounts, sizes, and condition of this material is not available. Many wildlife species depend on dead and down material for habitat, including pine marten, pileated woodpeckers, blue grouse, quail, rabbits, rodents, and numerous reptiles.

The Forest has enough dead and down material of mixed conifer and red fir to meet minimum management

requirements. Dead and down ponderosa pine generally meet MMRs for cull logs Forestwide. However, very little cull results from harvesting ponderosa pine. Down logs are usually created through natural recruitment.

In the past, cull logs were yarded from the Forest and placed in decks to reduce fire hazards. Retaining dead and down material for wildlife habitat was seldom considered. With the implementation of Forest-wide Standards and Guidelines, dead and down material will be managed to meet species' habitat requirements.

## Snags

### Introduction

Snags are standing dead trees, and an integral part of any forest ecosystem. On the Forest at least 35 species of birds and 19 species of mammals depend on snags for roosting, nesting, and feeding. In addition, snags provide habitat for many insects and reptiles. Snags are a renewable resource, and their management is a source of conflict. In addition to their wildlife and ecological values, snags can provide usable timber and, therefore, have been targeted in salvage sales. Snags provide firewood for home heating and industrial purposes.

The value of snags in forest ecosystems has not always been apparent. For many years some people perceived snags as lightning rods which attracted and spread wildfires. As a result, thousands of snags were cut to reduce fire potential. Others felt snags were safety hazards along roads and in timber harvest operations. Consequently, snags were cut under the provisions of timber sale contracts as a safety measure. Because standing dead trees contain commercially valuable wood, many insect-infested green trees were harvested in salvage sales.

### Supply

The Forest currently has a million acres which are suitable for managing snags. An additional 48,139 acres of 50-year-old stands can be managed for snags in another three decades when the trees reach a 16-inch minimum diameter.

Estimating the current supply of snags within vegetation types Forestwide is based on limited data. The following estimates are from snag transects conducted by district wildlife biologists:

**Eastside Pine** — Probably 90% of this vegetation type on the Forest is currently deficient in snags. Average snag density is .4-.6 snags/acre on > 20 lands (27-40% of MMR). On < 20 land within this vegetation type, visual estimates indicate that snag densities could be .1-.2.

**Mixed Conifer** – Probably 10% of this vegetation type is snag deficient. Transect data from three districts indicate that average snag density is about 2.0/acre.

**White Fir** – Virtually all of this vegetation type on the Forest meet or exceed snag MMRs.

**Lodgepole Pine** – Due to recent insect outbreaks and subsequent tree mortality, snags within this vegetation type exceed snag MMRs.

**Red Fir** – While no transects have been conducted, visual estimates indicate that snags are not deficient, particularly in the older stands.

**Juniper** – No information is available on snag densities in this vegetation type.

**Black Oak** – Based on visual observation, probably all of this vegetation type on the Forest is snag deficient – if not in total numbers, then in the size class of existing snags.

In summary, excluding the juniper vegetation type for which no snag density information is available, approximately 60% of the Forest land suitable for managing snags is currently snag deficient.

### Current Management

**Policy and Direction** – National direction for managing snags comes from National Forest Management Act (NFMA) of 1976 which directs forests to maintain viable populations of all native and desired non-native vertebrate species throughout their existing range. The Forest established its snag management policy in 1981.

**Inventory and Monitoring** – Monitoring existing snag densities determines whether current policy and direction are met in each timber compartment. It also determines the effects of various resource activities on cavity-dependent wildlife populations. Since 1975, inventories have been done on the Devil's Garden District to assess snag densities and other snag characteristics such as dbh and height. Forestwide, however, insufficient data has been collected to accurately assess snag density on each timber compartment or vegetation type.

**Firewood** – As a result of transects which indicate that snags are deficient, particularly in eastside pine, the Forest has restricted snag cutting for firewood purposes. In spring of 1982, Forest policy prohibited all snag cutting except in designated units for lodgepole pine on the Warner Mountain and Doublehead Districts. This policy has remained in effect, but enforcement has been difficult.

**Salvage Sales** – Before 1978, the Forest salvage-logged approximately 4.5 MMBF of timber annually.

Over the years these sales contributed to snag deficiency, particularly in eastside pine. Since 1982, approximately 2.9 MMBF has been salvage-logged on the Forest, almost 2.3 MMBF of which has come from eastside pine. In addition, during the 1950's and 1960's, snags were aggressively removed because of fire management concerns – a practice which also reduced snag densities. Without an inventory of pre-sale snag densities a conflict between meeting snag MMRs and salvage logging could exist.

**Wildfire Timber Salvage** – Long-term wildlife needs cannot be met simply by leaving minimum snag numbers in burned areas. No matter how many trees are left or what methods are used to increase the time a snag will stand, burned areas inevitably become snag deficient. On the average, almost 8,400 acres of montane conifer burns on the Forest each year. Snags in these burned areas provide ideal nesting and feeding habitat for several species of birds such as purple martin, mountain bluebird, Lewis' and black-backed three-toed woodpeckers, and tree and violet-green swallows. While some snags have been left as wildlife trees in most fires, the number is typically below MMRs. As a result, thousands of acres are snag deficient. Many of these burned areas will remain deficient in snags for about 80 years until timber plantations reach maturity and contain large enough trees for snag management.

**Snag Recruitment** – Current Forest direction is to manage snags and green tree recruitments to ensure that sufficient numbers are left following timber harvest or other activities. The Forest is currently practicing both passive and active snag management: green trees are left in harvest units to die and become snags naturally; and green trees are killed to create snags immediately.

**Green Tree Recruitment** – This is the most widely practiced method on the Forest for meeting minimum snag numbers. Typically, too few green trees are retained in the harvest unit to meet snag densities. Live culls and spiketop green trees are left, but the total number of snags typically falls short of 1.5.

This passive method of snag recruitment does not increase snag density, and has several disadvantages:

- Green recruitment trees eventually will die, but at an unknown rate. Therefore, predicting when or if minimum snag levels will be met is impossible.
- If green recruitment trees and existing snags, both susceptible to windthrow, are blown over, minimum snag densities will never be met.
- If green recruitment trees are not permanently marked as future snags and designated in stand re-

cord cards, they may be cut during the next harvest entry.

**Girdling**—This active method of recruitment kills green trees and increases snag density quickly, and has been used on the Forest one time.

**Topping**—This recruitment method removes the tops from green trees by explosives or a chain saw, and is the best method for increasing snag density because:

- Topped snags are resistant to windthrow. Over the long term, fewer trees are required to maintain MMRs.
- Topping slows the mortality of topped trees, enhancing diverse snag age distribution.
- Volume in the topped portion of the tree can be sold, which offsets the cost of topping.
- Topped trees will not be considered as crop trees during the next harvest entry.

Overall, the Forest is not providing minimum snag levels or long-term snag recruitment in eastside pine. The Forest has provided no overall direction to implement projects designed to increase snag density. The problem lies with timber sales which do not have enough standing volume to meet both assigned timber targets and snag recruitment.

### Opportunities

Opportunities for snag management involve inventory, creating snags, topping existing snags and green trees, and reducing or eliminating salvage sales. Appendix G discusses these opportunities in detail.

In cooperation with the Region and Pacific Southwest Experiment Station, the Forest is conducting a study on this and adjacent forests to (1) estimate existing snag densities, (2) correlate wildlife populations and snag use with various snag densities, (3) create a method for monitoring wildlife use of snags, and (4) recommend regional snag management guidelines in eastside pine. The study is currently in its third year, and will continue for two more years.

## Wetlands

### Introduction

Forest wetlands are permanent or intermittent bodies of water, excluding streams, seeps and springs. In the early 1800's, California had approximately five million acres of wetland habitat; today only about one-half million acres remain. Ninety percent of the former wetlands

are agricultural lands, housing developments, freeways, or dumps.

In contrast to the Statewide situation, the Modoc National Forest historically had few wetlands. Since the early 1900's wetlands have increased from 3,400 acres to over 35,000 acres through Forest development projects.

In the early 1920's, ranchers constructed dams on the Devil's Garden Plateau at the outlets of natural clay basins to store spring runoff water to increase forage production for domestic livestock and to store water for downstream irrigation.

In 1965, the Forest began to consider other uses for wetlands, particularly Canada goose nesting. By 1976, the Forest expanded wetland management goals beyond livestock forage improvement and Canada goose habitat. Wetlands became recognized for their value to other wetland-dependent wildlife, such as waterfowl, marsh birds, shore birds, bald eagle, osprey, upland wildlife, and fish.

MIS related to wetland management are the Canada goose, mallard, bald eagle, osprey, pronghorn, large-mouth bass, and rainbow trout.

### Supply

Today, 233 wetlands cover 35,218 surface acres (about 2% of the Forest). They range from 1 to 5,824 acres. Generally, four types of wetlands exist on the Forest: short emergent marshes, silver sage basins, deep-water reservoirs, and vernal wetlands. Short emergent marshes are the most productive.

In fall, wetlands, which have evaporated to about 8,600 acres, provide important resting and holding areas for waterfowl and shorebirds migrating south. Twenty-six wetlands, covering almost 6,000 acres, have been developed or improved to increase waterfowl production.

Twenty-two wetlands, covering more than 10,000 acres, are stocked and provide habitat for largemouth bass and rainbow trout. In addition, wetlands provide almost 7,000 AUMs of annual forage, about 6% of all permitted use on the Forest (122,500 AUMs in 1984) by domestic livestock and wild horses.

### Current Management

Executive Order 11990 (Protection of Wetlands (5/24/77)) provides the most specific direction for forest wetland management. It requires all federal agencies to minimize destruction, loss or degradation of wetlands; and to preserve and enhance beneficial values of wetlands on public lands.

Primary conflicts with wetland management goals include water rights, livestock grazing, upland wildlife, fisheries, funding and maintenance.

**Water Rights**—The 1978 Supreme Court decision (Rio Membres) limited use of the reservation principle and stated that government agencies must obtain valid State water rights. As a result, development of several potentially very productive areas has been delayed or cancelled.

Since 1983, the Forest and the Bureau of Reclamation have signed agreements which resolve water rights conflicts on 18 key wetlands within the Clear Lake watershed. Agreements allow additional improvements in existing wetlands, but no increases in storage capacity.

**Livestock Grazing**—Constant underuse of wetlands reduces net forage production in succeeding years due to a heavy accumulation of litter which retards plant growth. On the other hand, constant heavy livestock grazing seldom adversely effects spikerush, the most abundant wetland vegetation; but heavy use may adversely effect some wetland plants preferred by waterfowl. Heavy use in wetlands is often associated with overuse of adjacent upland forage, which can create long-term negative impacts on wildlife forage species such as bitterbrush.

Balanced range use benefits wildlife, particularly pronghorn and sage grouse. As livestock remove the bulk of overstory grasslike plants, forbs are then available to sage grouse and pronghorn by mid- to late summer.

In the past, conflicts arose between waterfowl production and livestock grazing in and adjacent to Forest wetlands. To simultaneously graze livestock and produce more waterfowl, the Forest constructs ripped nesting islands in the wetland basin. They are seeded and fertilized to develop high quality dense nesting cover. Finally, they are fenced to exclude livestock grazing, which allows residual vegetation to remain for nesting waterfowl. In most cases, the remainder of the wetland and adjacent uplands are open to grazing.

The Forest standard on most wetlands is to use 70% of annual forage production. However, little vegetation remains for nest material. Consequently, sandhill crane nesting densities are generally low. Cranes do nest successfully each year on wetlands where grazing is deferred or excluded. Current grazing strategy may also prevent some emergent marshes from developing to their full ecological potential, or from providing high quality habitat for a wider array of wetland-dependent wildlife species.

**Upland Wildlife**—Timber harvest has been greatly reduced in timber stands adjacent to those wetlands with

active and potential bald eagle and osprey nesting territories.

The Forest and the CDFG disagree on the impact that construction of new wetlands and the expansion of old ones has on species such as pronghorn. CDFG contends that some newly constructed wetlands flooded traditional pronghorn kidding grounds and spring migration routes. CDFG also believes that expanding existing wetlands will flood low sage habitat which is an important source of forbs for pronghorn in the spring. The Forest contends that these impacts are negligible.

**Fisheries**—The Forest has established minimum water levels in three major trout reserves to ensure fish survival over winter and to optimize growth rates. Water management is under the control of downstream private landowners on four Forest wetlands which support trout and largemouth bass fisheries.

**Funding and Maintenance**—Since 1978, contributed funds for wetland improvement work has averaged \$160,000 annually. The Forest assumes maintenance responsibility. Although maintenance on developments is necessary, appropriated Forest Service money had not been available until 1984. Improvements requiring maintenance include island fences, eroding islands originally built to old standards, artificial Canada goose nest tubs, dams, spillways and water control structures.

### Opportunities

The Forest could develop wetlands and improve management by resolving water rights conflicts; acquiring private wetlands within the Forest boundary; continuing to develop nesting islands, and altering designs to accommodate other species; modifying grazing management strategies; and increasing maintenance funding to honor construction agreements and protect investments.

### Demand

Demand for wildlife and fish resources reflects the interest of people in the many types of values associated with these resources. Values and demands for wildlife and fish resources can be sorted into three partially overlapping categories: (1) commercial use; (2) ecological uses; and (3) social or recreational uses (Schweitzer et al. 1980). Recognizing and giving equitable consideration to wildlife and fish resources in forest resource management depends on establishing methods for measuring these values and demands, comparable to measures used for other resources.

*Commercial uses* of wildlife and fish are values generated by the sale or barter of wildlife and fish products

(e.g., furs, anadromous fish). These uses are the easiest to define and establish empirical evidence for values. *Ecological uses*, which express environmental value, are difficult to define. Nevertheless, people believe that wildlife and fish have value other than direct market and social values. Recent legislation (the NFMA of 1976, and the Endangered Species Act of 1973) are expressions of society's concern for the ecological values of wildlife and fish. *Social or recreational uses* of wildlife and fish are easy to define (e.g., hunting, fishing, wildlife observation), but difficult to measure. Most commonly, the economic value of recreational experiences to users is estimated by the contingent value method and travel cost method. These two preferred economic techniques estimate users' net willingness-to-pay (over actual expenditures) for recreation activities. How much people would be willing to pay in an open market is uncertain.

### Commercial Demand

Furbearing animals are the only wildlife resource on the Forest that have commercial value. Over the last two decades, demand has increased nationally; and the United States has become a net exporter (Schweitzer et al. 1980). Because preference for furs follows fashion trends, demand for them is expected to continue, particularly for spotted cat furs.

From 1976, trapping furbearers on the Forest increased for four years, with a peak in 1979 of more than 1200 pelts. Since 1979, the harvest has declined by 10-15% each year and appears to be leveling off at about 1000 pelts per year. Demand for furs from individual species has fluctuated annually with muskrat, coyote, and bobcat furs being the most popular.

Estimated revenue, in 1982 dollars, received by licensed trappers averaged \$43,150 over a six-year period, with an average price of \$45.00 per pelt. This value minus the estimated harvest cost to the trapper yields the RPA benefit value of \$21.84 per pelt (USDA Forest Service 1984a). The RPA value represents the estimated willingness-to-pay the federal government by a trapper, who currently pays nothing to harvest furbearers on national forest land.

### Ecological Demand

Ecological demand expresses society's desire to maintain at least the existing variety and distribution of fish and wildlife. Ecological demand is difficult to perceive in economic terms of demand and supply. When this is not possible, the political process forces a determination of the value and/or criteria to establish minimum levels satisfactory to society. For the time being, the Forest Service applies minimum management requirements

(USDA Forest Service 1984b) to meet the minimum level of this ecological demand. Above the established minimum level, fish and wildlife resources will compete with commodity resources using values assigned to recreation experiences (RPA hunting and fishing values).

### Social and Recreational Demand

Recreation activities associated with fishing, hunting, and wildlife are another demand for wildlife and fish. Recreational use of wildlife and fish on the Modoc averaged 108,394 Wildlife and Fish User Days (WFUD = 12-hour day) between 1977 to 1981. While 68% of this use was associated with hunting primarily for mule deer (Table 3-21), other popular species are pronghorn, California quail, blue grouse, dove, waterfowl, sage grouse and squirrels. Fishing amounted to 24% of the wildlife and fish recreational use, while nonconsumptive enjoyment of deer, pronghorn, waterfowl, and nongame birds accounted for an estimated 8%. Other recreational activities such as camping are associated with the recreational time spent hunting, fishing, or viewing wildlife. From big game hunting, associated camping accounted for an additional 152,493 Forest Recreation Visitor (RVD = WFUD = 12-hour day) for each year between 1977 - 1981.

In 1983 and 1984, CDFG imposed quotas in mule deer hunting zones. In 1984, the quota reduced big game hunting participation by 36%, decreasing from 50,352 WFUDs to 32,310 WFUDs. The Forest assumes a correlation between the decline in big game hunting WFUDs and small and upland game WFUDs which declined from 20,332 to 13,116. Current recreational use of wildlife and fish on the Forest is 83,136 WFUDs per year, with an additional 98,367 RVDs generated by camping associated with big game hunting. Unlike many other forests in California which are conveniently located, the distance between the Modoc and metropolitan communities limits its recreational use to fewer people.

### Future Recreational Use

Future participation in fish and wildlife recreation is primarily determined by (1) human population changes, (2) the capability of the habitat to support various populations of fish and wildlife species, and (3) CDFG harvest strategies, particularly quotas which may limit the amount of participation.

*Human Population Changes* — Schweitzer's (1980) data indicate an overall 60% increase in participation in hunting, fishing and nonconsumptive use during the next 50 years. Fishing and nonconsumptive enjoyment of wildlife and fish are projected to increase by 35 and 31%, respectively.

**Table 3-21. Wildlife and Fish Recreational Use on the Modoc National Forest.**

Wildlife and Fish User Days (WFUD = 12-hour day)		
Recreation Activity	1977-1981	1989
Big Game Hunting	50,831 <sup>1,2</sup>	32,789 <sup>1,3</sup>
Small and Upland Game Hunting	20,332	13,116
Waterfowl Hunting	<u>2,874</u>	<u>2,874</u>
	74,037 (68%)	48,779 (59%)
Nonconsumptive Use	<u>8,640</u>	8,640 (10%)
	8,640 ( 8%)	
Coldwater Fishing		
Streams	2,957	2,957
Lakes and Reservoirs	15,192	15,192
Warmwater Fishing	<u>7,568</u>	<u>7,568</u>
	25,717 (24%)	25,717 (31%)
<b>Total</b>	<b>108,394</b>	<b>83,136</b>
<sup>1</sup> 479 WFUDs are from pronghorn hunting. The remainder is for mule deer hunting. Figures do not include WFUDs for hunting off the Forest. <sup>2</sup> An additional 152,493 RVDs (Recreational Visitor Days) are generated by camping associated with hunting.		

Waterfowl hunting will also remain popular, but actual days of participation will remain low. Small and upland game hunting will have the slowest growth in participation, increasing by only 1% per year until 2000. Participation in big game hunting will increase 26% in the year 2000 and more than 50% by 2030. Unless mule deer populations increase and CDFG raises quotas accordingly, this demand will remain unmet.

Although not increasing as fast as fishing and non-consumptive use, demand for big game hunting will continue to be the primary form of wildlife and fish recreation on the Forest beyond the year 2000. Including camping associated with big game hunting, the Forest could provide over 250,000 WFUDs and RVDs by 2000 if conditions improve for mule deer.

*Habitat Capability and Animal Numbers*—Participation in fishing and hunting is also affected by the supply of game species. Although the extent to which people will participate if animal numbers change is not thoroughly known, Forest managers assume that:

- As the human population increases, so will participation, if the current supply of fish and wildlife remains constant.
- Although total participation will correspond to increases or decreases in fish and wildlife supply, the participation rate will remain constant.
- Participation in fishing and hunting will be limited by either the recreational carrying capacity of various areas on the Forest or the long-term biological carrying capacity of the habitat, whichever is lower.

*Harvest Strategies, Including Quotas*—Harvest strategies set by CDFG is the third major factor affecting participation in hunting and fishing. On the Forest, pronghorn and deer hunting are most affected by these strategies. Pronghorn hunting is limited by an annual drawing for a predetermined number of permits. Since the mid-60's, permits issued have increased from an average of 50 permits per year to the latest five-year average (1979 to 1983) of 535 permits per year. Desire to partic-

ipate has been continuously high since the 1960's, ranging from 17 to 42 applicants for each permit issued.

Mule deer hunting on the Forest is regulated by quotas which are limits on deer tags available for various hunting zones. Unlike pronghorn permits, which are used primarily to control increasing population numbers, mule deer quotas are established to limit hunting pressure on fewer deer.

#### Agency Objectives

The 1980 RPA Program set fish and wildlife habitat objectives to meet or exceed the levels listed below. Each objective is expressed as an average habitat capability index which is a percent of the 1982 population to be achieved by 1995 (e.g., the target of 120 for mule deer means the capability of mule deer habitat should be increased by at least 20% during this time period).

Mule deer	120
Cavity-nesting birds	100
Resident trout	120

Applied to the Forest, the RPA objective for mule deer population is to meet or exceed 30,240 animals by 1995. Participation is expected to increase from 32,310 WFUDs to 39,000 WFUDs.

Habitat capability for cavity nesting birds is measured through snag densities in conifer vegetation types. By achieving the RPA program objective to maintain 100% of the 1982 habitat capability, snag densities must remain at 1.75 snags per acre in mixed conifer; 2.26 snags per acre in red fir; and must increase from .3 to 1.5 snags per acre in eastside pine to meet the minimum management requirement. The eastside pine type is currently below minimum snag densities necessary to maintain viable levels of snag-dependent species.

Increasing resident trout by 20% will increase fish biomass from current estimates of 37,840 lbs. to 45,408

lbs. Coldwater fishing will increase from 16,341 WFUDs to 18,000-20,000 WFUDs depending on whether streams, lakes, and reservoirs are improved.

The CDFG has set objectives for deer and pronghorn herd populations for lands under all ownerships. Forest responsibility varies by herd. Part of the Interstate Deer Herd also uses Oregon, and is hunted in that state.

Deer Herd	Population
Warner Mountain :	10,000
Interstate :	9,600 migratory and 1,250 resident for a total of 10,850.
Glass Mountain :	9,600
Adin Deer:	Not established; current is 4,300
<b>Total</b>	<b>34,750</b>

CDFG favors increasing total deer numbers (above 1982 populations) by more than 10,000 animals, versus the RPA objective of 5,000 animals.

Pronghorn herd objectives set by the CDFG are as follows (Pyshora 1982): (RPA does not have comparable objectives.)

Pronghorn Herd	Population
Mt. Dome (eastside):	500
Clear Lake :	1,350
Likely Tables :	2,150
Big Valley :	700
Surprise Valley :	400
<b>Total</b>	<b>5,100</b>



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## 25. Wild and Scenic Rivers

In 1968, Congress passed the Wild and Scenic Rivers Act. The purpose of the Act is *"to preserve riverine systems containing certain exceptionally outstanding features such as scenery, recreation, geology, fish and wildlife, and historic and cultural resources. Selected rivers and their immediate environments are to be preserved in a free flowing condition and are to be managed for the benefit and enjoyment of present and future generations."*

In October 1979, the President directed the Department of Interior to inventory all rivers. The message also directed agencies to assess rivers for potential additions to the National Wild and Scenic Rivers System. The Heritage Conservation and Recreation Service (HCRS), USDI (now the National Park Service), conducted a Nationwide Rivers Inventory (NRI).

As part of the Land Management Planning (LMP) process, national forests were directed to assess all rivers that are included in the NRI for suitability for inclusion in the Wild and Scenic Rivers System. In addition, forest planning documents must address all rivers, flowing wholly or partially on National Forest System lands, which are identified as potential Wild and Scenic Rivers (Forest Service Handbook 1909.12 Chapter 8).

In response to these mandates, the Modoc inventoried and evaluated all the streams on the Forest and determined that seventeen have high resource values meriting detailed review. The Forest interdisciplinary team (ID team) evaluated these 17 streams and determined two, Willow and Boles Creeks, are eligible for wild and scenic river designation because they possess one or more outstandingly remarkable values. Further, the team tentatively identified the highest eligible classification as scenic. This evaluation and a detailed description of Willow and Boles Creeks is presented in Appendix T.

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## 26. Woodlands

### Introduction

In addition to the commercial conifer forest discussed under the *Timber* section, the Forest contains another vegetation type broadly classed as woodlands. Woodlands on the Modoc are primarily composed of aspen, black oak, and juniper. These forested lands are not suitable for timber production, but they are valuable for wildlife habitat, firewood, forage, and recreation. Wood-

lands add aesthetic value to and enhance the visual quality of streams, reservoirs, and lakes.

### Aspen

Aspen are found on 13,400 acres in large contiguous stands in the Warner Mountains, and throughout the Forest in association with riparian areas. However, large stands occur so infrequently that they receive little management emphasis, except for a few rejuvenation projects. Aspen provide variation in the overall diversity of the Forest. It is valuable for deer forage and habitat, and aesthetically pleasing to view, particularly in autumn.

### Black Oak

Black oak woodlands occur in the southwest portion of the Forest below the coniferous zone. Black oak also occurs with eastside pine forests in the southwest portion of the Forest in the transition zone between brush and conifer species. Pure black oak and black oak-pine stands cover about 9,600 acres on the Forest.

Black oak woodlands provide nesting cavities for various birds and mammals, and enhance habitat diversity. Oak are a source of acorns and forage. The young leaders on small trees are forage for deer. The value of black oak to wildlife is discussed in detail in the Special Habitats section of Wildlife in this chapter.

Black oak is not managed as commercial timber. Because oak provides acorns for wildlife and regeneration, the Forest usually prohibits cutting these trees. Occasionally a commercial thinning sale is offered to promote oak regeneration or improve growth and mast production for wildlife habitat. Because black oak can stump-sprout after harvest or fire, management of this woodland type is easier than for other vegetation lacking this attribute.

In the past, oaks were often removed with the commercial softwoods in mixed stands, or cleared during site preparation. Their removal reduced visual quality and the diversity of the woodlands and the wildlife dependent on them. It also eliminated acorn producers for regeneration. Today, if oak is found within a timber sale boundary, they are retained to protect diversity, ensure acorn production, and provide wildlife habitat. Removing over-story pine and thinning small pine helps oak by reducing competition.

Oak woodlands are very susceptible to fire damage. While fire kills mature acorn-producing trees, it promotes sprouting. Most oak on the Forest are in thickets of small trees, probably less than 80 years old.

Little forage is produced in black oak or black oak-pine types. However, livestock browse on oak leaders in

late summer. Some brush and very little grass grow in these stands.

### Western Juniper

Western juniper woodlands clearly dominate (28%) all other vegetation types on the Forest, and cover nearly 470,000 acres:

District	Acres	Percent of District
Warner Mountain	51,081	15%
Big Valley	60,559	20%
Devil's Garden	221,362	41%
Doublehead	136,533	29%

Juniper grows throughout the Forest below 7,500 feet, primarily on shallow soils. It also grows with eastside pine.

Juniper provides thermal cover as well as escape and hiding cover for wintering deer herds. Large clearcuts in juniper woodlands on deer winter ranges can harm the herd by contributing to thermal stress during severe weather or very cold temperatures. However, small clearcuts (twenty acres or less), provide excellent forage while still providing cover. Cavity species nest in juniper, even when green. Judicious juniper removal generally benefits wildlife diversity.

Some juniper woodlands are also important as forage areas. When all fires are suppressed, juniper encroachment is unchecked and renders grasslands unsuitable for forage. When juniper woodlands are allowed to burn, the invading species is removed and soil nutrients are recycled for grass and shrub species. The Big Sage Fire Management Unit (BSFMU) is a special area on the Devil's Garden and Doublehead Districts. The fire plan for this area allows lightning-caused fires to burn with minimal suppression efforts (see Fire and Fuels section). In addition to savings in suppression costs, fires in the BSFMU have reduced juniper trees on about 2,000 acres. More forage is available for livestock and wildlife.

If the Forest allowed fires to burn in other juniper areas, some acres would convert to bunchgrass ranges.

Fire could assume its natural role in restoring ecosystems. All fires are suppressed in recreation areas to preserve recreation values.

Managing juniper for firewood is important because of local demand. The Firewood section discusses supply and demand for juniper. Removing juniper also benefits grasses and shrubs by eliminating encroaching trees and leaving nutrients for grass and brush species important to wildlife and domestic livestock.

In most cases, woodcutters remove large trees which provide the best wildlife habitat, and leave small ones which compete with grasses and shrubs. Another disadvantage of woodcutting is the resulting slash piles which have to be treated to make grass available; although some wildlife species use slash piles for cover, nesting, and feeding.

Since 1980, the Doublehead Ranger District has removed juniper from about 150 acres per year through firewood sales in the Dry Lake and Clear Lake areas to promote grass and shrub growth. The problem of encroaching juniper can be alleviated by a planned firewood program resembling that on Doublehead Ranger District. Juniper firewood management will accommodate local demand and a growing market in Reno and Lake Tahoe, and enhance grass production for wildlife and livestock forage.

Historically, natural wildfire kept grasslands nearly free of juniper by burning off trees and leaving soil nutrients for grass species. Juniper woodlands have increased in the past 100 years because natural fires were not allowed to burn. The Forest Service fire suppression policy has resulted in juniper encroachment in grassland ecosystems. Historic livestock grazing further aided juniper invasion by removing grass species and providing an excellent seedbed for junipers. Currently, old juniper trees are thriving, and young trees continue to invade new areas.

As juniper woodlands expand, the crown cover closes, depriving grass and shrubs of sunlight and reducing available soil moisture. Areas that produced range forage fifty years ago are almost worthless today. Generally, attempts to eliminate juniper from rangelands have been unsuccessful.

## Opportunities

Opportunities exist to enhance diversity of both black oak and juniper woodlands. The Forest could maintain existing representations of black oak and juniper within each management area. It could allow land not managed

for timber production to cycle naturally, unless management were necessary for other resources.

The Forest lacks consistent data on black oak and juniper. Updated vegetation maps would improve the data base and assist in woodlands management and planning.











## Chapter 4. — Environmental Consequences

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### A. Introduction

This chapter describes the environmental consequences of implementing the six alternatives presented in Chapter 2 (Individual Alternative Descriptions). Information presented here supports, expands, and explains key comparisons made in Chapter 2 (Comparison of Alternatives), providing the scientific and analytic basis for that chapter. Material from Chapter 2 is not repeated here, and it may be helpful to refer to the chapter while considering the environmental consequences described below. Environmental consequences of resources are presented in the same order as Chapter 3 to facilitate locating items of interest.

The environmental consequences are the result of applying Forest-wide Standards and Guidelines, management prescriptions, and special management area direction. In each alternative, a mix of prescriptions produces various resource outputs, goods, and services; environmental consequences are inevitable. To predict long-term consequences, planners project outputs beyond the 10-15 year planning period. Outputs and effects are predicted for 50 years using a linear programming model (FORPLAN) and other models described in Chapter 2 and Appendix B.

Standards and Guidelines in all alternatives assure that extreme environmental consequences are avoided. They mitigate adverse impacts and ensure long-term productivity of the land.

Each resource section describes the basis, method, and means for measuring consequences. This chapter

identifies activities with major impacts and discusses the magnitude, duration and distribution of predicted impacts. Using the monitoring plan, presented in Chapter 5 of the Forest Plan, the Forest will evaluate predicted impacts, as well as the actual application of selected prescriptions.

The issue of herbicide use is addressed in the environmental impact statement Vegetation Management for Reforestation dated February 1989. This document is incorporated by reference; the consequences of herbicide use are not discussed in this chapter.

The following abbreviations for the alternatives are used throughout this chapter:

PRF	Preferred Alternative
CUR	Current Alternative
RPD	RPA With Departure Alternative
IND	Industry Alternative
RBU	Reduced Budget Alternative
AMN	Amenity Alternative

### B. Direct, Indirect, and Cumulative Environmental Consequences

#### Economic Consequences

Economic consequences of implementing alternatives can be measured in various ways. Some of the major indicators are described below, and values for each alternative are shown in Table 4-1.

**Table 4-1. Comparison of Economic Effects.**

Indicators	Alternatives					
	PRF	CUR	RPD	IND	RBU	AMN
Present Net Value (\$ MM)	919.1	937.0	933.6	960.6	889.9	880.9
Timber Allowable Sale Quantity (MMBF)	45.5	51.4	74.6	60.1	36.9	31.8
Hunting and Associated Recreation (M WFUD + M RVD)	198.9	177.2	214.7	216.5	201.3	232.4
Livestock Forage (M AUM)	118.8	120.0	122.5	138.4	100.0	97.3
Receipts to Counties (\$ MM/Yr)	2.3	2.3	3.4	2.8	1.6	1.5
Forest Budget (\$ MM/Yr)	12.1	10.3	15.1	14.5	7.8	11.1

**Present Net Value (PNV)** – PNV is a measure of relative economic efficiency. It is defined as the sum of discounted benefits (both market and nonmarket) minus the sum of discounted costs over the planning horizon (120 years). The alternative that produces the highest PNV is the most economically efficient solution. The reduction of PNV in any alternative as compared to the most economically efficient solution is the economic tradeoff, or opportunity cost, of achieving that alternative. The effect of each alternative's management direction on PNV is described in Chapter 2, section E.

**Area Employment and Income** – One way of measuring the economic effect of a particular activity or policy change is to look at the amount of goods and services bought and sold within the local economy as a result of that activity or policy change. A local economy has exports and imports similar to state or national imports and exports. Timber harvested and processed in communities near the Modoc National Forest is an export that benefits the local economy. Similarly, hunters traveling to the Forest from other parts of the State bring money to surrounding communities. This recreational activity is also an export because it brings money to the local economy from "outside". Exports from the local economy provide the dollars to stimulate additional economic activity.

It is important to recognize that the money generated from exports does not remain entirely within the local economy. This is especially true for the smaller, rural communities in the vicinity of the Forest. As described in Chapter 3, the economic structure of the surrounding communities is dominated by government (38%) and agriculture (19%). Due to their lack of economic diversity, the communities are far from self-sufficient; and many goods purchased locally must be transported from

larger areas. Money that flows out of the economy to pay for these imports can significantly reduce the total benefits generated from the sale of local products.

The Forest Service input-output model IMPLAN was used to provide estimates of the economic impacts of Forest management on employment and income in nearby communities. The total economic impact of any alternative is a combination of 1) primary or direct impacts and 2) secondary or indirect impacts. Direct impacts arise from exports to locations outside the local economy, as described above. Indirect impacts encompass the chain of consequences that result from the direct effects. For example, sawmills require more logs, electricity, and supplies to meet increased demand for lumber. Some of these necessities will be purchased locally. An additional stimulus to the local economy occurs when the wages and salaries from the direct and indirect employment effects are spent inside the region. This is referred to as the "induced impact" and is also captured by the input-output model.

Many assumptions and limitations are inherent in any model serving as a proxy for the actual economic structure of a region. Primary assumptions of an input-output model such as IMPLAN are that the production function of local industries has changed very little over time, and the basic "recipe" of inputs is analogous to that observed at a national scale. The ratio of employment to output is assumed to remain the same over time, thereby allowing employment to be derived from estimations of changes in total industry output. This has important implications when the product mix within an industry is altered. The fluctuation in the value of industry output in this case does not necessarily mean that the level of employment will change. If the physical level of output remains the

same, it can be argued that employment levels will not change significantly.

The predictive capabilities of the IMPLAN model are based on linear relationships. Regardless of the size or direction of a change in the level of Forest outputs, the local economy is expected to respond in a strictly proportional manner. In reality, this straight-line relationship may not hold, and some industries may be forced to shut-down completely if production is significantly reduced. Conversely, if large increases in demand occur, an industry may expand operations with additional capital investment and a disproportionate increase in employment. Therefore, the estimates of employment and income derived from IMPLAN must be interpreted with regard to the scale and operating capacity of individual industries within the local economy.

The input-output model is static in the sense that it quantifies relationships between Forest outputs and important economic indicators at one point in time. The total employment effect of any alternative will not occur immediately, but may take several years to ripple through the economy. Over this period of time, changes in national markets, interest rates, and production capabilities may alter the estimated pattern of effects. Therefore, the model may best be used to illustrate the relative magnitude of economic effects among alternatives and their distribution across sectors of the economy.

Other assumptions important to the analysis:

- The "region" or area of influence for the economic impact analysis includes Modoc, Lassen and Siskiyou counties.
- Sixty-five percent of the timber harvested on the Modoc National Forest is processed in the region. The remainder is "exported" to the rest of the state or elsewhere. Thus, the change in ASQ from the base year 1982 is modeled as an increase/decrease in total output from sawmills and logging sectors of 65% and 35%, respectively.
- Agricultural employment estimates within the IMPLAN model did not include family workers. Outside sources were used to adjust employment and income values for agricultural industries to include family workers. These sources include Bureau of Economic Analysis, *Total Full-Time and Part-Time Employment* (1969-88), Bureau of Economic Analysis, *Personal Income by Major Source and Earnings by Industry* (1969-1988), and California Economic Development Department, *Report 881-X Agricultural Employment Estimates*, 1990.
- The IMPLAN model generates employment figures based on a full-time equivalent, which may cause the

employment impacts for industries reliant on seasonal labor to appear underestimated.

- Wood product values were derived from the 1982 Forest Timber Sale Reports (2400-17). The average selling value (line 10) was used for output from the sawmill and planing sector. Output from the logging sector was valued at average bid value plus logging cost. Unique log-scale estimates were derived for each species.
- Increases in recreation (WFUDs and RVDs) are assumed to follow historical trends in use patterns. A "bill of goods" was calculated to represent the average recreation expenditure pattern for both hunting and general recreation. It is assumed that 50% of the increased use will come from outside the region. This is the proportion of total recreational expenditures that is considered as income to the region and included in the impact analysis.
- Receipts to the counties are equally divided between road maintenance and educational expenditures. The composition of education-related purchases is assumed to correspond to national averages.
- One-third of employment increases is assumed to be filled by the local labor supply pool.
- The changes in Forest outputs included in this analysis are sufficiently close to baseline values to assume that increases in supply will be met by corresponding changes in final demand. It is important to recognize that changes in demand, *not* supply, drive the economy and influence the level of employment. The validity of this assumption would be questionable if outputs were to deviate significantly from historical levels.

## Consequences

The following summary describes the economic impact of EIS alternatives on the surrounding communities and illustrates the relationship between Forest outputs and local industries. Table 4-2A lists changes in employment and Table 4-2B lists changes in income for each major industry group.

The first column in each table lists the 1982 total employment/income for each industry group in the study area. The second column represents an estimate of the employment/income that can be attributed to the 1982 level of operations on the Modoc National Forest. The remaining six columns provide estimates of the changes in either employment or income that could be expected to occur from implementing each alternative.

For example, 1982 employment in the retail and wholesale industries totalled 3,475. Of this number, Forest Service related activities and expenditures provided

sufficient demand to support the employment of 58 persons. At a much higher level of operation, such as in the RPD alternative, employment in these industries can be expected to increase by an additional 26 persons. The effect of changes in output levels for each alternative can, therefore, be evaluated in terms of impacts to overall economic conditions in the region as well as the total jobs supported by Forest Service operations.

#### **PRF Alternative**

The net economic impact of the PRF alternative is a gain of 13 full-time jobs, but a loss of \$38,400 in total income. The primary effect is a shift in employment and income from the logging and sawmill sectors of the economy to the service industries. Reduction in income reflects the differential in wage rates as lower paying jobs associated with service industries are substituted for higher paying jobs of the timber industry.

Total timber harvest under this alternative decreases by approximately 5 million board feet annually. Consequences of reductions in harvesting and processing of timber are a loss of 4 and 15 jobs in logging and sawmill industries, respectively. This represents 1% of the total 1982 employment and 19% of the Forest Service supported employment for these industries. Although timber output is reduced, prices of logs and lumber are assumed to rise, thereby increasing associated payments to counties. This is reflected by the addition of 8 employees to the construction sector for the completion of local road improvement projects, and an increase of \$155,000 in total income.

Loss of timber-related employment and income is partially offset by a boost to the retail and services sectors of the economy. A gain of 5 employees in retail trade and 16 in service-related industries results in an additional \$282,400 of total income injected into the economy. These sectors are already prominent in the economy, and the increase over base year employment is less than 1%. A shift to the retail and services sectors results from projected increases in recreation-related spending and an increased Forest budget.

A slight reduction in available forage for this alternative is reflected in a loss of one full-time position in the agricultural sector. Because of difficulties in estimating agricultural employment and the magnitude of seasonal, unpaid family and otherwise unaccountable labor statistics for these industries, the impact of forage reduction on the agricultural community should be viewed only in relative terms. In addition, the implication of any one alternative will be a result of the site-specific application of management objectives which are impossible to capture with a regional model.

#### **CUR Alternative**

The net effect of this alternative is an increase of 30 jobs and a gain of \$706,400 in total income. This slight impact reflects an intent to closely adhere to the level of outputs presently available on the Forest. The marginal increase of 1 million board feet of timber in combination with a slightly higher budget serves to generate positive economic effects throughout the economy. In addition, an assumed increase in the price of timber outputs directly effects estimates of county shares of timber receipts. The gain of 9 jobs in the construction sector is largely a consequence of the price differential.

Employment and income in the retail trade and service sectors increases moderately as a result of the slight influx of recreationists to the Forest and the purchases they make in local communities. A total of 13 additional jobs in these sectors of the economy accounts for an additional \$122,400 in total income. Lower wages associated with employment in trade and service sectors relative to those of manufacturing are reflected by changes in total income arising from employment shifts. Although the total increase in employment in trade and service sectors is three times that associated with wood products, the addition to total income is less than twice as much.

#### **RPD Alternative**

The net economic effect of the RPD alternative is an increase of 212 full-time jobs with an estimated \$5,414,700 increase in total income. This represents nearly twice the income generated by IND which is the second highest income-generating alternative. Both timber output and Forest budget are scheduled to increase more than 50% under this alternative. Large increases in Forest outputs stimulate increases in employment and income for all sectors of the economy. Secondary effects augment a burst of economic activity and add to the overall growth of the regional economy. Under this alternative, economic growth would soon diminish, because the elevated level of outputs could not be sustained by the Forest for an extended period. Long-run economic stability is sacrificed for short-term economic gain under this alternative.

The driving force behind the surge of economic growth is a 25% increase in timber harvest. This results in a 6% increase over base year employment levels in the logging and sawmill industries with the addition of 17 and 63 jobs, respectively. As a result, the number of jobs supported by Forest Service operations within these industries increases by nearly 50%. Total income from these components of the manufacturing sector increases by \$2,949,100. The boost to timber receipts results in more revenue for the counties, which leads to increased

expenditures for local road maintenance and an additional 22 jobs in the construction sector of the economy.

A Forest budget increase of 57% is injected into the regional economy through expenditures of Forest Service employee wages and salaries. These expenditures add to similar outlay from increasing numbers of recreationists. The combination of expenditures from these two sources benefits the trade and service sectors of the economy. The overall increase in direct economic activity stimulates a generous round of consumer purchases as a portion of additional income from all sources is spent in the region. The above activities increase employment in the trade and service by 26 and 57 full-time jobs, respectively. The income generated as a result totals \$984,000 — nearly twice that of the next closest alternative (IND).

#### IND Alternative

The net effect of the IND alternative is an increase of 111 full-time jobs and \$3,020,100 in total income. As a result of its market-commodity orientation, this alternative provides the highest degree of sustainable regional economic benefits of all alternatives.

Total timber harvest under this alternative increases by 20%, which supports an additional 7 logging jobs and 25 jobs in sawmills. Total income increases by \$1,152,900 as a result of increased production in the wood products industries. Increased timber receipts result in larger payments to the counties, which helps to support an additional 14 jobs in construction.

The positive effects of a 51% increase in the Forest budget are tempered by a reduction in hunting-related expenditures. The net effect of the budget increase, along with a moderate rise in general recreation-related expenditures, is an increase of 46 employees and \$749,900 of total income for the trade and service sectors of the economy. Although the number of additional jobs supported in these sectors is 50% greater than the employment increase for the wood products industries, the contribution to total income is actually less. This is indicative of higher labor intensity and lower wage rates associated with trade and service industries.

Forage production for livestock is highest under this alternative. As a consequence, 7 additional employees are gained in the agricultural sector. Actual regional economic value of additional forage will depend on the ability of specific operations to effectively utilize the additional supply.

#### RBU Alternative

The net effect of the RBU alternative is a loss of 71 full-time jobs and \$2,249,700 in total income. This alter-

native negatively impacts all components of the regional economy, causing significant declines in employment and income within the agricultural, logging, sawmill, service and retail trade sectors.

A drop in annual timber harvest of 13.6 million board feet (27%) results in a loss of 44 jobs in wood products industries. This is similar to the projected impacts of the AMN alternative. However, RBU reductions are not buffered by other sectors of the economy; and the loss of timber-related jobs is consequently more significant to the local economy.

Declines in trade and service industry employment reflect the budget reduction of 19% and the associated loss of salary expenditures in local communities. Loss of jobs for retail and services is estimated at 6 and 11, respectively. The increase in recreation-related spending by Forest visitors does not generate enough employment or income to make up for the absence of steady expenditures by Forest employees. In addition, the decline in economic activity from the reduced Forest program contributes to a slow-down of the economy in general as fewer dollars are pumped into the region from all sources.

#### AMN Alternative

The net regional economic impact of the AMN alternative is the loss of 56 full-time jobs resulting in a \$2,160,600 decline in total regional income. The principle effect of the alternative is to shift income and employment from commodity-based manufacturing industries to the trade and service sectors of the economy. Although the increase in hunting-related recreational expenditures is highest in this alternative, the associated boost to employment and earnings is not large enough to offset the reduction in other economic activity. The relatively lower income per employee of service sectors contributes to this disparity.

Logging and sawmill sectors of the economy suffer the largest negative impacts under this alternative. Reduction in timber harvest of 18.6 million board feet annually has significant implications for the timber related sectors of the regional economy. Decline in logging and sawmill employment is estimated at 13 and 47 jobs, respectively, and represents a drop of 4% from the combined base year employment levels for these sectors. The associated loss in total income approximates \$2,185,300.

The relative impact to the agricultural sector is also greatest under the AMN alternative, with an estimated loss of 8 full-time jobs. Reductions in employment and earnings are representative of closing grazing allotments under this alternative. Actual economic consequences of

**Table 4-2A. Comparison of Economic Effects on Regional Economy  
Employment (Total Jobs)**

Sector	Study Area (1982)	FS Supported	PRF	CUR	RPD	IND	RBU	AMN
Agriculture <sup>1</sup>	3,512	43	-1	0	+5	+7	-8	-8
Construction	996	17	+8	+9	+22	+14	+2	+3
Logging Camps/Contractors	283	36	-4	+1	+17	+7	-10	-13
Sawmills and Planing Mills	1,354	128	-15	+3	+63	+25	-34	-47
Other Manufacturing	877	6	+1	+1	+3	+2	-1	0
Transportation <sup>2</sup>	970	19	+1	+1	+8	+4	-2	-1
Retail/Wholesale Trade <sup>3</sup>	3,475	58	+5	+4	+26	+14	-6	+1
Financial <sup>4</sup>	911	16	+1	+1	+7	+5	-2	-1
Hotels and Lodging Establishments	615	23	+3	+2	+7	+3	+1	+4
Eating and Drinking Establishments	1,625	43	+4	+2	+16	+7	-2	+4
Other Services	3,648	72	+9	+5	+34	+22	-9	+2
Government	8,034	233	+1	+1	+4	+1	0	+1
<b>Net Change in Employment</b>			<b>+13</b>	<b>+30</b>	<b>+212</b>	<b>+111</b>	<b>-71</b>	<b>-56</b>

<sup>1</sup> Agriculture - Primarily ranching industry

<sup>2</sup> Transportation - Transportation, communication, public utilities sector

<sup>3</sup> Trade - Retail and wholesale trade sectors

<sup>4</sup> Financial - Finance, insurance, real estate sectors

this management alternative will depend on the availability of substitute forage and the economic viability of specific agricultural entities that are involved.

The economic impact of reduced timber production is lessened by an increase in consumption of recreation-related goods and services. However, these expenditures are not sufficient in composition or amount to compen-

sate for the loss of timber-related revenues. Visitor expenditures contribute most directly to the employment and income of service industries such as lodging and eating and drinking establishments. Ten full-time employees are gained in the service industries of the economy, in addition to \$137,500 in income.

**Table 4-2B. Comparison of Economic Effects on Regional Economy**  
**Total Income (thousands of 1982 dollars)**

Sector	Study Area Totals (1982)	FS Sup- ported	PRF	CUR	RPD	IND	RBU	AMN
Agriculture <sup>1</sup>	57,130	534.3	-19.8	+2.5	+105.1	+87.7	-104.8	-120.3
Construction	26,411	518.3	+155.0	+217.8	+530.7	+335.3	+43.2	+68.7
Logging Camps/Contractors	19,437	2,445.3	-266.1	+49.5	+1,194.6	+466.9	-653.9	-900.7
Sawmills and Planing Mills	37,859	3,590.6	-419.1	+73.1	+1,754.5	+686.0	-959.7	-1,321.8
Other Manufacturing	19,974	142.0	+12.8	+11.6	+65.5	+36.5	-13.8	-3.0
Transportation <sup>2</sup>	39,744	779.3	+55.9	+44.2	+33.7	+188.8	-96.3	-30.0
Retail/Wholesale Trade <sup>3</sup>	40,712	953.2	+8.0	+59.1	+401.8	+191.2	-63.2	+38.8
Financial <sup>4</sup>	89,643	1,536.8	+130.7	+89.0	+696.6	+449.5	-237.0	-76.3
Hotels and Lodging Establishments	4,410	167.5	+22.0	+13.2	+50.7	+21.2	+9.8	+27.4
Eating and Drinking Establishments	17,150	458.2	+45.1	+22.9	+173.7	+73.3	-16.1	+38.1
Other Services	70,962	1,686.9	+207.3	+108.2	+759.6	+464.2	-173.7	+72.0
Government	159,177	3,980.5	+29.8	+15.3	+90.1	+19.6	+15.8	+46.5
Net Change in Total Income			-38.4	+706.4	+5,856.6	+3,020.1	-2,249.7	-2,160.6

<sup>1</sup> Agriculture - Primarily ranching industry

<sup>2</sup> Transportation - Transportation, communication, public utilities sector

<sup>3</sup> Trade - Retail and wholesale trade sectors

<sup>4</sup> Financial - Finance, insurance, real estate sectors

## Social Consequences

The social groups most likely to be affected by Forest outputs, land allocations, and management practices are: 1) ranchers and farmers, 2) timber industry workers, 3) retail and service personnel, 4) retirees and second homeowners, 5) federal, state and local government employees, 6) recreationists, and 7) traditional and non-traditional Native Americans (see Chapter 3, Section D). Social groups are people who share the same interests and concerns. They are not mutually exclusive, and individuals may be included in more than one group. Other groups – women, handicapped, elderly, minorities – are distributed within the seven groups. No alternative discriminates against any group.

The alternatives raise social issues. When social groups within the Forest's sphere of influence differ significantly in their expectations for Forest resource use,

conflict may arise. For example, alternatives that emphasize timber harvest and livestock grazing are most acceptable to ranchers, timber industry workers, and others whose livelihoods are linked to resource utilization. On the other hand, alternatives emphasizing dispersed recreation and a natural Forest setting are most acceptable to retirees, second homeowners, and recreationists.

Forest activities can alter the social and economic setting if they affect lifestyles, attitudes, beliefs, values, and social organization, or population. Social impacts are a combination of these factors. Table 4-3 assesses the effects of alternatives on social groups by variables.

**Lifestyles** – Patterns of work and leisure; customs and traditions; and relationships with family, friends, and others.

**Table 4-3. Comparison of Social Effects<sup>1</sup>**

Variable & Group	PRF	CUR	RPD	IND	RBU	AMN
<b>Lifestyles, Attitudes, Beliefs, and Values</b>						
Ranchers & Farmers	Less Compatible	Compatible	Most Compatible	Compatible	Least Compatible	Less Compatible
Timber Industry Workers	Less Compatible	Less Compatible	More Compatible	Most Compatible	Less Compatible	Least Compatible
Retail and Service Personnel	More Compatible	Less Compatible	More Compatible	Compatible	Least Compatible	Less Compatible
Local, State and Federal Employees	Compatible	Compatible	Compatible	Compatible	Least Compatible	Less Compatible
Retirees and Second Home Owners	Compatible	Compatible	Less Compatible	Least Compatible	Compatible	Most Compatible
Recreationists	Compatible	Less Compatible	More Compatible	Least Compatible	Compatible	Most Compatible
Native Americans (Traditionalists)	Compatible	Compatible	Less Compatible	Least Compatible	More Compatible	More Compatible
Native Americans (Non-Traditionalists)	More Compatible	Less Compatible	More Compatible	More Compatible	Less Compatible	Less Compatible
<b>Social Organization</b>						
All Groups	Stable and cohesive	Stable and cohesive	More stable and cohesive	Stable and cohesive	Least stable and cohesive	Less stable and cohesive
<b>Population</b>						
All Groups	Stable	Stable	More growth inducing	Stable	Declining	Declining

<sup>1</sup> Emphasis is placed on the 1st decade.



**Attitudes, Beliefs, and Values**—Feelings, preferences, one's sense of freedom, self-sufficiency, and expectations for the land and its uses. Control by outside interests, capability of local government to meet needs, and ability to sustain food, fuel, and shelter influences a group's attitudes, beliefs and values.

Attitudes, beliefs, and values are tied to lifestyles. Quantity and mix of forest products, services, and opportunities can affect lifestyles, attitudes, beliefs, and values. The level of development and protection of natural resources also affects these variables.

**Social Organization**—Social institutions, community cohesion, and community stability. Little fluctuation in economic and social conditions sustains stability. Changes threaten stability if major conflicts occur and local residents are unable to mutually resolve them. Groups may polarize when changes unevenly affect their economic and social values.

**Population**—Size, rates of change, and composition. Permanent population is primarily related to economic conditions, while seasonal population is more closely related to amenity benefits. Population change and crowding are not considered significant for social groups within the zone of influence. Numbers of people have not dramatically changed in past years, nor are they projected to do so. No major employment potentials would lead to a major population increase. Newcomers to the area tend to hold many of the same values as long-term residents, who value a rural environment and low population density.

#### **PRF Alternative**

The PRF alternative generally complements the lifestyles of social groups economically linked to Forest. As displayed in Table 4-2a, jobs for timber industry workers decrease in the first decade. Because timber offerings remain constant over the next 3 decades this sector should stabilize. Employment in the agricultural sector decreases slightly. Retention of semi-primitive recreation opportunities, moderate protection of visual quality, and moderate increases in deer and other wildlife are consistent with attitudes, beliefs, and values of social groups who enjoy a natural environment. These people fall within all social groups. Because PRF complements production-oriented and amenity-oriented social groups, it also support the needs of retail and service personnel who depend on all social groups for their economic well-being. Table 4-2 reflects the projected increase in jobs displayed for those sectors. Fewer livestock are likely to be permitted to graze on the Forest—a decision conflicting with attitudes and beliefs of ranchers who have used federal land for livestock grazing since the

1860's. Under PRF, forage availability for livestock will probably decrease from 122,500 AUMs in 1982 (base year) to 118,800 AUMs (3%) in the 1st decade, and to an estimated 94,200 AUMs by the 5th decade. The anticipated decline in forage availability for livestock is the result of more forage available to meet deer herd objectives and an expected decrease in transitory range availability.

Adjustments in permitted grazing use will be made through site-specific allotment management planning. Adjustments may be minimal or extensive depending on specific management objectives for each allotment.

Under PRF, the community remains cohesive and the population stable.

#### **CUR Alternative**

Current management is favorable to social groups who rely on natural resource utilization: ranchers, timber industry workers, and retail and service personnel. However, lifestyles of the timber industry group are somewhat disrupted because less volume in eastside pine is harvested. Local mills may have difficulty marketing and processing volume composed mostly of mixed conifer. Retention of semi-primitive recreation opportunities and moderate protection of visual quality is compatible with the beliefs of social groups valuing the Forest's natural settings. CUR supports values of recreationists except hunters, whose values conflict with Forest activities. Because current management induces neither growth nor decline, community cohesion and population are sustained.

#### **RPD Alternative**

The RPD alternative emphasizes high commodity production levels and increased recreation opportunities. It is compatible with the lifestyles of long-term residents and others whose livelihoods depend on Forest outputs: ranchers and farmers; timbers industry workers, including non-traditional Native Americans; and retail and service personnel, who benefit economically from recreation and commodity user groups. RPD is less compatible with attitudes, beliefs and lifestyles of second homeowners, traditional Native Americans, and others who value a natural, undisturbed environment. Polarization among the groups could occur; loss of some community stability and cohesion is likely.

#### **IND Alternative**

The IND alternative is compatible with social groups dependent on Forest commodity production: timber industry workers, retail and service personnel, ranchers, and non-traditional Native Americans who are employed

by the timber industry. Because hunting opportunities are reduced, so are benefits to retail and service personnel dependent on trade with hunters. IND is not compatible with the lifestyles and values of social groups supporting the retention of the natural environment, such as retirees and second homeowners, and traditional Native Americans. IND may induce polarization among the groups and diminish stability and cohesion of local communities.

#### **RBU Alternative**

RBU enhances the interests of Native Americans and others who value maintaining the Forest in a natural setting. The values of recreationists are met, except in developed campgrounds where facilities are managed at low standard. The lifestyles of all groups dependent on commodity production from the Forest are most affected by this alternative. Local communities are adversely affected by loss of income and fewer jobs in government

agencies and the timber industry. Reduced revenue to county governments from Forest receipts disrupts community stability and cohesion with a subsequent decrease in population.

#### **AMN Alternative**

Like RBU, the AMN alternative supports the lifestyles, beliefs and attitudes of those who value maintaining the Forest in a natural setting. However, unlike RBU, AMN substantially increases bighorn sheep. In addition visitors enjoy more semi-primitive recreation opportunities, developed recreation, investments in wilderness, and more of the Forest managed to maintain visual scenery. This alternative does not complement the attitudes or lifestyles of those dependent on Forest commodity production. Reduced income for ranchers, timber industry workers, government workers, and county governments reduces the number of permanent residents and diminishes community stability.

## Resource Consequences

### 1. Air Quality

Because of its low population and isolated geographic location, the Modoc has very good air quality. Wildfire, prescribed fire, vehicle emissions, and dust from roads have direct effects on air quality. The effects are short-lived and consist primarily of visibility impairment in localized areas from particulates.

Wildfires can cause temporary but substantial degradation to air quality. Because of changes in the natural fuel condition and level of fire management, the degree of air pollution is proportional to the acreages burned by wildfires. Acres burned by wildfire are expected to increase as the population increases. Consequently, under all alternatives air quality is impaired for a short time following fires.

Prescribed burning also affects air quality. Prescribed fires are used for timber site preparation, fuel reduction, and range, forage, and habitat improvement. The more acres burned under prescribed fire, the higher the level

of particulates and visibility impairment. If future technology for these activities reduced the number of burned acres, air pollution would correspondingly decline.

Vehicle emissions can impair air quality. While both developed and dispersed recreation includes vehicle use, developed recreation concentrates use, which can impact air quality in local areas.

In all alternatives, air quality degradation from road dust depends on the amount of timber activity and level of recreation use associated with vehicles. Dust is generated during road construction and reconstruction. Even with increases in developed recreation and road construction and reconstruction, the impact to air quality from dust is negligible (Table 4-4).

RPD and IND have the highest potential for impairment of air quality based on the wildfire and prescription burning acres; AMN has the lowest potential. Considering road construction and reconstruction, RPD, PRF, IND, and AMN have the greatest potential for air quality impairment; RBU and CUR have the least potential. However, reconstruction miles include aggregate base and road surface improvement on arterial and collector roads and, therefore, may actually improve air quality over time.

<b>Table 4-4. Activities Impairing Air Quality</b>						
<b>Activities</b>	<b>(Average Annual Values – 1st Decade)</b>					
	<b>PRF</b>	<b>CUR</b>	<b>RPD</b>	<b>IND</b>	<b>RBU</b>	<b>AMN</b>
<b>Prescribed Burning (acres)</b>						
Timber/Range/Wildlife	1,798	1,150	2,850	3,453	1,250	629
Fuels	350	250	350	350	250	350
<b>Wildfire (acres)</b>	<b>6,236</b>	<b>6,258</b>	<b>6,236</b>	<b>6,236</b>	<b>6,258</b>	<b>6,236</b>
<b>Total Burning</b>	<b>8,384</b>	<b>7,658</b>	<b>9,436</b>	<b>10,039</b>	<b>7,758</b>	<b>7,215</b>
<b>Dev. Recreation (MRVD)</b>	<b>101</b>	<b>101</b>	<b>101</b>	<b>101</b>	<b>101</b>	<b>101</b>
<b>Rd. Construction (miles)</b>	<b>11.5</b>	<b>8.0</b>	<b>16.6</b>	<b>15.0</b>	<b>5.7</b>	<b>10.0</b>
<b>Rd. Reconstruction (miles)</b>	<b>25.0</b>	<b>18.7</b>	<b>27.1</b>	<b>28.0</b>	<b>13.4</b>	<b>21.0</b>

## 2. Cultural Resources

Cultural resource protection requires identification, evaluation, preservation, and, sometimes, recovery of important values. Human activities and natural factors will continue to disturb, destroy, and deteriorate cultural resources. Disturbance will also increase through vandalism, as public access and use of the Forest increases.

Land management activities will enhance efforts to identify and evaluate cultural resources, recover their important values, and interpret them. Cultural resources will be protected before activities that may affect their values are undertaken. However, those activities may still disturb or destroy values.

Potential impacts are discussed in general terms rather than on a site-specific basis. Activities which have major impacts are:

- timber management
- road construction and reconstruction
- livestock grazing
- wetlands development
- fire
- soil and water improvements
- land exchanges
- mining, minerals, and geothermal development
- forest recreation
- program management

### Timber Management

Timber management activities such as timber sales, timber stand improvements (TSI), commercial firewood sales, and site preparation can adversely impact cultural resources. Primary effects are caused by ground disturbance associated with these activities. Ground disturbance occurs on the surface (from commercial firewood sales and TSI) as well as beneath the surface (from timber sales and site preparation). Surface and subsurface disturbance may destroy cultural resource properties or disturb artifacts and patterns that yield information on the past. If relatively fragile patterns of archaeological materials have been severely disturbed, their scientific value is reduced or lost.

### Road Construction and Reconstruction

Adverse effects from road construction and reconstruction activities are similar to those from timber activities. New road construction may disturb or obliterate an

archaeological site; reconstruction may similarly impact a site previously affected.

### Livestock Grazing

Cattle in particular can disturb cultural resource properties by trampling. Erosion from grazing can indirectly impact sites. Trampling archaeological sites is most significant near water and in areas of high archaeological site density. The impact of grazing on cultural resources is proportional to the amount of livestock and number of acres grazed, and associated range structural improvements.

### Wetlands Development

Wetlands development may adversely impact cultural resources directly by construction or inundation, and indirectly by attracting livestock to the water source. Trampling archaeological sites around wetlands increases, and wave action or fluctuating water levels erodes sites.

### Fire

Fire can destroy historic remains, such as cabins, or impede hydration readings from prehistoric obsidian artifacts. Bulldozed fire breaks may directly disturb or destroy archaeological sites. Erosion following fires can partially or completely remove or bury archaeological sites and disturb artifacts. Easier access and greater visibility may encourage vandalism or cause inadvertent damage to sites.

On the other hand, fire removes obscuring surface vegetation and forest duff and improves visibility. Sites may be revealed that were not visible before the fire.

### Soil and Water Improvements

Soil and water improvement activities can adversely effect cultural resources by disturbing the ground surface or subsurface. Streambank stabilization, however, can protect sites by stopping or slowing erosion adjacent to a stream course.

### Land Exchange

Through land exchange, ownership and protection of cultural resources may transfer from government to private ownership. Generally, significant scientific information may be recovered from archaeological sites prior to any exchange.

### Mining, Minerals, and Geothermal Development

Ore recovery can damage or destroy prehistoric and historic cultural resources. Surface disturbance can when minerals are removed. Geothermal development, from initial exploration to power plant construction, may ad-

versely impact cultural resources by ground-disturbing activities.

### **Forest Recreation**

As more areas open for OHV use, the potential for inadvertent damage to archaeological sites increases. Similarly, as dispersed recreation use increases, so does the potential for vandalism and unintentional damage. Vandalism and unintentional damage decrease when recreation is managed at the standard level and visitor use is more controlled.

### **Program Management**

Managing the cultural resource program has the greatest potential for affecting the overall condition of cultural resources. Many components of the program are independent of other Forest projects. These include cultural resource inventories, evaluating new and backlog sites, nominating eligible properties to the National Register of Historic Places (NRHP), protecting properties, monitoring, and interpreting and enhancing properties.

A high level of management includes all of the elements above. A moderate level of management may include many elements of a high level of management, but

they are accomplished at a reduced level. At low level management, efforts include inventory and protection of properties from site-specific project activities. Little or no interpretation or enhancement occurs.

### **All Alternatives**

All alternatives meet minimum requirements outlined in the Forest Standards and Guidelines (S&Gs). Cultural resources are inventoried prior to any project. They are evaluated to determine eligibility to the National Register of Historic Places and nominated if appropriate. Acres disturbed from mineral, mining and geothermal development and dispersed recreation activities (except OHV use) remain constant throughout all alternatives.

Consequences of each alternative on the condition of cultural resources is measured by management objectives, and the nature, location, and extent of other land management activities (see Table 4-5). Positive factors include increased efforts to manage cultural resources and restrictions on access and use of Forest lands (e.g., wilderness, semi-primitive non-motorized, and riparian areas).

**Table 4-5. Activities Affecting Cultural Resources.**

Activities	Decade	(Average Annual Values)					
		PRF	CUR	RPD	IND	RBU	AMN
Timber Sale Quantity (MMBF)	1	45.5	51.4	74.6	60.1	36.9	31.8
	5	46.8	53.8	58.7	60.1	40.9	40.2
Road Construction (Miles)	1	11.5	8.0	16.6	15.0	5.7	10.0
	5	5.0	8.3	11.6	3.0	6.4	5.0
Road Reconstruction (Miles)	1	25.0	18.7	27.1	28.0	13.4	21.0
	5	20.0	19.5	21.3	25.0	14.8	15.0
Livestock Grazing (M AUMs)	1	118.8	120.0	122.5	138.4	100.0	97.3
	5	94.2	91.7	123.7	87.4	70.5	80.7
Wetlands Development (Acres)	1	362.5	242.6	362.5	242.6	79.4	362.5
	5	563.4	442.6	563.4	442.6	108.4	563.4
Expected Burned Acres	1	6,236.0	6,258.0	6,236.0	6,236.0	6,258.0	6,236.0
	5	6,426.0	6,431.0	6,426.0	6,426.0	6,431.0	6,426.0
Watershed Improvement (Acres)	1	260.0	195.0	315.0	315.0	190.0	315.0
	5	85.0	20.0	140.0	140.0	15.0	0.0
Land Exchange (Acres)	1	160.0	160.0	160.0	160.0	0.0	160.0
	5	160.0	160.0	160.0	160.0	0.0	160.0
Recreation OHV-Open Summer (M Acres)	1	1010.8	1010.8	1010.8	1064.0	1064.0	813.3
	5	1010.8	1010.8	1010.8	1064.0	1064.0	813.3
Cultural Resource Program Level		Moderate	Low	High	Moderate	Low	High
Risk (potential for resource conflicts)		Moderate	Moderate	High	High	Low	Low

### **PRF Alternative**

Under PRF, the cultural resource program is managed at a moderate level. Conflicts with commodity-oriented resources occur but may be offset by increased cultural resource awareness and public interpretation.

### **CUR Alternative**

Under CUR, cultural resources are managed at a low level, emphasizing project activity inventory. Interpretive services are conducted in cooperation with organizations such as the Modoc County Historical Society. Unintentional damage and vandalism continues with little effort to educate the public. Conflicts with commodity-oriented resource activities exist.

### **RPD Alternative**

RPD offers a high-level cultural resource inventory program and increased Native American consultation and interpretive possibilities. Because a high volume of timber is harvested under this alternative, conflicts with cultural resource management may result in loss or damage. However, a higher level of cultural resource program management may offset the potential for conflict.

### **IND Alternative**

IND offers low-level interpretive services. The program depends on cooperative work with local organizations such as the Modoc County Historical Society. The public benefits from interpretive services, including signing significant cultural resource sites, and simple brochures and displays at Forest Service offices and the County Museum. Emphasis on commodity-oriented activities increases potential for conflict with and disturbance of cultural resources. However, these may be offset by sufficient funding to protect sites and prevent major losses of cultural resource values.

### **RBU Alternative**

RBU conducts the lowest level cultural resource program of all alternatives and is directed only by S&Gs. Because of the low level of project activities (timber harvest and livestock grazing use) which could affect cultural resources, this alternative also has a low potential for conflicts or damage from activities. Unintentional damage and vandalism continue. No interpretive services occur.

### **AMN Alternative**

AMN offers a high-level cultural resource program with more potential for interpretive services by developing cultural resource sites for public education and enjoyment. Because timber harvest and livestock AUMs are expected to decrease and semi-primitive non-motor-

ized areas increase under this alternative, potential conflict with cultural resource values is low.

### **Potential for Conflict**

Cultural resources management has little impact on the management of other resources. If significant cultural resources are identified during project planning, those resources are usually avoided and protected by designing the proposed project around the site. For example, if 100 MBF of timber are removed from harvest consideration to protect significant cultural resources, then another 100 MBF are located and marked for harvest in an adjacent area without significant cultural resources. Special methods, such as over-the-snow logging and directional falling, are sometimes used to harvest timber within or adjacent to protected cultural resources.

Potential for conflict is based on deviation from current management. Generally, alternatives with more ground-disturbing project activities than CUR have a higher risk potential. Conversely, those with less ground-disturbing activities have a lower risk potential. An exception occurs under PRF: although more acres are disturbed than under CUR, a higher level of cultural resource management reduces the risk factor.

Based on approximate levels of ground-disturbing activities and expected cultural resource program funding levels, the IND alternative has the highest potential for conflict with cultural resources; RBU, the lowest potential. Alternatives rank from high to low potential for conflict as follows: IND, RPD, CUR, PRF, AMN, and RBU.

## **3. Diversity**

Vegetative diversity will be altered under any land management alternative. Activities which have a major influence on diversity are:

- timber management (harvest, reforestation, timber stand improvement)
- firewood cutting
- range management (grazing and range improvements)
- fire management (wildfires, fire suppression, fuels management and prescribed burning)

Timber harvest eliminates mature plants and promotes early successional vegetation. Reforestation ensures that the same vegetation type occupies those areas after harvesting. Reforestation and timber stand im-

provement also affect the relative abundance of plant species within vegetation types by reducing or changing the plant composition of the community.

**Firewood cutting** of juniper is similar to timber harvest in its effect on diversity. Often trees in the oldest age class are preferred, leaving younger age classes of juniper or grass/forb stages.

**Improper grazing practices** may eliminate or reduce plant species, such as woody vegetation within riparian areas or preferred forage species. **Range improvements** can affect diversity in the same manner as timber harvest and reforestation. Cultural practices, which change brush or native grasses to introduced perennial grasslands, and other range improvements set vegetation back to early successional stages; and they change vegetation communities.

Natural or human-caused **wildfires** set vegetation back to earlier successional stages. Post fire treatments, such as reforestation, may also reduce previously abundant vegetation. On the other hand, **fire suppression** affects diversity by maintaining vegetation characteristics that would not occur if fires were allowed to burn. **Prescribed burning** strikes a balance between wildfire and suppression in its effect on diversity.

Outputs for timber harvest, firewood cutting, and fire are shown by alternative in Table 2-11. Appendix M defines successional stages.

### Consequences

As discussed in Chapter 3, diversity is evaluated by richness, evenness, and pattern. Under all alternatives:

- **Richness** – no vegetation type, community, or seral stage is eliminated under any alternative.
- **Evenness** – the relative abundance of plants, animals, habitat types, successional stages and cover classes change under all alternatives. Old growth and mature, dense canopied stands decrease, while acres of early successional stages increase (Figures 4-1 to 4-8). Wildlife species dependent on mature conifer stands decrease, while species associated with early successional stages, such as deer, increase. Plant and animal abundance within communities are reduced due to reforestation techniques on areas allocated to full yield timber management. On acres managed under the Timber-Forage prescription, species richness is only slightly reduced due to less disturbance within stands.

Under all alternatives, <20 timberlands provide 34,000 acres of open-canopied (3a, 4a, and 4a-old

growth) successional stages in addition to that provided by >20 timberlands.

- **Pattern** – aspects of pattern on commercial timber lands change dramatically under all alternatives. Even-aged timber management increases the number of successional stages within an area through the next five decades. Limitations of clearcutting 20-40 acres (depending on the prescription) and dispersion requirements create a mosaic of successional stages. The number of wildlife species initially increases due to cutting, but then decreases as large areas reach sapling, pole and small tree stages. Requiring a 10-to-20-year period before adjacent stands are cut is not sufficient to maintain significant differences in age classes and structure between adjacent cut units.

Old-growth stands have been and will continue to be fragmented as the result of timber management. The Forest will minimize the adverse effects of this fragmentation by providing corridors between old-growth areas. By reserving specific areas for old-growth management, core areas can be managed that will be maintained over time. We will manage habitats surrounding these core areas to include stands that are in older rotation cycles. These managed areas will fluctuate spatially and over time. In this manner, reserves of old-growth-dependent plant and animal species can expand into adjacent stands when they are suitable.

Uneven-aged timber management will not produce the dramatic effects or pattern that even-aged management produces. Small openings created by group selection cuttings will modify patterns on a small scale. Overall character will be of late successional stages

The pattern on permanent rangelands does not change significantly. Lands dominated by grass or brush may change slightly as plants age and succession occurs. Juniper continues to dominate thousands of acres on the Forest and may invade and dominate new areas within the next five decades.

Separate objectives for eastside pine, mixed conifer, and red fir in each management area were used to maintain or reach at least 5% old growth. Improving distribution of old-growth habitat was the motive. Management areas with more than 5% old growth, particularly eastside pine, were harvested. In management areas with less than 5% old growth, seral stage 4B/C was held until old-growth characteristics were met. This results in an overall decline in eastside pine old growth until the 7th decade when all management areas contain at least 5% old growth (Figures 4-9 to 4-11).



The Forest has the opportunity to improve the condition of shrub and woodland communities including sagebrush, bitterbrush, and juniper. Improvement projects will emphasize rejuvenating shrubs, increasing perennial herbaceous vegetation in the understory, and reducing juniper encroachment. To date, vegetation manipulation on rangelands has been unpredictable. Often, treatment results in an increase of annual exotics or undesirable shrub species. The success of a project depends on conditions before treatment and climatic conditions following treatment.

#### **PRF Alternative**

Old growth decreases from 12% in the first decade to 9% in the 5th decade. By the 10th decade, old growth increases to 17% as younger seral stages grow into old growth and are reserved at this seral stage. Stages 2 and 3B/C increase as a result of even-aged management and regulation of timber stands. Successional stage 4B/C decreases slightly over the planning horizon but stays relative stable. As long as 4B/C old-growth habitat is available to meet management objectives, timber stands are not retained in the younger 4B/C stage. Open-canopied stands (3A and 4A) also decrease on > 20 timberlands, but more are available on < 20 timberlands. By the 10th decade, successional stage 4A-old growth makes up 5% of the > 20 timber land base. This land is managed primarily for bald eagles and riparian habitat.

Improved livestock grazing management under PRF increases habitat for wildlife associated with rangeland and riparian areas. Plant species diversity also increases as ecological condition in these areas improves.

#### **CUR Alternative**

Under CUR, old growth also decreases to 7% by the 5th decade. A slight increase to 8% occurs by the 10th decade. Other than a slight increase in successional stage 4A and a slight decrease in stages 3B/C and 2, the consequences to diversity are similar to PRF.

Maintaining current permitted livestock grazing use delays improving vegetative diversity on rangelands in unsatisfactory ecologic condition for one decade. However, through range structural improvements riparian area diversity increases.

#### **RPD Alternative**

Old-growth habitat under RPD decreases to 7% of the > 20 timberlands by the 5th decade. This trend continues through the remainder of the planning horizon. By the 10th decade, slightly higher percentages of early successional stages (1 and 2) exist under PRF and CUR, reflecting the higher timber harvest in RPD. For all other

habitat stages, the pattern and amount of habitat provided is as described for the PRF Alternative.

Meeting RPA objectives for livestock grazing involves many nonstructural range improvements. Where prescribed fire or other techniques create early successional stages, habitat diversity improves. Where farming changes native vegetation to introduced plant varieties, diversity decreases.

#### **IND Alternative**

Old-growth habitat under IND also decreases to 7% by the 5th decade, reflecting the large timber sale quantity under this alternative and RPD. As under RPD, more early successional stages are present in IND.

Increasing livestock AUMs to about 138,400 AUMs for the 1st decade delays improving vegetative diversity on rangelands and riparian areas.

#### **RBU Alternative**

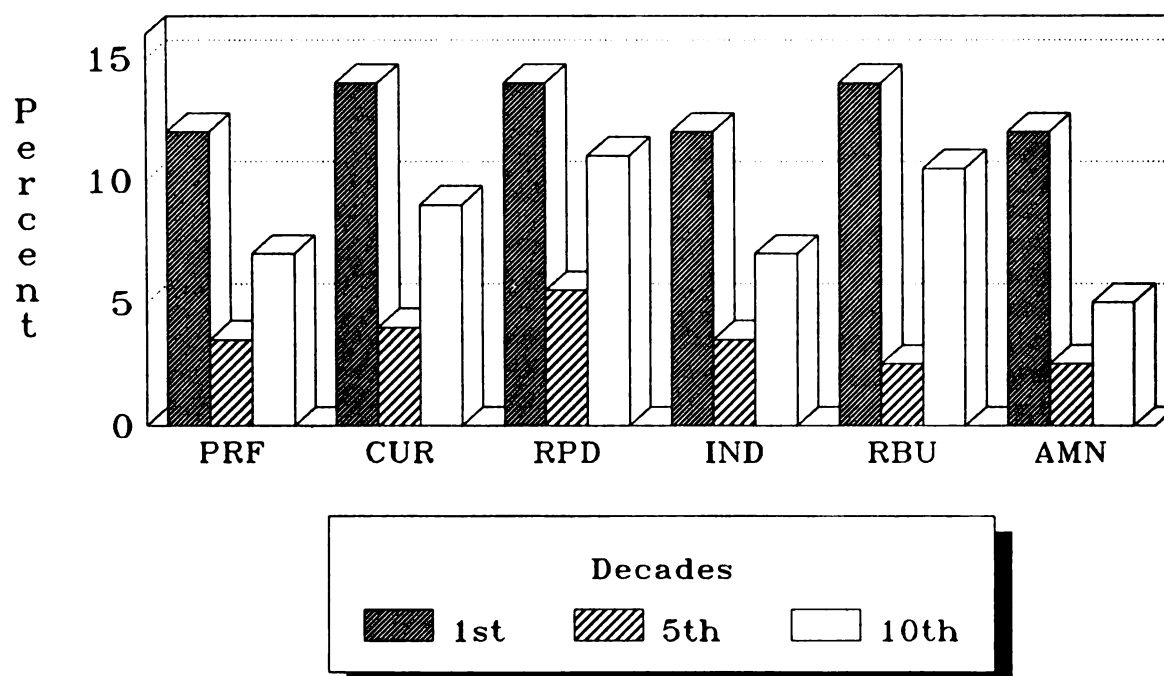
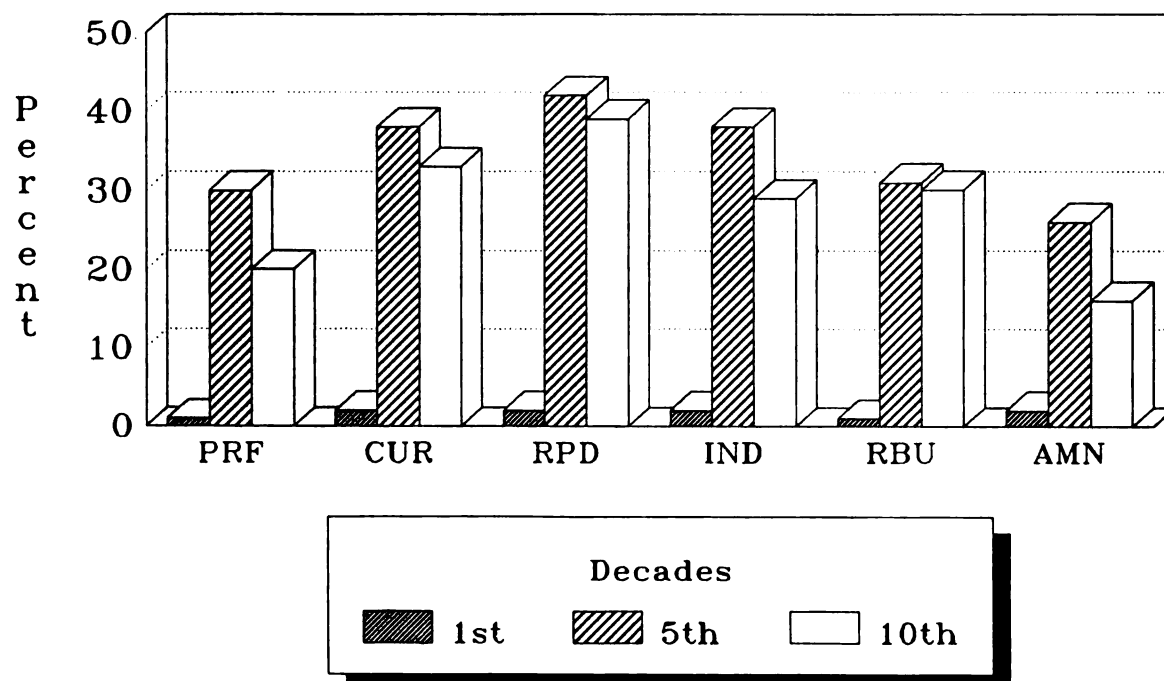
By the 10th decade, old-growth habitat is maintained on 9% of the > 20 timberland base. More 4A-old growth is available by the 10th decade than in the base year, but still less than the 5% minimum. Substantial amounts of 4A successional stage are available throughout the planning horizon, reflecting little harvest in this habitat stage. Under a reduced budget it is more economical to harvest better stocked stands and leave open-canopied, lower volume stands. By the 13th decade these 4A lands are considered 4A-old growth. As described for PRF, most land is comprised of early- to mid-successional stages (1, 2, 3B/C) throughout the planning horizon. Through these 3 stages, results of even-aged management are apparent: most stands are harvested by the time they are 100 years old.

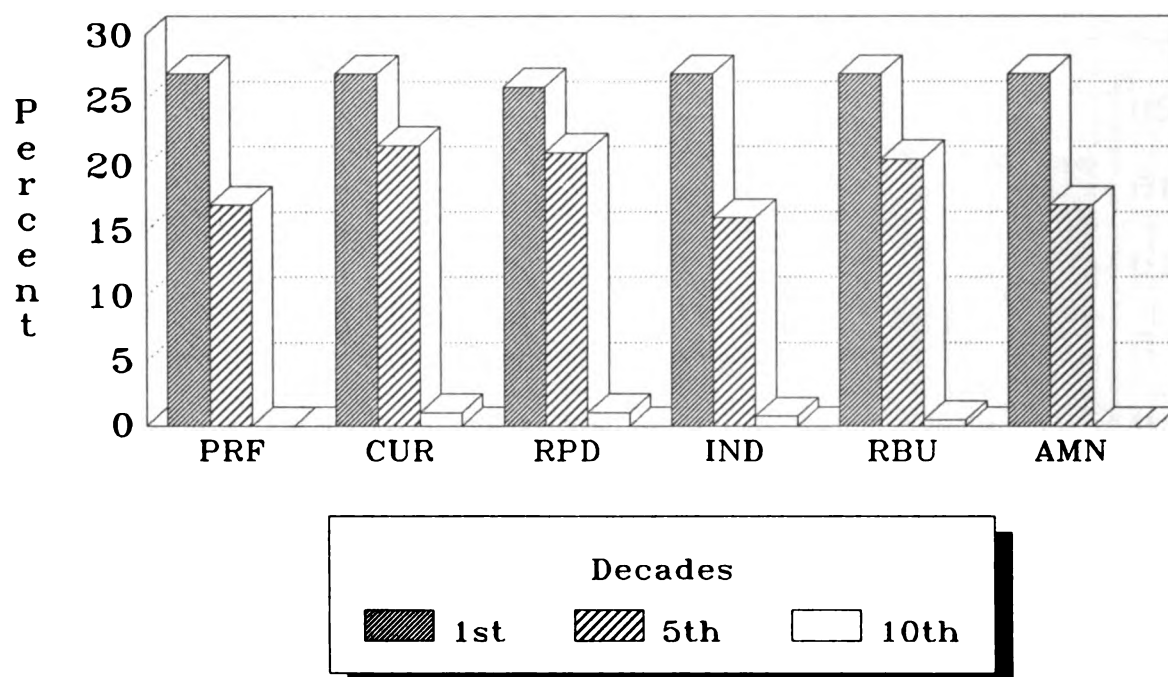
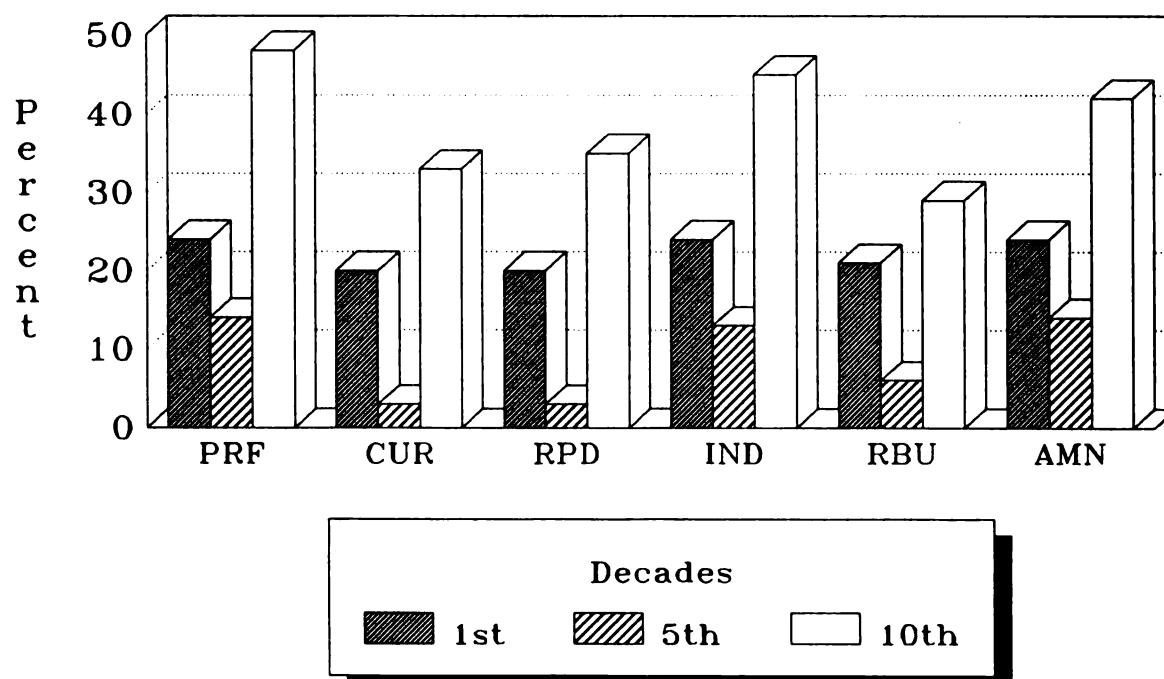
Improved livestock grazing management under RBU increases habitat for rangeland and associated wildlife. Plant species diversity also increases as ecological condition improves.

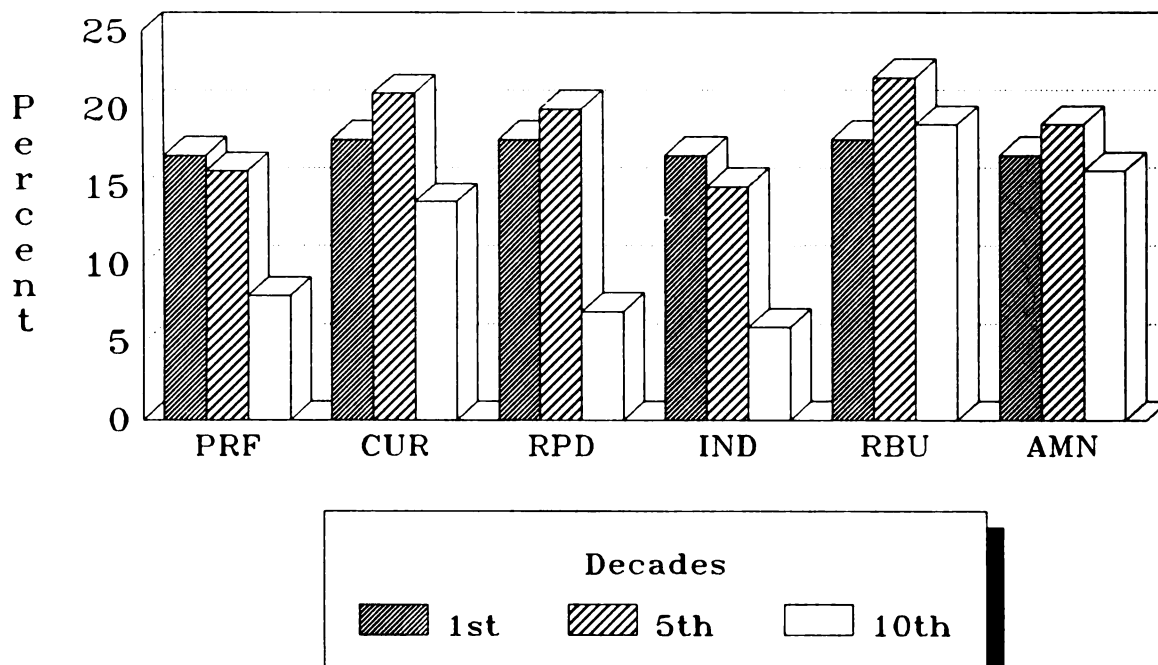
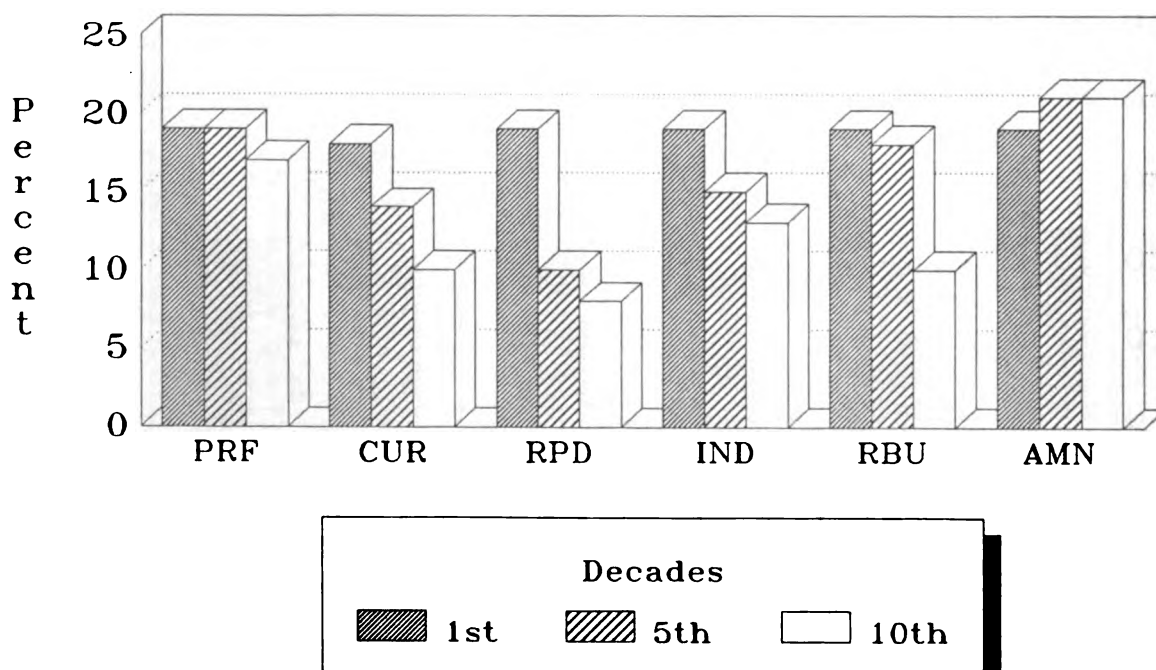
#### **AMN Alternative**

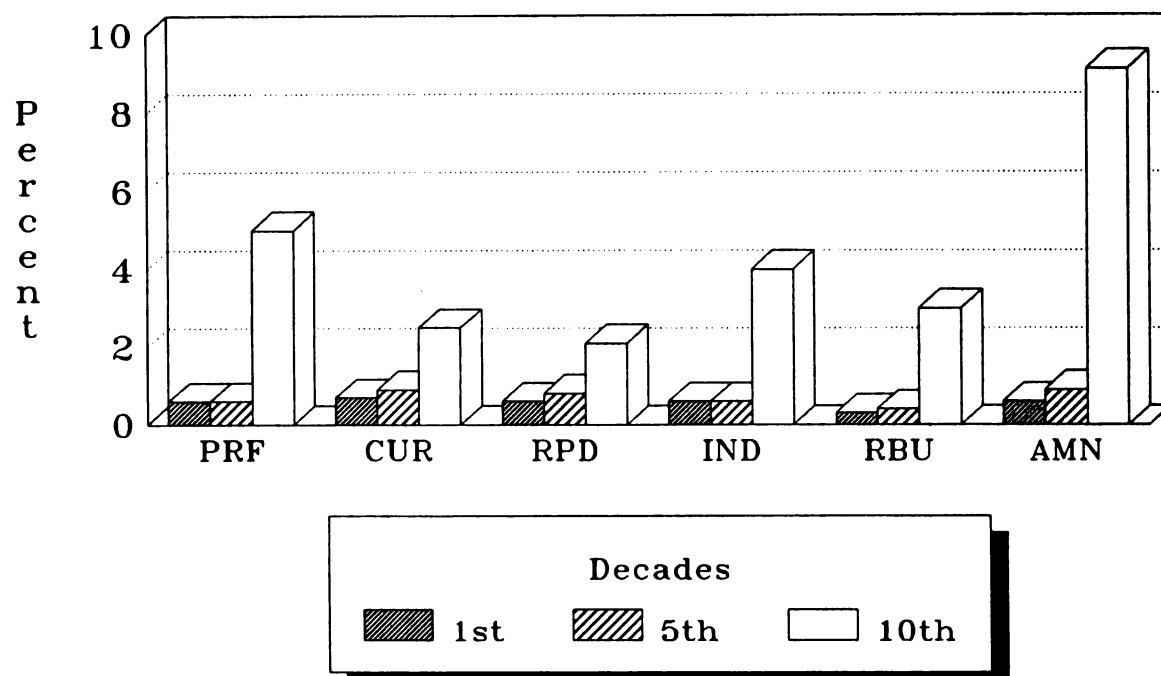
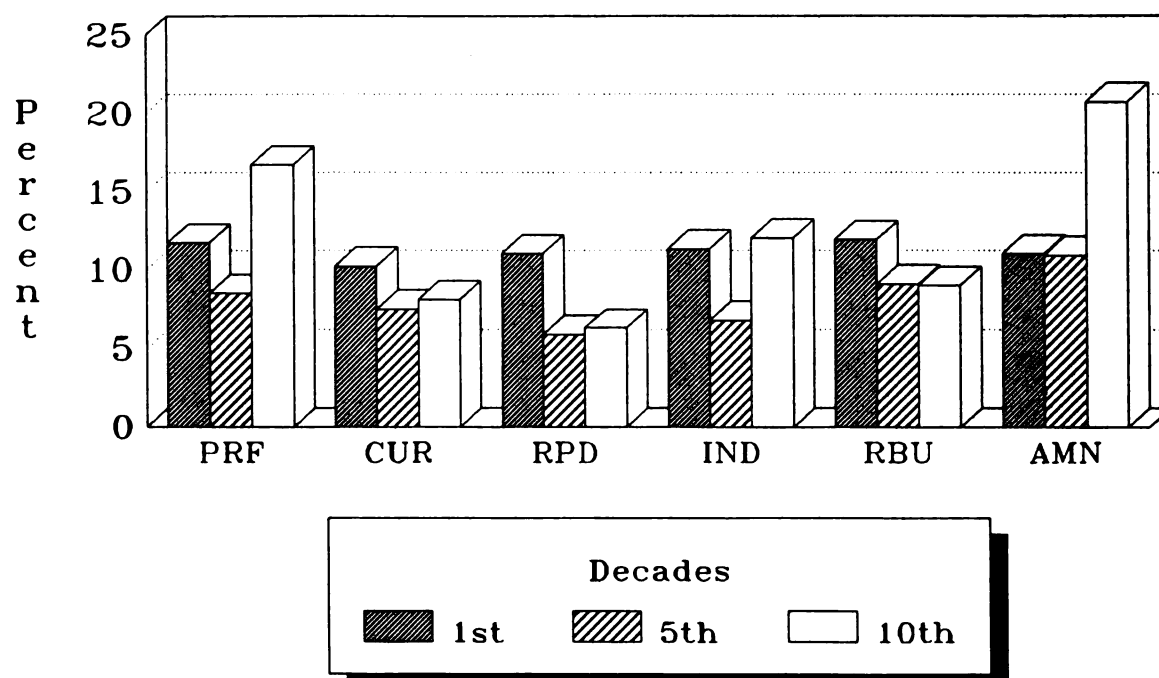
The objective under this alternative is to provide a minimum of 10% old-growth habitat. The objective is met for the entire planning horizon. More late successional stage habitat (4A, 4B/C, 4A-old growth, and 4B/C-old growth) is provided under AMN than under other alternatives. Due to the lower amount of timber harvest, less land is managed in early successional stages (1 and 2).

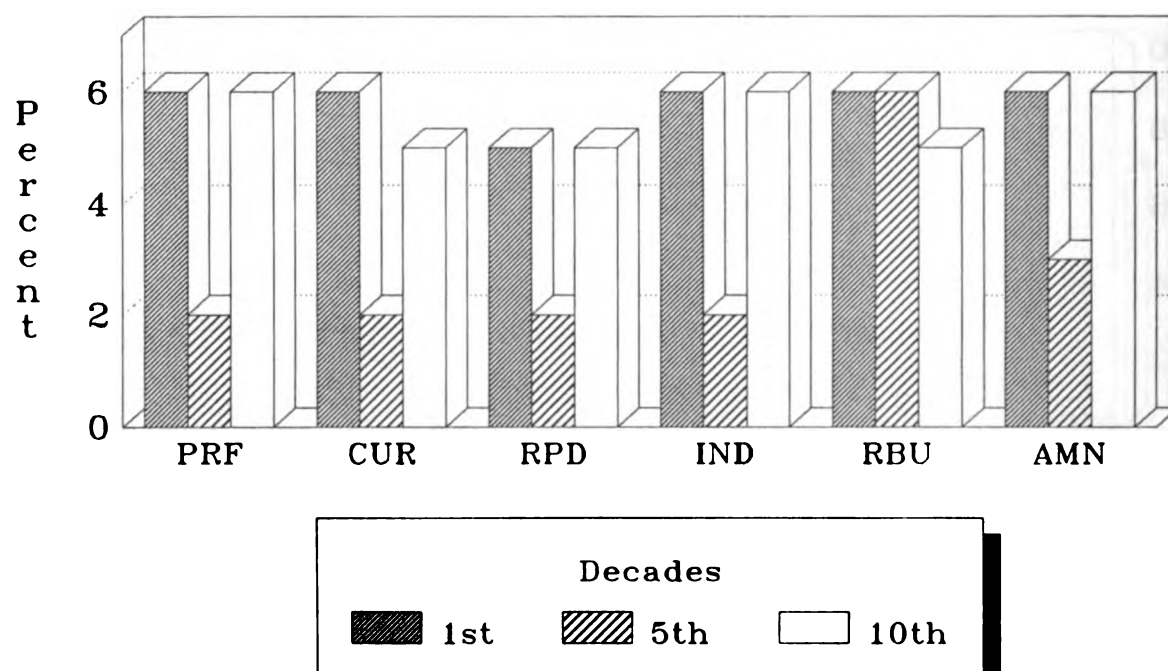
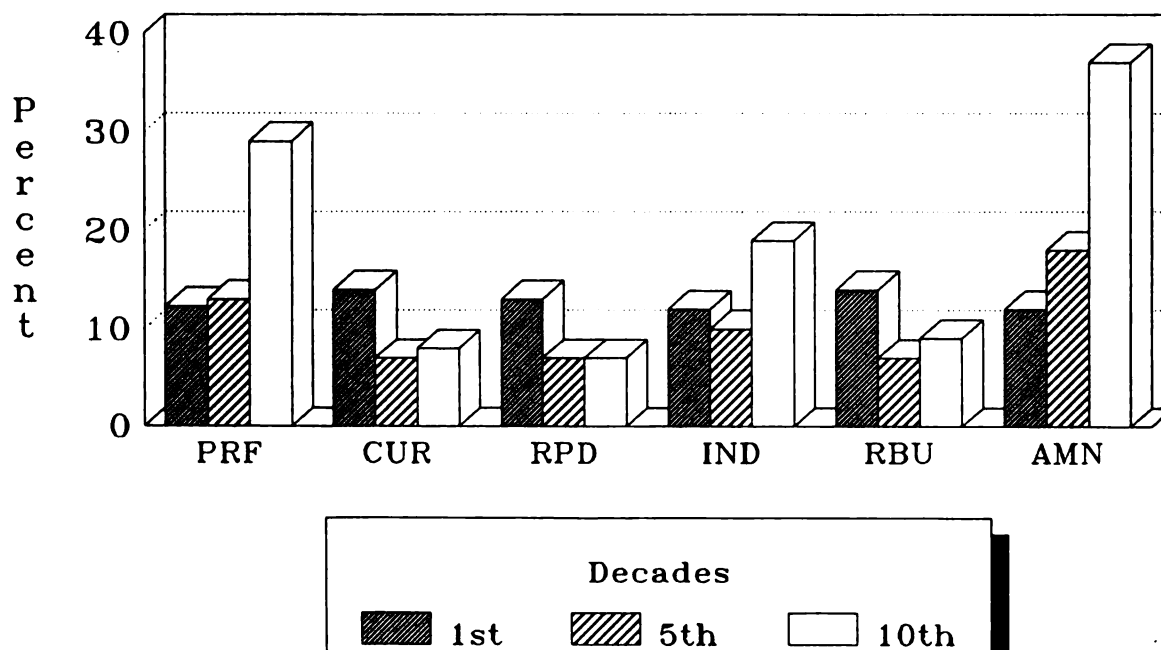
As described for RBU, improved livestock grazing management under AMN improves plant and animal diversity on rangelands and in riparian areas.

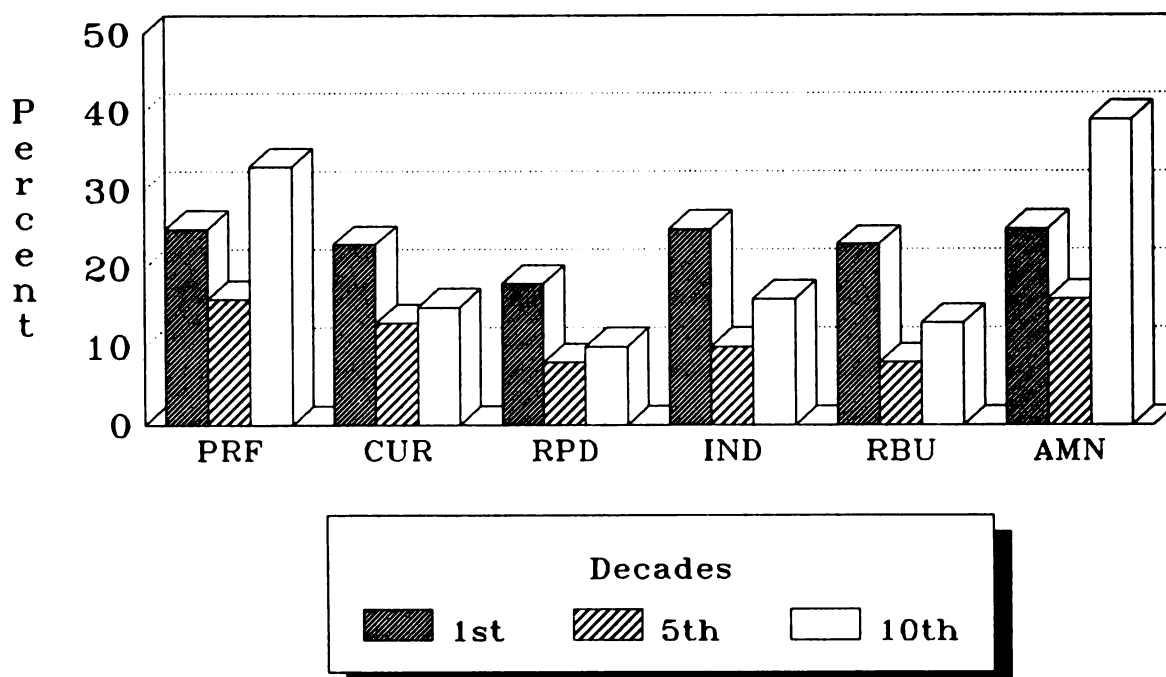
**Figure 4-1. Successional Stage 1 on > 20 Timberlands****Figure 4-2. Successional Stage 2 on > 20 Timberlands**

**Figure 4-3. Successional Stage 3A on > 20 Timberlands****Figure 4-4. Successional Stage 3B/C on > 20 Timberlands**

**Figure 4-5. Successional Stage 4A on > 20 Timberlands (Including Old Growth)****Figure 4-6. Successional Stage 4B/C on > 20 Timberlands (Including Old-Growth)**

**Figure 4-7. Old-Growth 4A on > 20 Timberlands****Figure 4-8. Old-Growth 4B/C on > 20 Timberlands**

**Figure 4-9. Eastside Pine Old-Growth 4B/C on > 20 Timberlands****Figure 4-10. Mixed Conifer Old-Growth 4B/C on > 20 Timberlands**

**Figure 4-11. Red Fir Old-Growth 4B/C on > 20 Timberlands**

## 4. Energy

Energy sources are firewood, biomass, geothermal, and hydroelectric. Environmental consequences from alternatives affecting firewood are discussed in that section of this chapter, and environmental consequences of geothermal is discussed as part of leasable minerals. Biomass and hydroelectric energy are discussed below. Section H of this chapter discusses energy consumed in managing the Forest and conservation potentials.

### Biomass

The Forest Service ensures that firewood is available to meet demand for personal use. Therefore, material suitable for firewood is not considered available for biomass use. Enough biomass material must also be left in the Forest to meet ecological needs for soil nutrients, plants, erosion control, and wildlife habitat needs.

Timber harvest activities determine the amount of biomass available for energy production. Amount of biomass is primarily affected by the number of acres har-

vested and thinned, volume harvested per acre, and silvicultural practices used (e.g., clearcutting vs. selection).

Current demand for biomass is low, and little is known about the future demand. The present supply is expected to meet demand for the next decade. Although the volume varies, demand for biomass is met under all alternatives.

### RPD and IND Alternatives

Biomass production is the greatest under these alternatives and exceeds the present base year amount.

### PRF and CUR Alternatives

Biomass production is equal to that of the base year.

### RBU and AMN Alternatives

Biomass production continues to exceed demand, even though timber harvest decreases in these alternatives.

### Hydroelectric

No hydroelectric projects are currently operating or under permit on the Forest. New hydroelectric proposals

are reviewed through site-specific environmental analyses to insure the the action will be (1) compatible with the management prescription for the area, and (2) consistent with the nation's need for energy.

Under all alternatives, sufficient stream flows are maintained to protect instream beneficial uses. All stream crossings, diversions, and dams provide for fish passage where necessary.

Management prescriptions that preclude or severely restrict hydroelectric development on the Forest are:

- Wilderness
- Riparian Area

#### Wilderness

This prescription prohibits use of mechanized equipment, precluding any hydroelectric development.

#### Riparian

Under this prescription no surface disturbance is permitted within 700 feet of any body of water or meadow area. This restriction can be amended by the Forest Supervisor.

Management prescriptions that could restrict hydroelectric development on the Forest are:

- Semi-Primitive Non-Motorized
- Visual Retention
- Raptor Management
- Timber Visuals

#### Semi-Primitive Non-Motorized

The prescription minimizes surface disturbance by restricting access for the purpose of hydroelectric development. Development is allowed but it is not encouraged.

#### Visual Retention

This prescription emphasizes protecting the visual quality of the area to which it is applied. Hydroelectric development is moderately restricted.

#### Raptor Management

This prescription restricts the surface occupancy of hydroelectric development activities in areas that adjoin habitats of species described under the Endangered Species Act of 1973, as amended. This restriction can be amended by the Forest Supervisor if the developer can demonstrate that activities will not cause unacceptable environmental impacts on protected species.

#### Timber-Visuals

This prescription requires that activities conform to the visual quality objective of partial retention. This restriction moderately impacts hydroelectric development.

#### Consequences

Acres affected by the above prescriptions are shown in Table 4-6. We compare alternatives based on the probability of hydroelectric development. We assume such operations are likely to develop in areas not covered by restrictive administrative prescriptions. *Environmental Consequences* does not address the hydroelectric potential of specific sites nor the consequences of development. Because these considerations are variable, they are most appropriately discussed in site-specific analyses.

#### All Alternatives

About 9,300 acres are managed under the Riparian Area prescription, and approximately 72,000 acres are managed under the Wilderness prescription. These acres are common to all alternatives.

In all alternatives, the Raptor Management prescription constrains 52,100 acres.

**Table 4-6. Hydroelectric Development Restrictions by Alternative.**

	M Acres					
	PRF	CUR	RPD	IND	RBU	AMN
Severely Restricts Development	93.0	93.0	93.0	93.0	93.0	93.0
Restricts Development	130.1	201.0	166.8	124.8	110.3	223.0
<b>Total</b>	<b>223.1</b>	<b>294.0</b>	<b>259.8</b>	<b>217.8</b>	<b>203.3</b>	<b>316.0</b>



**AMN Alternative**

Under this alternative the most acres are restricted from hydroelectric development.

**CUR and RPD Alternatives**

These alternatives have the second highest number of acres restricting hydroelectric development.

**PRF, IND and RBU Alternatives**

These alternatives have the fewest acres restricting hydroelectric development.

## 5. Facilities

Forest facilities include roads, trails, major stream crossings, utility transmission lines, buildings, dams, and electronic sites. Roads are discussed below, while trails are discussed in *Recreation*. Utility transmission lines and electronic sites are discussed in *Lands*. Environmental consequences to major stream crossings, utility transmission lines, buildings, dams, and electronic sites are not expected to vary by alternative.

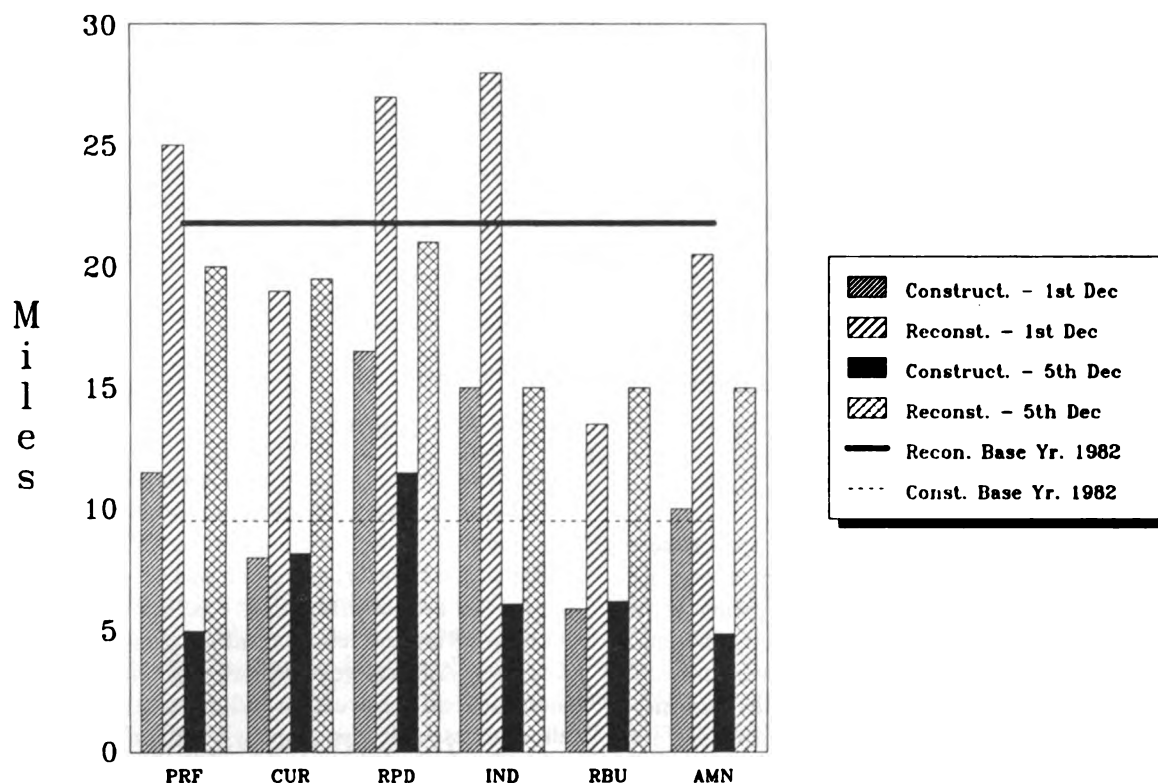
**Roads**

The Forest maintains a transportation system to accommodate traffic needs and to prevent resource damage. The goal of road system development and management is to provide Forest users safe, cost-effective transportation facilities consistent with land and resource management objectives.

Activities that have major impacts are:

- Timber production
- Recreation use
- Fire suppression
- Rangeland access
- Firewood gathering

Timber production and recreation use place the heaviest demands on the Forest transportation system. Timber harvest is the single greatest influence on road activity. The Forest road system was developed largely in support of timber program needs. The timber management program influences road location as well as road densities. Alternatives emphasizing timber harvest will increase road construction and reconstruction. Similarly, alternatives with less emphasis on timber harvest will have less new road development (Figure 4-12).

**Figure 4-12. Average Annual Road Construction and Reconstruction**

The Forest is currently roaded except for the Wilderness and special areas. New road construction will be limited to local roads for harvesting isolated timber parcels. Under all alternatives, existing and planned roads are brought under management; and unnecessary roads are closed or obliterated.

Alternatives focusing on dispersed recreation provide for fewer road closures, and emphasize user comfort on arterial and collector roads. Management of local roads varies by alternative.

Under all alternatives, Forest-wide Standards and Guidelines pertaining to the road system will apply. Such direction includes limiting access to nest areas of threatened and endangered species during critical periods, building roads on steep terrain according to specific standards, and seasonally closing roads to prevent resource damage. Under all alternatives, road maintenance will provide a safe and environmentally acceptable road system.

#### PRF, RPD, and IND Alternatives

Less road construction and reconstruction for timber activities occurs than in the base year. However, total road construction above the base year increases when one includes new construction for accessing range and recreation sites; roads currently constructed as temporary roads.

Local roads currently used for timber production and dispersed recreation are maintained to allow passage by high-clearance vehicles (i.e., pickups). Major haul roads, roads accessing developed recreation sites, or other heavily used areas are maintained for passenger car travel.

#### CUR and RBU Alternatives

Road construction and reconstruction are also below base year levels. All local roads associated with timber activities are maintained for high-clearance vehicles. Under CUR, access to developed recreation sites allow for passenger car travel. Under RBU, roads to fewer developed sites are provided this convenience. Access to

sites which receive light use are maintained for travel by high-clearance vehicles.

#### AMN Alternative

Road construction and reconstruction for timber activities is considerably less than in the base year. However, new construction access for recreation use increases total road construction to slightly above the base year. Reconstruction increases in the 1st decade providing user comfort on arterial and collector roads; and bringing existing, uninventoried roads under a management strategy.

### Stream Crossings and Dams

Most structures crossing major streams are in place and require maintenance or replacement as needed for traffic safety and protection of the stream environment. Additional stream crossings depend primarily on the need to access areas for resource activities. Major crossing needs are constant throughout all alternatives. Land managers employ watershed best management practices for all stream crossings.

Dam maintenance prevents damage to structures and downstream resources. The risk to life is very low, but dam failure could cause environmental damage. In all alternatives, existing dams are inspected and maintained to protect investments and the stream environment. Future dam construction is determined on a project-specific basis through environmental analysis.

### Utility Transmission Lines

For environmental consequences, see the *Lands* section of this chapter.

### Buildings

Under all alternatives, the Forest maintains facilities such as ranger stations, offices, crew quarters, shops, and warehouses. Many administrative facilities are too old for cost-effective maintenance and require reconstruction or replacement. Because of workforce changes, some buildings are no longer needed and may be sold or removed; other structures may be remodeled or replaced to provide facilities that meet health and safety codes.

### Electronic Sites

Environmental consequences to electronic sites are discussed in the *Lands* section of this chapter.

## 6. Fire and Fuels

Environmental consequences to fire are based on projected timber management practices, wildfire suppression strategies, ecological responses to wildfire, prescribed burning and reforestation practices, historical fire data, and application of the national fire management fire analysis system. Depending on the fire management organization, the system predicts suppression costs, acres burned, and damages.

### Activities Which Have Major Effects on Fire

- Timber harvest
- Young timber plantations
- Fire management program option
- Fuel treatments

**Timber harvest** creates large amounts of logging debris (slash). If untreated, the debris poses a fire hazard and threatens surrounding areas. Consequently, alternatives emphasizing timber harvest without intensive slash treatment have increased fire hazard. Most overstory removal and selection harvests used in uneven-aged management systems create slash which cannot be economically treated because it is intermingled with the remaining trees. Natural and logging slash is generally removed when regeneration units are prepared for planting.

**Young timber plantations** are highly flammable, and the risk of fire increases as more plantations are established. The duration of a plantation's highly flammable character varies by timber stand type. Lower-elevation mixed conifer plantations are highly flammable until about age 30, while fir plantations remain flammable until age 60. Scheduled thinning with slash treatment can lessen the risk by maintaining space between individual tree crowns and by accelerating the growth of individual trees. The inherent risk to fir plantations is low. Areas of selection harvesting are equally hard to protect from fire because 1) slash accumulates after repeated entries, 2) young stands are susceptible to fire, and 3) several age classes create multi-layered fuel ladders for fire to spread to tree crowns. Early fuel treatment and planned maintenance are critical to success in young stand protection.

The fire program management option selected in an alternative determines the strategy emphasis and the total acres of wildfire. Fire management consists of prevention, detection, suppression, and fuels management. Every alternative allows a mix of suppression strategies: confinement, containment or control. The strategy used

depends on the fire history of the area, expected fire intensity, and specific management area direction. Suppression objectives are consistent with management area objectives and the resource values at risk.

**Fuel treatments** reduce the hazard created mainly by timber harvest and precommercial thinning. Fuel treatment methods include prescribed fire as well as non-burning methods such as cutting logs into short pieces, removing debris for firewood, or lopping and scattering. Indirectly, fuel treatments reduce fire suppression costs, resource damage, and the need for seasonal fire closures. Acres affected by prescribed burning are directly proportional to the amount of timber regeneration harvest under each alternative.

All alternatives include the use of prescribed fire from natural (lightning-caused) ignitions in the Wilderness, but not in special interest areas or the research natural area.

## Consequences

Output tables for each alternative in Chapter 2 show expected burned acreages by wildfire intensity class. High intensity wildfire can be detrimental, whereas low intensity wildfire is often beneficial. Acres burned are essentially the same in all alternatives (Table 4-7). Because of the generalized nature of fire modelling, the differences are insignificant.

**Table 4-7. Average Annual Acres Burned**

Decade	PRF	CUR	RPD	IND	RBU	AMN
1	6,236	6,258	6,236	6,236	6,258	6,236
2	6,245	6,262	6,245	6,245	6,262	6,245
3	6,340	6,427	6,340	6,340	6,427	6,340
4	6,340	6,399	6,340	6,340	6,399	6,340
5	6,426	6,431	6,426	6,426	6,431	6,426
<b>Total</b>	<b>31,587</b>	<b>31,777</b>	<b>31,587</b>	<b>31,587</b>	<b>31,777</b>	<b>31,587</b>

**Table 4-8. Other Activities Affecting Fire Management.**

	Decade	PRF	CUR	RPD	IND	RBU	AMN
Timber Harvest (MMBF)	1	45.5	51.4	74.6	60.1	36.9	31.8
	5	46.8	53.8	58.7	60.1	40.9	40.2
Reforestation (M Acres)	1	3.4	2.7	4.5	4.0	2.1	2.0
	5	3.7	2.6	4.8	5.8	1.2	2.7
Fuel Treatment (M Acres)	1	4.3	3.7	7.8	5.9	3.5	1.8
	5	6.3	4.4	8.3	7.0	3.1	2.2

Table 4-8 shows other activities affecting fire management.

#### **CUR, RPD and IND Alternatives**

Suppression and fuel treatment are used to limit wildfires to 6,236 acres in the 1st decade. Higher levels of timber harvest result in subsequent reforestation to fire-susceptible plantations. Fuel treatments in these alternatives reduce some risk to fire, but not enough to reduce wildfire less than current levels.

#### **PRF, RBU and AMN Alternatives**

Lower timber harvests in these alternatives result in lower reforestation and fewer fuel treatment acres. We expect no impact on acres burned by wildfire.

Firewood supply also depends on limbs and cull logs associated with timber harvesting. Under current management, about 38,000 cords per year are available but not fully used because of vehicle access problems, small material, and undesirable species such as white fir. Alternatives emphasizing large timber volumes have a higher potential for available firewood from slash.

Demand for firewood depends largely on the value of other energy sources. When gas and oil prices rise, firewood becomes more attractive as a heating source. As a result of the 1974 energy crisis, personal-use wood permits increased dramatically until about 1982 when the demand stabilized. Demand for firewood is assumed to follow local population trends and is constant throughout all alternatives. Forestwide, woodcutters prefer juniper for firewood, with logging slash of secondary importance. Of the species composing logging slash, eastside and lodgepole pine are preferred.

## **7. Firewood**

Firewood management addresses deep public interest in a sustained supply of firewood and its equitable distribution. The most significant factors affecting firewood management are supply and demand.

Firewood available from juniper comes from a fixed land base. Currently, little is known about the juniper growth rate or the speed with which it invades or regenerates on sites previously harvested. Estimates of 10-year growth rates show that 18,760 cords of western juniper could be removed annually if all areas were accessible for harvest. More information on juniper inventory is outlined in the Firewood section of the Analysis of the Management Situation in the Forest planning records.

#### **All Alternatives**

Under all alternatives the Forest meets the current level of demand estimated at 23,000 cords per year. Preference is given for personal use over commercial uses.

The current inventory of juniper is expected to last indefinitely because growth exceeds demand. On the other hand, firewood from logging and thinning slash fluctuates by alternative depending on the allowable sale quantity. Table 4-9 shows the estimated number of cords available annually from the regeneration harvest occurring under each alternative.

**Table 4-9. Firewood Produced from Regeneration Harvest  
(Cords Per Year for the 1st Decade)**

	PRF	CUR	RPD	IND	RBU	AMN
Mixed Conifer	8,900	19,390	23,620	15,000	12,740	5,500
Eastside Pine	15,500	260	10,390	16,000	0	5,100
Red Fir	1,100	820	1,590	1,800	2,620	600
Lodgepole	1,000	0	0	1,200	0	0
<b>Total</b>	<b>26,500</b>	<b>20,470</b>	<b>35,600</b>	<b>34,000</b>	<b>15,360</b>	<b>11,200</b>

#### RPD Alternative

This alternative provides the greatest amount of available firewood because it has the highest allowable sale quantity. Consequently, commercial harvest yields the most slash for firewood. However, the amount of eastside pine available for firewood is moderate compared to other alternatives.

#### PRF and IND Alternatives

These alternatives provide a moderate level of firewood from logging slash, while maintaining high levels in eastside pine.

#### CUR, RBU, and AMN Alternatives

These alternatives provide the lowest levels of firewood from logging slash. However, current demand is still met because about 18,760 cords of juniper are available annually.

tion associated with special use permits can cause landslides.

Lands most susceptible to mass wasting are:

- Steep slopes  $\geq 40\%$
- Bedrock that lacks cohesiveness as a result of stress from overlying material
- Clay soils

Forest lands are rated (extreme to low) by their potential for mass wasting. No lands on the Modoc are rated extreme; 15% are rated as high – and only one-fourth of that percentage is located in areas subject to management activity which could result in slope failure. The remaining lands have low potential for mass wasting.

Under all alternatives, management activities are altered or eliminated to reduce potential adverse impacts of mass wasting in areas with a high risk for mass wasting. Restrictions could be expressed as:

- reducing basal areas removal from unstable areas;
- designing special structures;
- eliminating management activities in the area.

Under all alternatives, Best Management Practices (BMPs) protect soil and water quality. Potential for mass wasting is expected to be minimal; therefore, impacts to management activities are probably insignificant. Appendix N of the Forest Plan discusses BMPs.

#### Groundwater

Human activities can also affect the quantity of water recharged into the ground. Road construction compacts soil and prevents water absorption for recharge. Timber

## 8. Geology

### Landslide Hazards

Human activities can increase the rate and volume of material affected by landslides or mass wasting. Timber harvesting can diminish root systems' ability to retain soil, and change groundwater flows. Road construction and maintenance often remove material supporting slopes, resulting in slope failure. Mining and special use developments can induce slides indirectly by timber removal or road construction, or directly by removing support material. In addition, compaction from facility construc-

harvesting can remove soil, which decreases the amount of water absorbed for recharge. Similarly, mining activities can reduce the quantity of water allowed to recharge subsurface reservoirs indirectly by timber removal or road construction, or directly by removing support material.

Under all alternatives, BMPs are used to prevent damage to groundwater. BMPs include outcropping roads where possible, leaving surface debris within clearcut units, and minimizing surface compaction during forest management activities. Under all alternatives, surface activities such as timber harvesting and road construction have little effect on the quantity of groundwater.

Groundwater is used primarily during road construction and maintenance. Both activities generally increase in alternatives with increased harvest levels. Therefore, alternatives with high timber harvest levels are likely to have the most groundwater use.

High demand for groundwater is also associated with special projects such as mining or gas line construction.

Under all alternatives, the volume of groundwater withdrawn will not significantly impact its availability or affect other groundwater users.

Chemical reactions between water and the surrounding environment affect the quality of groundwater. If toxic substances are introduced into the ground, then the quality of groundwater is adversely effected. However, hazardous material spills can be managed through plans of operation, special use permits, and contract specifications. Under all alternatives, degradation of groundwater quality is negligible.

## 9. Lands

Lands activities occur in response to resource needs, laws, regulations, and direction regarding landownership adjustment, special land uses, land status, rights-of-way acquisitions and withdrawals.

Consequences to the land use program change as it responds to internal and external needs. Thus, consequences are measured in terms of the following program accomplishments: miles of landline location, rights-of-way acquired, acres of land acquired or exchanged, acres of withdrawals, and special use permits for various land uses.

The level of land use management directly affects the ability to respond to internal and external needs. Many

components of an effective land use program (e.g., land status, property line location, land ownership adjustment, and special use permits) can be independent of or dependent on Forest activities and programs. Property line location is independent of Forest resource activities and is necessary to manage Forest lands under all alternatives.

At a low level of program management, the Forest attempts to respond to legally mandated responsibilities including collecting special use fees, preventing encroachments, maintaining land status records, and locating land lines.

At a moderate level of program management, the Forest accomplishes its legally mandated responsibilities and responds to internally generated resource programs. Property lines are located and monumented as necessary for resource activities. Land exchanges in the public interest are accomplished where feasible. All special use is in the public interest (vs. personal interest).

At a high level of program management, the Forest locates all property lines between the Forest Service and other ownerships by the year 2020 and resolves encroachments by the year 2000. All rights-of-way acquisitions, grants and land adjustments are kept current. All special uses are fully administered and all new applications for special use permits are acted upon in a timely manner. Maintenance of land lines is current.

### PRF and CUR Alternatives

Under PRF and CUR, the Lands program is managed at a moderate level. An estimated 44 miles of land lines are located and monumented, and about four rights-of-way are acquired per year in the 1st decade. Land adjustments are based on opportunity for ownership consolidation. Twenty miles of property lines are maintained.

### IND, RPD and AMN Alternatives

Under these alternatives, the Lands program is managed at a high level throughout the Forest. Six rights-of-way for Forest access are acquired. An estimated 59 miles per year of landlines are located and monumented, including 17 miles per year of resource-related surveys. Maintenance of 30 miles per year of landlines will also occur. State and County road use permits are converted to easements. Emphasis under AMN is acquisition for threatened and endangered and other game and non-game wildlife habitat.

### RBU Alternative

The Lands program is managed at a low level. An estimated 11 miles of land lines are located and

monumented, and approximately 2 rights-of-way are acquired per year for Forest access.

## Coordination with Adjacent Landowners

Coordination efforts described in Chapter 3 continue under all alternatives. The average of land adjustments does not vary significantly by alternative, but specific areas to be acquired vary according to the theme of each alternative.

## Utility Transmission Lines

Specific areas are avoided in locating new utility corridors under all alternatives: designated wilderness, research natural areas, special interest areas, semi-primitive recreation areas, and areas used in the practice of Native American religions. Because each alternative involves a different mix of these areas, future corridor locations could be affected in various ways. The Forest coordinates its activities with users and permittees of existing transmission lines to ensure compatibility among activities and intended use of the utility corridor. Future corridors will be analyzed on a site-specific basis.

## Electronic Sites

Sites designated as electronic sites (Plan, Appendix U) are formally designated by the Regional Forester. These sites are used for the needs of the Forest Service and for commercial or private users. After designation, a site-specific management plan will be developed for each site. The management plan will identify future uses for the site.

Designation of electronic sites will not result in any additional impacts to the area.

## Special Uses

Under all alternatives, the Forest coordinates with permittees to ensure that management activities do not preclude permitted use of the land.

## 10. Law Enforcement

Law enforcement is affected by human population growth, recreational visitors, and socio-economic stability.

As populations in surrounding communities grow, and as more visitors use the Forest, law enforcement problems are likely to increase. Typical problems are human-caused fires, vandalism, theft, and illegal drug laboratories.

Changes in the Forest budget and outputs affect employment and income in local communities around the Forest. Depressed economic situations could induce more timber and firewood theft and wildlife poaching. Consequently, the need for law enforcement would increase. All alternatives have little effect on clandestine drug manufacturing and cannabis cultivation.

### PRF, CUR, RPD, and IND Alternatives

Under these alternatives, law enforcement efforts are adequate most of the time. Compliance is maintained commensurate with increased use of the Forest. Timber and firewood losses are minimal. However, range and soil are occasionally damaged from unauthorized use. Inappropriate activity of some Forest visitors may occasionally mar the recreational experiences of others.

### RBU and AMN Alternatives

Similar environmental consequences occur under RBU and AMN. However, more law enforcement problems occur because of a somewhat unstable social and economic situation.

## 11. Minerals

Direct impacts to mineral prospecting, exploration, and development are difficult to predict because the timing and location of work depends on demand, supply, and market prices. Project evaluations and analyses precede all mineral development.

## Mineral Materials

The County, State, and other federal agencies will remove more minerals materials as the local population increases. The need for Forest road surfacing material is determined by timber harvest level. Table 2-11 shows 1st and 5th decade road construction and reconstruction by alternative.

### Consequences

The volume of mineral material removed from the Forest varies only slightly throughout all alternatives. With the exception of the North Warners (north of Sugar Hill), existing material sources are adequate for future



needs in all alternatives. Some existing quarries will require expansion under alternatives emphasizing roads. Developing new sources of minerals materials may remove a few acres from timber production, decrease visual quality, and temporarily disturb wildlife and degrade air quality.

Removing other common variety materials, such as decorative rock, causes insignificant environmental effects and is not anticipated to vary by alternative.

Minerals materials will be used most under the RPD and IND alternatives, and least under RBU.

## Locatable Minerals

Mining will be conducted according to federal and State laws and regulations, Forest-wide Standards and Guidelines, and management prescriptions.

Mineral withdrawals, restricting access, and requiring specific mitigation measures or extensive reclamation are the greatest impacts to mineral exploration and development. The sites and acres which have been withdrawn from mineral entry are shown in Appendix I. Table 4-10 shows the impacts of mineral withdrawals.

Implementing certain management prescriptions will restrict access, may require non-mineral resource mitigation measures, and require extensive reclamation – all of which may increase the cost of various aspects of mineral exploration and development.

Management prescriptions having the greatest effect on minerals are:

- Special Areas
- Developed Recreation (standard and low standard)
- Semi-primitive Non-motorized Dispersed Recreation
- Visual Retention
- Raptor Management
- Timber-Visuals
- Riparian Area

### Special Areas

Under this prescription, Special Interest Areas (SIAs) are withdrawn from mineral entry. If mining claims pre-date the withdrawal, restrictions may be applied to plans of operation. Restrictions on access and intensity of disturbance could prohibit certain mining activities.

## Developed Recreation

Under this prescription recreation sites are withdrawn from mineral entry. Sites not currently withdrawn are managed so that activities occurring in or adjacent to recreation sites will not be incompatible with the intent of the prescription. This prescription severely restricts mineral activities in both timing and intensity of activity.

### Semi-Primitive Non-Motorized

This prescription minimizes surface disturbance resulting from access for mineral development. Mineral development is allowed, moderately restricted, but not encouraged. The major impact to mineral activity is the degree of reclamation which would be required: i.e., complete restoration of a disturbed area.

### Visual Retention

This prescription emphasizes protecting the visual quality of areas to which it is applied. Mining activities are not precluded; but they are moderately restricted by requiring extensive reclamation to any activity.

### Raptor Management

This prescription provides for protection in areas adjoining habitats of species described in the Endangered Species Act of 1973, as amended. The prescription may be so restrictive that it precludes mineral development.

### Timber-Visuals

Under this prescription, mineral activities conform to the visual quality objective of partial retention. The prescription moderately restricts mineral development.

### Riparian Area

This prescription protects surface waters. The restriction may require extensive mitigation measures by mining operators.

### All Alternatives

The number and location of withdrawals do not change by alternative. As shown in Table 4-10, most lands affected by these withdrawals have low mineral potential, except for the mineral withdrawal for the Cave and Lily Lakes recreation/administration site. At this location, mineral potential is based on the site's nearness to the Highgrade mining district. Withdrawals will not significantly affect mineral development.

All alternatives implement the same management prescriptions. However, acres of each prescription vary by alternative; thus, the acres affected by each alternative also vary (Table 4-10).

**PRF, CUR and RPD Alternatives**

These alternatives do not increase the acres of high and medium mineral potential that are constrained by management prescriptions. The Timber-Visuals and Semi-Primitive Non-Motorized prescriptions have the greatest impact on high potential areas. Most of the acres

affected by management constraints have low or unknown mineral potential. The difference between alternatives is the number of acres affected by the Timber-Visuals prescription. Acreage under all other prescriptions is the same for PRF, CUR and RPD.

**Table 4-10. Potential Locatable Mineral Areas Withdrawn or Mitigated by Alternative.**

Areas Where Mgt Prescriptions Constrain Mineral Development	Mineral Potential <sup>1</sup>	Existing 1982	Withdrawals					
			M Acres					
			PRF	CUR	RPD	IND	RBV	AMN
Wilderness	L	.0	71.2	71.2	71.2	71.2	71.2	71.2
Research Natural Area	L	.8	.8 <sup>2</sup>	.8	.8 <sup>2</sup>	.8	.8	.8 <sup>2</sup>
Special Areas	L	9.3	9.3 <sup>3</sup>	9.3 <sup>3</sup>	9.3 <sup>3</sup>	9.3 <sup>3</sup>	9.3 <sup>3</sup>	9.3 <sup>3</sup>
Recreation Areas	M	.2	.2	.2	.2	.2	.2	.2
	L	7.2	7.2	7.2	7.2	7.2	7.2	7.2
Administrative Sites	M	.2	.2	.2	.2	.2	.2	.2
	L	1.7	.4	.4	.4	.4	.4	.4
<b>Total</b>		<b>19.4</b>	<b>89.3</b>	<b>89.3</b>	<b>89.3</b>	<b>89.3</b>	<b>89.3</b>	<b>89.3</b>
<b>Potential Acres with Mitigating Measures<sup>4</sup></b>								
Prescription Areas <sup>5</sup>	H	10.2	10.2	10.2	10.2	8.0	8.0	12.5
	M	21.1	21.1	21.1	21.1	18.0	18.0	24.0
	L	179.2	195.4	247.7	213.6	128.7	114.2	395.4
<b>Total</b>		<b>210.5</b>	<b>226.7</b>	<b>279.0</b>	<b>244.9</b>	<b>154.7</b>	<b>140.2</b>	<b>431.9</b>

<sup>1</sup>

H = High  
M = Medium  
L = Low

<sup>2</sup>

An additional 6.4 M acres previously withdrawn in the South Warner Wilderness will become a Research Natural Area..

<sup>3</sup>

Includes acres withdrawn in the Medicine Lake Recreation Area.

<sup>4</sup>

Acres that may have mitigating measures applied to approved plans of operation.

<sup>5</sup>

Lands managed under the following prescriptions:

Semi-Primitive Non-Motorized  
Developed Recreation (Standard)  
Visual Retention  
Raptor Management  
Timber-Visuals  
Riparian Area

### IND and RBU Alternatives

Under IND and RBU, constrained acres of high and medium mineral potential decrease because no acres are managed under the Semi-Primitive Non-Motorized prescription. The greatest change from existing constraints (1982) is the number of acres managed under the Timber-Visuals and Visual Retention prescriptions. All other constraints are constant.

### AMN Alternative

Under this alternative, more land with high, medium, low, or unknown mineral potential is constrained. More acres are constrained because the Semi-Primitive Non-Motorized and Visual Retention prescriptions are applied to more land.

### Leasable Minerals

Leasable mineral activities are affected by withdrawing lands from leasing, or imposing surface occupancy

restriction, or both (Table 4-11). Restrictions may be no surface occupancy (NSO), conditional surface occupancy (CSO), or resource notices (RN). Management prescriptions identify which restrictions may be included in mineral leases.

Management prescriptions having the greatest effect on leasable minerals are:

- Special Areas
- Developed Recreation (standard and low standard)
- Semi-primitive Non-motorized Dispersed Recreation
- Visual Retention
- Raptor Management
- Timber-Visuals
- Riparian Area

Table 4-11. Constrained Acres of Leasable Minerals by Alternative.								
Mineral Potential Rating	SO <sup>1</sup>	Existing 1982	M Acres					
			PRF	CUR	RPD	IND	RBU	AMN
High	NSO <sup>2</sup>	22.9	22.9	22.9	22.9	22.9	22.9	22.9
	CSO <sup>3</sup>	25.2	12.6	25.38	14.9	89.8	11.1	30.0
Medium	NSO	2.38	2.38	2.38	2.38	2.38	2.38	2.38
	CSO	2.9	3.1	2.9	8.5	5.4	2.8	8.9
Unknown/Low	NSO	123.9	123.9	123.9	123.9	123.9	123.9	123.9
	CSO	120.9	80.9	120.9	91.5	61.9	44.3	132.0
Total		298.5	246.1	299.0	264.4	306.6	207.38	320.4
<p>1 S.O. = Surface Occupancy</p> <p>2 N.S.O. = No Surface Occupancy</p> <p>3 C.S.O. = Conditional Surface Occupancy</p>								

### Special Areas

Under this prescription, Special Interest Areas (SIAs) require a NSO restriction.

### Developed Recreation

Under this prescription, a NSO restriction is imposed for identified recreation sites.

### Semi-Primitive Non-Motorized

This prescription may require a CSO restriction on mineral lease activities. Leasees would be required to demonstrate that proposed activities would not be incompatible with the theme of the prescription.

### Visual Retention

This prescription emphasizes protecting the visual quality of areas to which it is applied. A CSO restriction may be applied to mineral leases. Leasees may request a waiver of this stipulation if they can demonstrate that their proposed activities do not conflict with the theme of the prescription.

### Raptor Management

This prescription provides protection in areas adjoining habitats of species described in the Endangered Species Act of 1973, as amended. The prescription requires a NSO stipulation. In addition, this prescription protects sensitive wildlife species by imposing a CSO stipulation.

### Riparian Area

This prescription protects surface waters. CSO stipulations are applied to these areas.

### All Alternatives

Under all alternatives, mineral leasing is denied within the South Warner Wilderness; it is also temporarily denied in areas of proposed land exchanges. The South Warner Wilderness has a low potential for mineral leasing. The number and location of acres temporarily withdrawn as a result of proposed land exchanges will not significantly affect mineral development.

The number of acres subject to NSO stipulations remains constant throughout all alternatives. The Raptor Management, Special Areas, and Riparian Area prescriptions impose NSO stipulations, as do withdrawals.

The difference in consequences among alternatives and the existing allocations is the number of acres allocated to the Semi-Primitive Non-Motorized, Visual Retention, and Timber-Visuals prescriptions.

## 12. Pests

Indicators of pest-related damage include tree mortality, reduced growth, inferior wood quality, and fewer seeds. Damage can result in understocking, failure or delay in regeneration, reduced site utilization and productivity, degraded recreation sites, and undesirable changes in the vegetation.

Resource activities expected to have major effects on pests are:

- intensity level of vegetation management.
- reforestation (regeneration harvest)
- timber stand improvement (including intermediate harvest)

Vegetation management provides the best opportunities to prevent or reduce the amount and impact of pest-related damage, although direct actions against pests may be necessary in specific situations. Forest management practices such as timber stand improvement and reforestation maintain the health and vigor of timber stands at a higher level than under natural conditions. Controlling stocking level, species composition, and removing stressed trees (where they exceed snag standards) reduce insect and disease damage.

The intensity of vegetation management reflects opportunities to prevent and reduce damage. With greater opportunity to manage vegetation, less damage is anticipated because pest considerations are integrated in the vegetation project plans. For example, areas managed intensively for timber have the greatest opportunity and need to reduce and prevent pest losses. Where the condition of the vegetation is important, as in developed recreation sites, opportunities are present for pest management, even though timber production is not the primary goal. On the other hand, the Wilderness has limited opportunities that occur only when pests threaten resources on surrounding lands. Areas managed for less than full timber production have moderate pest management opportunities.

Regeneration harvest removes stands which are particularly susceptible to, or currently experiencing, high levels of pest damage. Stands heavily infested with dwarf mistetoe or succumbing to bark beetles, root disease or other pest complexes receive high priority.

Although regeneration often creates the need to control competing vegetation and gophers, it also creates timber stand improvement opportunities to maintain insect and disease damage at acceptable levels through-

out the rotation of the stand. Intermediate harvests prevent pest damage through removal of stressed trees to reduce tree stocking to biologically appropriate levels.

Under all alternatives, the Forest cooperates with appropriate federal, state, and local agencies in monitoring, reporting and controlling bubonic plague problems associated with rodents and livestock losses from predators.

## Consequences

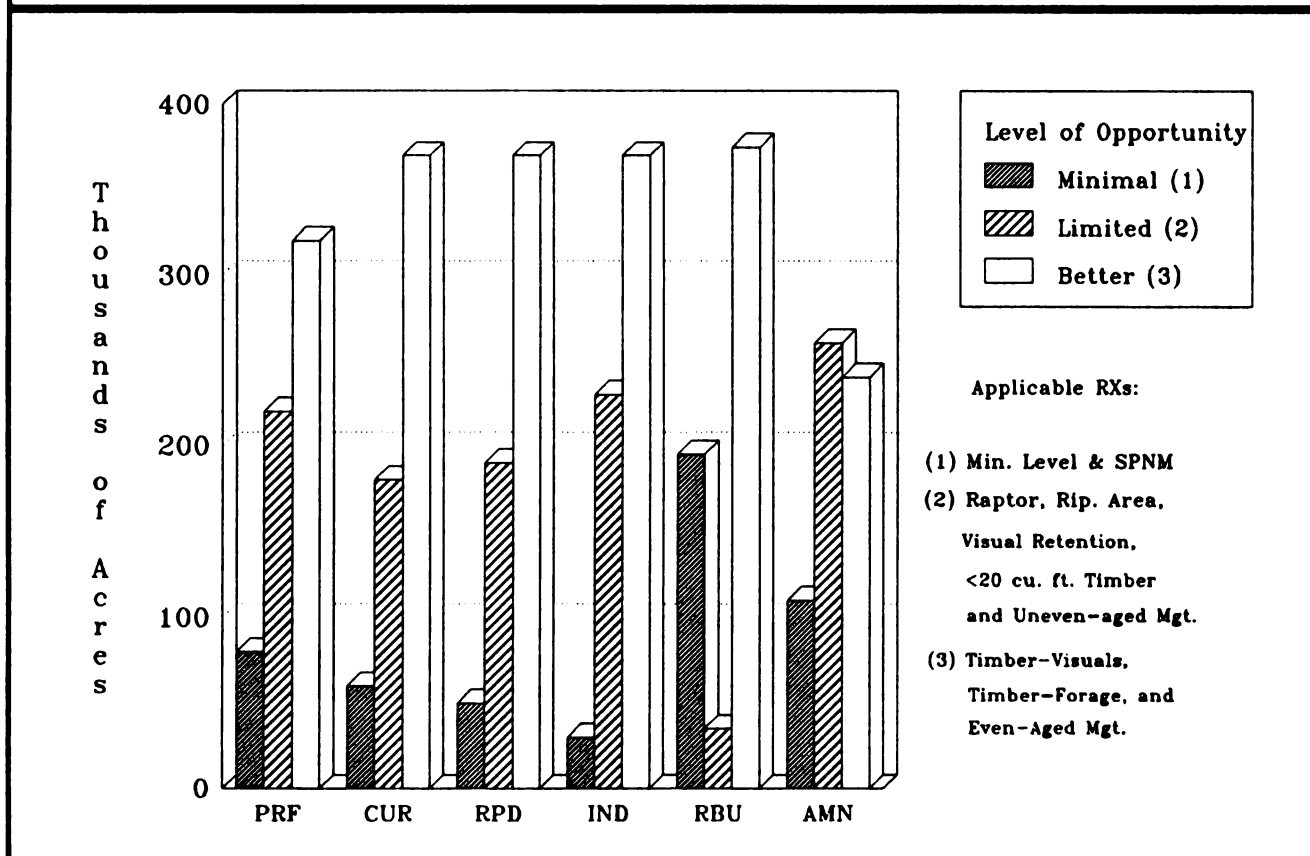
The integrated pest management (IPM) approach is applied under all alternatives, allowing the use of strategies most appropriate to the situation. If resource damage interferes with management objectives, the options available to reduce the damage are evaluated. Biological

effectiveness, environmental safety, economic effectiveness, and compatibility with other resource concerns are considered when selecting a pest management option.

The intensity of pest management varies with the objectives of each alternative. As a result, the Forest sustains various levels of damage from pests depending on the alternative. The likelihood of pest-related damage depends on climate and environment as well as prevention and mitigating measures.

Reforestation and timber stand improvement for alternatives are shown in Table 2-11. The intensity of vegetation management for each alternative is shown in Figure 4-13. Each management prescription was analyzed to determine the intensity of vegetation management expected.

**Figure 4-13. Opportunity for Pest Management by Alternative**



### PRF and CUR Alternatives

When limited and better opportunities (Figure 4-13) are combined, tree mortality and growth loss are more prevalent under PRF and CUR than under RPD and IND, because the opportunity to manage vegetation is reduced under these alternatives. The relative opportunity to prevent or reduce pest-related damage is similar in both alternatives, but better under PRF.

### IND and RPD Alternatives

These alternatives offer the best opportunity to manage vegetation and implement pest prevention practices with the lowest tree mortality and growth loss. In areas intensively managed, pest-caused mortality and growth loss declines from present levels. The need to manage regeneration pests (mainly gophers, grass, brush, and certain regeneration insects) is high. During stress periods, such as drought, the chance of large-scale pest-caused damage is reduced. Vegetation management in developed recreation areas improves vegetation vigor, decreases tree mortality, and reduces hazard trees. Areas with low levels of vegetation management and pest prevention practices experience tree mortality and growth loss at or above current levels, with an increased chance of large-scale losses. Generally, stands near or exceeding biological stocking levels on high stress sites experience high mortality. Stands on low stress sites, or stands which are sparse or poorly stocked, experience less mortality.

### AMN and RBU Alternatives

These alternatives have the potential for the greatest timber losses to pests. Limited vegetation management results in higher tree mortality and more growth loss than presently occurs. In addition, there are more frequent and higher levels of large-scale losses during periods of stress. AMN alternative provides the better opportunity for pest management, and in some respects is similar to PRF alternative.

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## 13. Range

Environmental consequences to rangelands are based on applying range vegetation management principles, and range condition and trend data as provided by various studies on Forest allotments, and from grazing history. Consequences for livestock grazing use are quantified by the potential animal unit months (AUMs) of forage available for use each year that are produced from various management practices. Other effects are

described in terms of expected changes in range ecologic condition.

Major impacts on rangeland vegetation and its use are:

- Forage available to deer and wild horses
- Timber harvest level and Timber Management Prescription
- Nonstructural and structural range improvements
- Riparian area management
- Bighorn sheep management
- Wild horse management
- Wilderness management

### Forage Available to Deer and Wild Horses

Forage available for livestock, wild horses and wildlife is a key issue on this Forest. Cattle and sheep permittees rely on forage from the Forest to seasonally graze livestock, while many Forest users are interested in maintaining or increasing deer numbers. In addition, the Forest maintains a herd of about 305 wild horses.

To address this issue, forage requirements for deer and wild horses were converted to a common, measurable unit – the AUM – to predict demand from the finite capability of various vegetation and soil productivity types (Appendix L). AUMs available for wild horses remains at 4,400 under all alternatives, while forage available for deer and livestock varies by alternative. Forage available for deer use is consistent with deer herd plans.

### Timber Sale Quantity and Timber Management Prescription

Timber harvest opens forested areas, producing palatable forage readily used by livestock and wildlife. As the Forest canopy closes, forage yield, nutrient value, and palatability are reduced.

Currently, open-canopy, forage-producing timber stands comprise two-thirds of the timberlands. In the future, these poorly stocked stands now providing 100-200 pounds of forage per acre will be clearcut and planted to well-stocked stands. The rate at which this change is made depends on the allowable sale quantity in each alternative.

In addition, site preparation prior to tree planting and herbicide release treatments reduces the amount of palatable shrubs, forbs and grasses. The amount of land harvested under the Even-Aged Timber Management Prescription or the Timber Management with Forage

Production (Timber-Forage) Prescription affects forage production. While timber stands are managed to produce full timber yields under the Even-Aged Timber Prescription, forage is an incidental output. Under the Timber-Forage Prescription, both sawtimber and forage production are emphasized.

## Nonstructural and Structural Range Improvements

Forage production on permanent rangelands improves over time as ecologic condition improves. Allotment management plans outline tools for accomplishing vegetation management objectives which can improve ranges in unsatisfactory ecologic condition. Structural improvements (e.g., fences and water developments) improve livestock distribution, promote uniform forage utilization, and are key factors in grazing strategies which enhance preferred forage species.

Nonstructural range improvements alter existing vegetation to increase palatable forage produced on the site. Nonstructural improvements include prescribed fire, herbicide application, and mechanical treatments which rejuvenate some species of decadent brush and reduce competition by juniper. Type conversions or seeding projects on more productive sites can also yield abundant forage.

## Riparian Area Management

When properly managed, riparian areas are among the most productive range sites on the Forest. Most riparian areas have been affected to some extent by improper management practices. Proper management tools for these areas include (1) installation of structural improvements, such as fences, to create pasture systems or protect sensitive areas; and (2) adjustments in timing and duration of livestock use. Riparian areas generally respond quickly to improved management. As ecologic condition improves, forage production will increase.

## Bighorn Sheep Management

Suitable habitat for about 400 bighorn sheep exists throughout the Warner Mountain Ranger District, especially within the South Warner Wilderness. To sustain a viable population of bighorn sheep and to prevent introduction of disease from domestic livestock, adjustments in livestock use of the area are required.

## Wild Horse Management

With the passage of the Wild Horses and Burros Protection Act, the Forest provides habitat for 275-335 wild horses (an average of 305 horses). The amount of forage available to wild horses removes forage available for livestock use.

## Wilderness Management

The South Warner Wilderness was grazed by livestock long before it was classified as a primitive area (1931) and later as a wilderness (1964). However, as recreational use continues to increase, users argue that grazing detracts from their recreation experiences. When visitors use popular camping areas, trails, and riparian areas above practical capacity (see Chapter 3, Section 14), complaints and public pressure to reduce or eliminate grazing increases.

An objective of wilderness management is to preserve the wilderness character while accommodating livestock grazing. Consequently, using structural range improvements to manage livestock grazing in the Wilderness is difficult. While structures such as fences and water troughs improve livestock management, they leave a noticeable human imprint on the landscape.

## Consequences

Table 4-12 displays forage production and estimated forage available for each class of grazing animal; allowable sale quantity; and the amount of timberland harvested under the Timber-Forage Prescription.

**Table 4-12. Range Environmental Consequences.**

	Base Year 1982	Decade	PRF	CUR	RPD	IND	RBU	AMN
Forage Production (M AUMs)		Average Annual Values						
Permanent Range	92.4 <sup>1</sup>	1	108.9	110.3	110.3	110.3	100.9	102.9
		5	117.4	117.9	118.1	117.9	108.4	110.0
Transitory Range (including < 20 lands)	56.6	1	49.9	40.3	47.3	53.7	40.5	45.5
		5	21.2	13.0	29.5	17.8	16.6	20.5
Nonstructural (livestock) Improvements	0.0	1	11.8	13.5	21.4	14.5	10.9	13.0
		5	10.2	5.8	34.5	12.3	2.8	11.2
Nonstructural (deer) Improvements	0.0	1	0.5	0.0	0.0	0.0	0.0	0.0
		5	0.5	0.0	0.7	0.0	0.0	0.0
Total	149.0	1	171.1	164.1	179.0	178.5	152.3	161.4
		5	149.3	136.7	182.8	148.0	127.8	141.7
Forage Availability (M AUMs)								
Livestock	122.5	1	118.8	120.0	122.5	138.4	100.0	97.3
		5	94.2	91.7	123.7	87.4	70.5	80.7
Deer	22.1 <sup>2</sup>	1	47.9	39.7	52.1	35.7	47.9	59.7
		5	50.7	40.6	54.7	56.2	52.9	56.6
Wild Horses	4.4	1	4.4	4.4	4.4	4.4	4.4	4.4
		5	4.4	4.4	4.4	4.4	4.4	4.4
Total	149.0	1	171.1	164.1	179.0	178.5	152.3	161.4
		5	149.3	136.7	182.8	148.0	127.8	141.7
Timber Sale Quantity (MMBF)	50.4	1	45.5	51.4	74.6	60.1	36.9	31.8
		5	46.8	53.8	58.7	60.1	40.9	40.2
Timber-Forage Prescription (% of Total Acres harvested under Even-aged Mgt.)	0.0	1	43	9	50	6	94	0
<sup>1</sup> includes nonstructural improvements								
<sup>2</sup> meets 67% of base year forage needs								



## All Alternatives

Forest Standards and Guidelines require maintaining or enhancing satisfactory ecological condition. Unsatisfactory ecologic condition improves under all alternatives. Rangelands in unsatisfactory condition are treated by implementing improved grazing strategies, using structural and nonstructural range improvements, and adjusting timing and duration of livestock use.

All alternatives meet current deer herd needs (Appendix L); and the alternatives meet deer herd goals at varying levels. Although structural and nonstructural improvements are implemented, combined forage needs for existing permitted livestock use and deer are insufficient.

Riparian-dependent resources (water, fish, vegetation, and wildlife) are favored where uses conflict. Riparian area condition improves under all alternatives; but timing varies between alternatives.

Under all alternatives 4,400 AUMs are allocated to wild horses.

Management under the Timber-Forage Prescription does not preclude eventual loss of transitory forage. Although more forage is produced than under the Even-Aged Timber Prescription, gradual replacement of open-canopied stands with well-stocked stands under either prescription steadily reduces the existing forage supply.

### PRF Alternative

Permanent range forage increases 18% through implementation of improved grazing strategies. As livestock distribution and forage utilization are better managed, both ecologic condition and forage production improve on rangelands. Forage production is increased through 6,800 acres of nonstructural range improvements and maintenance of 22,000 acres of existing seedings. Seventeen allotments receive added riparian area management.

Transitory forage decreases in the 1st decade by 11% and continues to decrease through the 5th decade as forage-producing, poorly-stocked timber stands are harvested and reforested.

Overall forage production increases by 15% in the 1st decade as AUMs increase to 171,100 AUMs. By the 5th decade, more forage is produced than in the base year. However, the amount is less than the 1st decade production because transitory forage decreases.

In the 1st decade, the Timber-Forage Prescription is applied to about 43% of the acres harvested under even-

aged management. The allowable sale quantity is 52 MMBF.

Forage available to livestock decreases by about 45.5 AUMs during the 1st decade. Forage available to deer doubles from that available in the base year, thus reducing forage available to livestock. By the 5th decade, forage available to livestock decreases 21% from the 1st decade, as transitory forage decreases and deer forage availability increases.

### CUR Alternative

Permanent range forage increases 19%. As improved grazing strategies are implemented and livestock distribution and forage utilization are better managed, both ecologic condition and forage production improve on rangelands. Forage production is increased through 2,500 acres of nonstructural range improvements and maintenance of 6,000 acres of existing seedings. Seventeen allotments receive added riparian area management.

Transitory forage decreases in the 1st decade by 29% and continues to decrease through the 5th decade as forage-producing, poorly-stocked timber stands are harvested and reforested.

Overall forage production increases by 10% in the 1st decade as AUMs increase to about 164,100 AUMs. By the 5th decade, total production decreases 17% from the 1st decade due to loss of transitory range.

In the 1st decade, the Timber-Forage Prescription is applied to only 9% of the acres harvested under even-aged management. Transitory forage decreases by 68% in the 5th decade. Livestock grazing remains the same as the base year in the 1st decade. In the 1st decade, forage available to deer increases 80% above the base year, thus reducing forage allocated to livestock, especially beyond the 1st decade. By the 5th decade livestock grazing decreases about 24% from the 1st decade as transitory forage declines and deer forage availability increases.

### RPD Alternative

Permanent range forage increases 19%. As improved grazing strategies are implemented and livestock distribution and forage utilization are better managed, both ecological condition and forage production improve. Forage production for livestock grazing is increased through heavy investments in non-structural improvements through the 3rd decade. Over 191,400 acres of nonstructural range improvements, maintenance of 29,350 acres of existing seedings, and type-conversion on 2,700 acres occur in the first three decades.

Transitory forage decreases in the 1st decade by 16% and continues to decrease through the 5th decade, as forage-producing, poorly-stocked timber stands are harvested and reforested.

Overall forage production increases by 20% in the 1st decade as AUMs increase to 179,000 AUMs. Forage production is sustained through the 5th decade with production rising to 182,800 AUMs.

In the 1st decade, the Timber-Forage Prescription is applied to about 50% of the acres harvested under even-aged. The allowable sale quantity is 75 MMBF.

Livestock grazing meets base year obligations in the 1st decade. By the 5th decade, livestock grazing increases slightly ( $< 1\%$ ) from the 1st decade to provide forage just above the base year level. Nonstructural range improvements provide the additional forage. Forage available to deer more than doubles from that available in the base year.

#### IND Alternative

Permanent range forage increases 19% in the 1st decade and continues increasing through the 5th decade. As improved grazing strategies are implemented and livestock distribution and forage utilization are better managed, both ecological condition and forage production improve. Forage production for livestock grazing is increased through non-structural improvements primarily in the 1st decade. Over 3,000 acres of nonstructural range improvements, maintenance of 28,400 acres of existing seedings, and type-conversion on 2,400 acres occur in the first three decades.

Transitory forage decreases in the 1st decade by 5% and continues to decrease through the 5th decade, as forage-producing, poorly-stocked timber stands are harvested and reforested.

Overall forage production increases by 20% in the 1st decade as AUMs increase to about 171,000 AUMs. Forage production decreases by the 5th decade to about 148,300 AUMs because transitory forage decreases.

In the 1st decade, the Timber-Forage Prescription is applied to only 6% of the acres harvested under even-aged management. Consequently, transitory forage decreases by 69% in the 5th decade. Livestock grazing increases to 138,400 AUMs (12%) in the 1st decade. By the 5th decade, however, livestock grazing decreases about 37% from the 1st decade, as transitory forage declines and more forage is available to deer. Forage available to deer increases by 39% in the 1st decade, but increases 61% from the base year by the 5th decade.

#### RBU Alternative

Permanent range forage increases 9%. As improved grazing strategies are implemented and livestock distribution and forage utilization are better managed, both ecological condition and forage production improve. Nonstructural range improvements for increasing forage production are not done.

Transitory forage decreases in the 1st decade by 28% and continues to decrease through the 5th decade as forage-producing, poorly-stocked timber stands are harvested and reforested.

Overall forage production in the 1st decade remains about the same as base year. By the 5th decade, forage production declines by 16% from loss in transitory forage.

In the 1st decade, the Timber-Forage Prescription is applied to about 94% of the acres harvested under even-aged management. The allowable sale quantity is 37 MMBF.

Livestock grazing decreases by about 22,500 AUMs (18%) during the 1st decade. By the 5th decade livestock grazing decreases 30% from the 1st decade, as transitory forage declines, and as deer are assigned more of the available forage.

#### AMN Alternative

Permanent range forage increases 11%. As improved grazing strategies are implemented and livestock distribution and forage utilization are better managed, both ecological condition and forage production improve. Forage production in seedings is maintained on 29,300 acres. Thirty-one allotments receive added riparian area management.

Transitory forage decreases in the 1st decade by 20% and continues to decrease through the 5th decade as forage-producing, poorly-stocked timber stands are harvested and reforested.

Overall forage production increases by 8% in the 1st decade as AUMs increase to 161,400 AUMs. By the 5th decade, less forage is produced because of declining transitory forage.

In the 1st decade, all regeneration harvest is managed under the Timber-Forage Prescription.

Livestock grazing decreases by 25,200 AUMs (21%) during the 1st decade. By the 5th decade livestock grazing decreases by 16,600 AUMs from the 1st decade. As under other alternatives, transitory forage decreases and deer forage allocation increases. Moreover, livestock grazing in the Wilderness is eliminated because allot-

ments are closed to livestock in order to establish viable bighorn sheep populations.

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## 14. Recreation

This discussion is based on (1) principles of outdoor recreation management established by the Forest Service and (2) application of the Recreation Opportunity Spectrum (ROS) system (Appendix K in the Forest Plan).

Effects on the recreation environment include the amount, types, and quality of recreation activities provided in each alternative. Consequences for recreation are expressed as changes in visitor use and opportunities. Visitor use is measured by recreation visitor days (RVDs), and the quality of the recreation experience as defined by management levels for developed and general forest recreation. ROS class acres, persons-at-one-time (PAOT) capacities, and miles of trail are indicators of recreation opportunities.

Activities which have a major impact on recreation are:

- Developed Site Management
- Dispersed Area Management
- Visual Resource Management
- Timber Management
- Minerals, Geothermal, and Utilities Management
- Range Management
- Road System/OHV Management
- Wildlife Management

### Developed Site Management

The intensity of developed site management directly affects the quality of the developed recreation experience. Sites operated under **standard management** provide all services and facilities normally expected for the type and development scale of the site, resulting in a high quality recreation experience. The backlog of facilities needing rehabilitation is corrected during the 1st decade, and additional facilities are constructed when annual use exceeds capacity. Visitor information and interpretive programs are emphasized. Sites are managed to maintain long-term values and to ensure that the vegetation remains healthy.

Sites operated under **low standard management** are maintained and operated to at least minimum requirements. Visitors often provide their own supplies and perform routine cleanup. Sites or units within sites may be closed to reduce costs. Visitor information services meet basic visitor needs. Additional facilities are not constructed, and some RVDs are irretrievably lost when visitor use exceeds site capacity. Services are reduced from standard levels, and the quality of the recreation experience may not be acceptable to some visitors. Sites are not managed for long-term values and show signs of decline. Vegetation becomes increasingly vulnerable to disease and insects.

Heavily used sites may show signs of rapid deterioration. Site closure may be necessary to restore site values.

### Dispersed Area Management

Dispersed areas are managed at a standard or low standard level. Those areas managed under the standard level provide on-the-ground administration, visitor information services, facilities, maintenance and high-quality recreation opportunities. Trails and minimal user facilities are constructed to support the ROS class experience and provide new opportunities. At popular locations, measures are taken to maintain long-term values of the site. Off-highway vehicle use is actively managed.

When areas are managed at the low standard level, convenience facilities are reduced, not maintained or not provided. Long-term recreation experience is reduced; moreover, the possibility of damage to recreation and other Forest resources increases.

### Visual Resource Management

Visual resource management influences land-disturbing activities so that the areas in which they occur appear more natural. High-quality recreation experiences are usually dependent on a natural setting and, therefore, on effective visual resource management. A low visual resource management program shifts the forest setting toward the urban end of the ROS scale, as timber management, roads, utilities, and other activities impact the scenery.

### Timber Management

Timber harvest activities and associated road construction affect the quality of recreation opportunities by altering the visual landscape and through physical changes in the recreation setting (i.e., ROS category).

Generally, as lands are managed more intensively for timber production, acreages correspondingly shift from semi-primitive non-motorized ROS categories to semi-primitive motorized and roaded natural ROS categories. Historically, the road system has dissected the Forest foot and horse trail network. Timber harvest activities may impact popular dispersed recreation sites.

## Minerals, Geothermal, and Utilities Management

These activities create long-term impacts through vegetation removal, ground disturbance, road construction, or unnatural-appearing structures. Although few acres may be involved, these activities often dominate the general area. Negative effects of some point impacts, such as microwave repeaters and open pit mining, can be mitigated through design. However, effects of major utility corridors are difficult or impossible to mitigate after the corridor is selected.

## Range Management

Structural improvements and grazing shift the ROS setting from the primitive toward the rural class. Many recreationists are offended by the presence of domestic livestock within the Wilderness and developed recreation sites, while others may regard cattle as a pleasant reminder of the Old West. Recreationists are more tolerant of encounters with livestock elsewhere in the Forest. Proper grazing management can reduce these conflicts.

## Road System Management

Surfaced roads are a major investment which conveniently access recreation opportunities. Developed recreation areas benefit greatly from this type of access, because road improvements and high value sites increase demand. Precipitation on unsurfaced roads may render them unuseable. Wet, muddy, or dusty roads discourage use of remote areas, and may affect water and air quality. Road improvement shifts the character of the Forest toward the urban ROS setting. Road management is emphasized under all alternatives; however, road standard vary in each alternative.

Abundant primitive roads offer unique opportunities for summer and winter OHV use. They disperse use, and consequently maintain a semi-primitive social setting. Road management and OHV restrictions respond to designated ROS class and limitations imposed by other resource needs.

## Wildlife Management

Some recreationists are avid hunters, anglers, and wildlife observers. Resource protection and habitat improvement projects increase the success of these activities and enhance the recreation experience. Although hunting changes by alternative, fishing and non-consumptive use change very little. As fish production increases, so does recreation use; consequently, more fish are caught. Wetlands and improved habitat offer opportunities to view wildlife.

## Assumptions

Recreation demand is determined primarily by factors external to the Forest. Therefore, recreation use is relatively constant across all alternatives. Although recreation use may be similar in most alternatives, the opportunities and the quality of the recreation experience can vary greatly.

Quality recreation experiences can increase demand. If unique, high-quality recreation experiences are available, the demand for them increases faster than general recreation demand. As forests close to urban populations approach capacity, visitors seeking solitude and few regulations travel greater distances to achieve them. This can accelerate demand for more primitive recreation experiences on this Forest. While remoteness of forests was not considered in demand projections, it is relevant.

If gasoline costs substantially increase, demand on this Forest may decrease because closer opportunities are usually available.

Special land uses, such as utility lines and geothermal development have major impacts on recreation opportunities and quality. These are externally initiated activities for which consequences cannot always be predicted or estimated. Resource program levels indicate which activities are permitted and the extent to which negative impacts are mitigated.

Roads built for timber activities become system roads and are available for public use. Access primarily affects dispersed recreation. Road management has a significant impact on all recreation opportunities.

Outputs from Table 2-11 and resource program direction in chapter 2 show differences between alternatives and can be referenced for understanding environmental consequences.

### PRF and CUR Alternatives

**Developed:** Under standard management, campgrounds are maintained in good condition and provide a quality experience for most recreationists. Popular sites are rehabilitated to replace worn out facilities, and make improvements. Demand is met by expanding existing overused facilities or by developing popular dispersed sites that require protection. Therefore, crowded conditions are minimized. Services improve over the present situation. Programs, displays, and publications are available for public education and enjoyment.

The scenic backdrop of all major developed recreation sites and their access roads are managed to prevent views of unnatural appearing impacts. Some changes may be noticeable, but appear natural.

**Dispersed:** Standard management improves opportunities for recreation, but intensive timber management degrades the natural Forest setting in many locations. About 131 miles of new trails are constructed in the first five decades, while 118 miles of existing trails are maintained, for a total system of 249 miles. About 122 miles of trails under PRF and 15 miles under CUR are reconstructed in decades 1 through 5. Trail conditions improve as a result of reduced grazing.

Popular dispersed sites show signs of overuse; some may be developed, rehabilitated, or closed to reduce additional damage by vehicles and people. Roads constructed for timber harvest and other activities access many new areas for motorized recreation activities. Popular dispersed sites are protected or enhanced during timber harvest activities under PRF, while under CUR these sites are not protected.

Eighty-seven percent of the Forest remains open to OHVs. Conflicts are likely to decrease between livestock and recreationists in both alternatives because fewer livestock graze over time. The potential for conflict is greater under CUR because it provides more AUMs than PRF. Wetlands development and improved habitat create more opportunities to view wildlife.

About 78,000 acres are dedicated to semi-primitive non motorized uses outside the Wilderness. The number of unroaded areas decreases gradually as a result of continued timber harvest and associated road construction. Demand for SPNM opportunities are met in the year 2030. A moderate level of visual resource protection (590,200 acres) maintains a natural appearance along major roads, secondary roads, and in scenic areas. Most other timbered areas are eventually harvested and lose their natural appearance. Arterial and major collector roads are surfaced to provide all-weather access for recreation use.

### RPD Alternative

**Developed:** Under standard management, campgrounds are maintained in good condition and provide a quality experience for most recreationists. Popular sites are rehabilitated to replace worn out facilities, and make improvements. Demand is met by expanding existing overused facilities or by developing popular dispersed sites that require protection. Therefore, crowded conditions are minimized. Services improve over the present situation. Programs, displays, and publications are available for public education and enjoyment.

The scenic backdrop of all major developed recreation sites and their access roads are managed to prevent views of unnatural appearing impacts. Some changes may be noticeable, but appear natural.

**Dispersed:** Standard management improves opportunities for recreation, but intensive timber management rapidly degrades the natural Forest setting in many locations. About 131 miles of new trails are constructed in the first five decades, while 118 miles of existing trails are maintained, for a total system of 249 miles. Fifteen miles of trails are reconstructed in the 1st decade.

Popular dispersed sites show signs of overuse; some may be developed, rehabilitated, or closed to reduce additional damage by vehicles and people. Roads constructed for timber harvest and other activities access many new areas for motorized recreation activities. Timber harvest adversely affects many lightly used sites because no protection is assigned. Eighty-seven percent of the Forest remains open to OHVs.

About 78,000 acres outside the Wilderness are dedicated to semi-primitive non-motorized uses. The number of unroaded areas decreases quickly in this alternative because timber harvesting and associated road construction are emphasized during the 1st decade. Demand for SPNM opportunities are met in the year 2030. A moderate level of visual resource protection (590,200 acres) maintains a natural appearance along major roads, secondary roads, and in scenic areas. Most other timbered areas are eventually harvested and lose their natural appearance. Arterial and major collector roads are surfaced to provide all-weather access for recreation use.

### IND Alternative

**Developed:** Same as RPD alternative.

**Dispersed:** Standard management improves opportunities for recreation, but intensive timber management generally degrades the Forest setting. About 82 miles of new trails are constructed in decades 1 through 3, while 118 miles of existing trails are maintained, for a total

system of 200 miles. About 105 miles of trails are reconstructed in decades 1 through 5.

Popular dispersed sites show signs of overuse and some may be developed, rehabilitated, or closed to reduce additional damage by vehicles and people. Roads constructed for timber harvest and other activities create access to many new areas for motorized recreation activities. Timber harvest adversely affect many lightly used sites because no protection is assigned. Over 90% of the Forest remains open for OHVs. Higher range AUMs potentially create more conflicts between livestock and recreationists.

Unroaded areas gradually decrease as a result of continued timber harvest and associated road construction. Demand for SPNM opportunities are not met in the year 2030, because only 13,500 acres are managed for SPNM outside the Wilderness. Those seeking solitude in a primitive setting find it in the Wilderness or outside the Forest. A low level of visual resource protection (412,400 acres) and an emphasis on timber harvest cause a gradual decline in the Forest's appearance away from major roads. Generally, roads are of a higher standard to accommodate increased log hauling and recreation traffic.

#### **RBU Alternative**

**Developed:** Under low standard management, campgrounds deteriorate, resulting in closures as early as the 2nd decade. Demand is not met because no new construction occurs. Major sites remaining open are crowded. Crowded conditions and worn out facilities reduce the quality of experience for most users. Some recreationists leave the Forest to find opportunities elsewhere. Those that remain are self-sufficient by necessity, providing their own water and supplies, similar to dispersed campers. Larger campgrounds operated at a profit by the private sector fare well. Volunteers improve the sites and prevent closures. Very few programs, displays, and publications are available for public education and enjoyment.

The scenic backdrop of most developed recreation sites and their access roads are partially managed to prevent views of unnatural appearing impacts. Some disturbances are noticeable, but the scenery does not rapidly decline.

**Dispersed:** Under low standard management, recreation opportunities are reduced. Most trails outside the Wilderness are abandoned; the remainder are infrequently maintained. However trails are subject to less damage because of reduced grazing. Forty-five miles of trails are reconstructed in the 1st and 2nd decades.

Popular dispersed sites show signs of overuse and some may be closed to prevent additional damage by vehicles and people. Roads constructed for timber harvest and other activities create access to new areas for motorized recreation activities, particularly hunting. However, some roads may be rough or closed to reduce maintenance. Timber harvest degrades some lightly used dispersed sites because no protection is assigned. Over 90% of the Forest remains open for OHV use.

Unroaded areas gradually decrease as a result of continued timber harvest and associated road construction. Demand for SPNM opportunities are not met in the year 2030, because only 13,500 acres are managed for SPNM outside the Wilderness. Those seeking solitude in a primitive setting find it in the Wilderness or outside the Forest. A low level of visual resource protection (412,400 acres) causes a gradual decline in the Forest's appearance away from major roads. Road standards and level of service are reduced.

#### **AMN Alternative**

**Developed:** Under standard management, campgrounds are maintained in good condition, and provide a high-quality experience for most recreationists. Popular sites are improved or rehabilitated to replace worn out facilities. Demand is met by expanding overused facilities and by developing popular dispersed sites. Consequently, crowded conditions are minimized and new opportunities offered. Services improve over the present situation. The interpretive program is emphasized: programs, displays, and publications are available for public education and enjoyment. Entrance stations and visitor information facilities are constructed to increase visitor awareness of the many opportunities available.

The scenic backdrop of all developed recreation sites and their access roads are managed to optimize the natural forest setting. Timber harvest is used as a tool to enhance recreation values. Large trees dominate the foreground view.

**Dispersed:** Standard management improves recreation, and emphasizes managing the Forest for primitive (in the Wilderness) and semi-primitive opportunities. Trail condition improves as a result of reduced grazing. About 375 miles of new trails are constructed in the 1st through 5th decades, while 118 miles of existing trails are maintained, for a total system of 493 miles. About 180 miles of trails are reconstructed over the same period. These trails provide many kinds of experiences and accommodate all types of users.

Popular dispersed sites are managed to prevent overuse and maintain long-term values. Roads constructed for timber harvest and other activities access new areas

for motorized recreation activities. Popular dispersed sites are protected or enhanced during timber harvest activities. Seventy percent of the Forest remains open to OHVs; and to compensate for some loss of access, 125 miles of OHV trails are provided.

About 198,000 acres outside the Wilderness are dedicated to semi-primitive non-motorized uses. The number of unroaded areas slowly decrease as a result of timber harvest and associated road construction. Livestock grazing reduces opportunities for a primitive experience. Demand for SPNM opportunities is easily met in the year 2030. Managing for SPNM creates expectations inconsistent with grazing. Consequently, the more SPNM areas, the greater the potential for conflicts between livestock and recreationists.

A high level of visual resource protection (1,006,200 acres) maintains a natural appearance along major roads, secondary roads, and in scenic areas. Only isolated, seldom seen timbered areas are eventually harvested and lose their natural appearance. All-weather arterial, collector, and selected local roads provide higher standard access for motorized recreation use.

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## 15. Research Natural Areas (RNA)

Recommendations for RNAs are based on the compatibility with the theme of each alternative. All alternatives protect the Devil's Garden 800-acre RNA. It is managed in a natural condition under provisions of its existing establishment report. Most development activities are prohibited: timber management, grazing, road building, concentrated recreation, and mineral exploration and development.

Because the area is not fenced, unauthorized grazing could damage the Devil's Garden RNA. However, grazing by cattle, wild horses, deer and pronghorn is naturally limited by water shortage and rimrock on the eastern border which virtually prevents access from that side.

Firewood activities could threaten the integrity of the RNA. A dramatic increase in demand for juniper firewood could result in unauthorized firewood cutting and disturbance of natural conditions. However, the natural terrain which limits wildlife and livestock grazing also prevents woodcutters from entering the RNA on the east side.

### PRF, RPD, and AMN Alternatives

Raider Basin, a potential RNA, is nominated by the Forest under these alternatives. This candidate site has

been reviewed by the R5/PSW RNA Committee. If approved by the Regional Forester, the Forest will prepare an establishment report, specifying the management provisions; and forward to the Chief for establishment.

### CUR, IND, and RBU Alternatives

No new RNAs are recommended. However, Raider Basin continues to be protected in its natural condition because it is in the South Warner Wilderness.

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## 16. Riparian Areas

*See 22. Water and Riparian Areas.*

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## 17. Sensitive Plants

### All Alternatives

Potential for harm to sensitive plants is low. Under all alternatives, surveys are conducted prior to all land-disturbing activities. Consequently, the chances of disturbing unknown populations of sensitive plants are reduced. A low probability of unintentional disturbance exists with any land-disturbing activity; but alternatives with much land disturbance have higher probabilities of adversely affecting sensitive plants. RPD alternative has the highest probability of disturbance. Risk of disturbance is low in PRF, CUR, and IND alternatives, and lowest in RBU and AMN alternatives.

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## 18. Soils

Soil is a non-renewable resource. One inch of soil is developed from bedrock in several hundred to more than a thousand years. When soil is lost through erosion, soil productivity is reduced essentially forever. Removing vegetation from a site will expose the soil to erosion and loss of plant nutrients.

Soil productivity is reduced when erosion removes soil; management activities displace soil; soil porosity is reduced; or when large and small organic debris (e.g., down logs) is removed from the forest floor (typically, after timber harvests). Major activities that impact soil productivity include:

- timber harvesting
- livestock grazing
- road and trail construction and reconstruction, and uninventoried roads
- wildfire
- soil and watershed improvements

**Timber harvesting** activities which cause soil disturbance and soil displacement increase soil compaction and loss through erosion. Changes in vegetative ground cover and compacted soils reduce water infiltration and rates of water runoff. High rates of overland runoff increase soil loss as water moves soil particles. The organic surface horizon of the soil contains most of the nutrients available for plant growth. When this horizon is removed, the soil loses much of its capacity to supply nutrients.

**Improper livestock management** and improper season of use can result in excessive soil compaction and loss of natural vegetative cover. Water runoff increases, more soil erodes, and nutrients are lost. Vegetation type conversions through prescribed burns or mechanical site preparation can have an adverse impact on soil productivity if improperly executed.

**Road and trail construction and reconstruction, and uninventoried roads** expose disturbed soil to erosional forces, interrupts drainage patterns, and can intercept subsurface water flows. Semi-impermeable road surfaces increase runoff and peak flows. Native-surface roads increase sedimentation during runoff periods. In sensitive watersheds where mass wasting can occur, slope stability is reduced by road construction. Adequate road and trail maintenance reduces gully and erosion. The Forest has approximately 700 miles of uninventoried roads which can adversely affect soils because these

roads are not maintained and can suffer damage from OHV use.

**Wildfire** removes vegetative cover from watersheds, and can cause the soil surface to become hydrophobic. Without vegetative cover, soil erosion and sedimentation increase while water quality and soil productivity decrease. In addition, stream peak flows increase during flood stages. Nutrient loss from the burn area also reduces soil productivity. Wildfires on timbered land are commonly followed by post-burn timber activities, including salvage logging and site preparation for new plantations. These activities can further aggravate an already degraded watershed.

**Soil and watershed improvements** primarily improve soil productivity and watershed condition. Watershed rehabilitation projects include stabilizing gullies; obliterating, closing, or repairing actively degrading uninventoried roads and trails; seeding and fertilizing to reduce erosion; ripping to reduce compaction; and respreading displaced topsoil.

Table 4-13 shows the soil erosion and sedimentation index (ESI) by alternative. The index is derived from weighted values of outputs which contribute to soil erosion and sedimentation and water quality degradation: livestock animal unit months (AUMs); range and wildlife vegetation type conversions; timber harvesting activities including clear-cutting, shelterwood, seed-tree, intermediate and unevenaged management; road and trail construction and reconstruction; and acres of projected wildfire by intensity levels. For example, an acre of clearcutting, site preparation and planting has a higher potential for erosion and sedimentation than an acre of seed-tree harvesting. Therefore, the first acre would have a higher weighted value in the ESI than the second acre. The result is an indicator relative to the base year, and not a prediction of sedimentation.



**Table 4-13. Soil Erosion and Sedimentation Index (ESI)<sup>1</sup>**

Planning Period	PRF	CUR	RPD	IND	RBU	AMN
Decade 1	107	100	130	122	91	97
Decade 2	104	97	106	102	90	100
Decade 3	104	104	153	105	89	96
Decade 4	93	95	103	95	84	101
Decade 5	111	95	121	110	83	101

<sup>1</sup> Expressed as a numerical increase or decrease from the CUR alternative for decade 1 which is equal to 100

## Mitigation

Preventive planning is the key to successful maintenance of the soil resource. Prescriptions and Forest-wide Standards and Guidelines for soil and water mitigate long-term consequences related to the soil resource. Policies and specifications for conserving the soil can be found throughout the Forest Service Manual, in various Forest Service handbooks, and in contract and permit provisions. Moreover, the Forest will apply many erosion-control procedures (Best Management Practices) that were adopted by the Forest Service in response to Section 208 of the Clean Water Act. Although designed to protect water quality, BMPs indirectly maintain the watershed and soil resource (Appendix N in the Forest Plan).

All alternatives will result in improved soil productivity and watershed condition, because degraded acres are rehabilitated through watershed improvement projects, and fewer livestock graze except in the RPD alternative.

### PRF Alternative

The ESI ranges between 107 and 104 for the first 3 decades, drops to 93 for the 4th decade, and rises to 111 during the 5th decade. Increased ground disturbance is most significant from timber harvesting activities and wildlife improvement projects. This disturbance is offset by fewer livestock AUMs and 7,450 acres of watershed improvement projects.

Watershed projects moderately improve overall soil productivity and watershed condition. In addition, remaining degraded acres improve naturally because grazing pressure decreases through restricted use or allotment closures.

### CUR Alternative

The ESI is 100 for the first decade, which is standard for all alternatives. During this base decade, the Forest output most closely parallels the base year. The ESI fluctuates very little over the next 4 decades. Increased timber activities is offset by sharp reductions in livestock AUMs. The ESIs in decades 4 and 5 are lower than the base decade ESI of 100, even though timber activities are equivalent to that period. The lower ESI results from continued reductions in livestock AUMs. Watershed improvement projects improve soil productivity and watershed condition. Some degraded acres will improve naturally as grazing pressure decreases through restricted use or allotment closures.

### RPD Alternative

This alternative creates the most soil disturbance and erosion and sedimentation. The ESI erratically fluctuates in decades 1 through 5 from 130, to 106, to 153, to 103, and to 121. Range and wildlife non-structural improvements account for most of the increase in the ESI for the 1st, 3rd and 5th decades, while less timber activity lowers the ESI during the 2nd and 4th decades. Livestock AUMs, board feet of timber, and deer numbers are managed at high levels. Although more than 10,000 acres of watershed improvement projects counter higher ESIs, overall soil productivity and watershed condition improve slowly because of high ESI values from heavy grazing, and intensive deer and timber management.

### IND Alternative

This alternative parallels the PRF Alternative, except during decade 1, in terms of the ESI. Timber harvest volume is the highest of all alternatives, while increased deer numbers are strongly emphasized. Livestock AUMs are also the highest of all alternatives during the first decade but decrease in decades 2 through 5. Watershed

projects over 10,200 acres in decades 1 through 5 result in slowly improved soil productivity and watershed condition during the first decade. Soil productivity and watershed condition moderately improve during decades 2 through 5.

#### **RBU Alternative**

Because timber volume and range AUMs are the lowest of any alternative, this alternative produces the lowest ESI. Low emphasis on road maintenance increases the ESI. Watershed improvement projects cover 3,950 acres. Low levels of livestock grazing, however, indirectly improve the most degraded watershed acres because of less grazing pressure through restricted use or allotment closure. Overall soil productivity and watershed condition moderately improves throughout the next 5 decades.

#### **AMN Alternative**

Moderate emphasis on timber harvesting activities and low emphasis on livestock grazing hold the ESI to 97, 100, 96, 101 and 101 for decades 1 through 5, respectively. Watershed projects improve 7,400 acres during the first 3 decades, while other degraded acres naturally improve because of reduced grazing, restricted use, and allotment closures. Overall watershed condition and soil productivity moderately improve under this alternative.

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## **19. Special Interest Areas**

### **Geologic Special Interest Areas (SIAs)**

Under all alternatives, the existing SIAs – Burnt Lava Flow, Medicine Lake Glass Flow, and Glass Mountain Glass Flow – retain their status and management direction. Timber harvest, road construction and mineral surface development is not permitted.

Full protection from mining may be the exception on the Glass Mountain Glass Flow. Perlite and block pumice

mining claims cover 60% of the surface area. Although some claims have not been active in the last few years, other claimants have annually performed assessment work in the area. All claims predate exclusion from mineral withdrawal.

For the short-term, existing mineral claims are checked for validity and monitored to determine if yearly assessment work is being done and properly filed. Efforts to minimize negative impacts to the integrity of the Flow continue. The long-term goal is to exclude further mineral material sales in this area. Valid mining claims will be honored; SIA boundaries may be adjusted to accommodate these rights.

Under all alternatives, the Forest recommends nominating Burnt Lava Flow and Medicine Lake Glass Flow SIAs for National Natural Landmark status (Appendix F).

Because of the uniqueness of these sites and their current status as SIAs, no environmental consequences are anticipated, should they be designated as National Natural Landmarks.

### **Cultural Special Interest Areas**

Environmental consequences to cultural SIAs are the same as discussed under the Cultural Resources section of this chapter. Under all alternatives, except AMN, no cultural SIAs are recommended.

Under AMN alternative, 10 cultural SIAs are recorded and nominated in the 1st decade and 5 areas per decade thereafter. Management direction for each SIA differs depending on the resources. However, multiple-use management is not precluded if the special values of the area are ensured.

### **Botanical Special Interest Areas**

Under the PRF Alternative, Dismal Swamp will be evaluated for designation as a botanical SIA.

## 20. Timber

Environmental consequences to timber are based on forest management principles, management experience, and field observations. Activities which have major effects on timber are:

- old-growth habitat and diversity
- pest management
- deer herd management and forage requirements
- dispersed recreation management
- visual management
- bald eagle management
- snag management

Five percent of each timber type and seral stage combination must be provided to meet minimum management requirements (MMRs) for diversity. **Old-growth habitat** limits the timberland available for harvest and regeneration by maintaining timber stands older than 180 years. Alternatives providing diversity above MMR levels affect timber production and management.

Each alternative offers **pest management** opportunities that result in varying amounts of pest-related damage on the Forest. Indicators of pest-related damage include tree mortality, or reduced growth, wood quality, and seed production. Such damage can result in understocking, failure and delay of regeneration, reduced site productivity, and other undesirable vegetation changes. In general, vegetation management, such as timber stand improvement and reforestation practices, provide the best opportunities to reduce pest-related damage.

**Deer management** relies on vegetation management to create early successional habitat of brush, grasses, and forbs. Depending on deer population objectives and consequent forage and cover needs, timber management (harvest, reforestation and timber stand improvement practices) can vary. Where forage is needed, timber management objectives may be reduced from full yields and forage given equal emphasis.

**Dispersed recreation management** provides a variety of recreation opportunities from primitive to roaded natural (See Appendix K in the Forest Plan for a description of each recreation opportunity class). Land managed for semi-primitive non-motorized recreation is excluded from timber management unless needed for recreation enhancement. Land managed for semi-primitive motorized recreation is available for timber management, but a semi-primitive setting is provided through longer rota-

tions and smaller harvest units. Roaded natural areas are suitable for timber management. Consequently, effects on timber vary depending on the recreation opportunities provided.

**Visual management** establishes standards for the scenery on Forest lands. Known as visual quality objectives (VQOs), they range from preservation, the most restrictive, to maximum modification, where significant vegetation alterations are allowed (See Appendix Q for VQO definitions). Depending on the alternative, timberlands are assigned different objectives and timber management is limited to varying levels of disturbance.

**Bald eagle management** limits timber harvest to maintaining or improving bald eagle habitat. Small timber volumes are harvested from these lands.

Timber volume is also affected by **snag management**, which requires a MMR of 1.5 snags per acre on timberlands capable of growing greater than 20 cubic feet per acre per year (> 20 lands). Volume is retained in eastside pine to provide for snag-dependent wildlife.

Consequences to timber management are measured for each alternative by:

- amount of suitable timberland
- timber management prescriptions on suitable timberlands
- allowable sale quantity, long-term sustained yield
- silvicultural and harvest practices
- rate of existing stand conversion to even-aged management
- species harvest mix

Table 4-14 displays these consequences at the end of this section.

### Suitable Timberlands

Each alternative begins with an identical land base which is tentatively suitable for timber production. Not included are 1) lands withdrawn by Congress, the Secretary of Agriculture, or the Chief of the Forest Service; 2) land incapable of producing crops of industrial wood; and 3) land not physically suited for timber production. Appendix O describes the procedure for determining suitable lands; Table 3-14 shows the results. Using this procedure, the Forest identifies 619,258 acres as tentatively suitable, of which 435,100 acres are > 20 lands, and 184,155 acres are < 20 lands. Tentatively suitable timberlands comprise 37% of the Forest land base.

Each alternative uses a different proportion of the tentatively suitable acreage to achieve outputs of the alternative. Some acres originally identified as tentatively suitable are not suitable if 1) the land was assigned to other resources uses that precluded timber management; 2) the land was needed to meet MMRs; or 3) managing the land was not cost efficient in meeting objectives over the planning horizon. These lands are designated as “not suited” for timber production in the alternative.

Removing land from tentatively suitable land bases reduces the potential allowable timber harvest. The magnitude of this reduction depends on the amount of land removed, as well as its productivity. In general, long-term sustained yield (LTSY) decreases in alternatives which allocate more acres to other resources.

### Timber Management Prescriptions on Suitable Timberlands

Timber management varies with alternatives’ objectives which are based on the condition and structure of existing vegetation as well as its desired future condition. Objectives are shaped by constraints imposed by ecological conditions, economics, management, and society. Timber management prescriptions are various practices applied to specific areas to achieve objectives. Prescriptions offer choices for achieving similar objectives. For example, harvesting can be accomplished by clearcutting, shelterwood, and group selection; and timberlands can be reforested naturally or artificially.

Timber management prescriptions are categorized as full, modified, or limited (marginal). Full and modified timber management is applied on > 20 lands, while limited timber management is applied on < 20 lands. The < 20 lands are regulated separately from > 20 lands, and outputs are not comingled with outputs from > 20 lands.

**Full management (Regulation Class I)** involves even-aged silvicultural systems. The even-aged system includes clearcutting, shelterwood, and seed tree methods of regeneration. The seed tree method is not viable on this Forest and is not modeled. A Regionwide description of these silvicultural systems is found in Appendix P.

The primary objective of full timber management prescriptions is to produce timber at optimum levels. Under even-aged management, rotations of regenerated stands are based on CMAI with optimal timber yields expected. The harvest unit size may vary up to the maximum specified in the Forest-wide Standards and Guidelines; the VQO of modification is met. Because the harvest unit size is larger under even-aged management than under uneven-aged management, operating costs are lower.

Lower costs and higher yields result in greater economic efficiency.

**Modified management (Regulation Class II)** is also based on even-aged and uneven-aged silvicultural practices, but other resource objectives in addition to timber’s are achieved. To meet VQOs of retention or partial retention, longer than optimal rotations are used and smaller openings are left. When timber and forage production are co-emphasized, reforestation and timber stand improvement practices are modified to increase the production of forage. Because forage production is stunted or completely curtailed under a closed tree canopy—conditions typical under uneven-aged management—only even-aged management is applied. Less than full timber yields are expected under modified management.

The uneven-aged system includes single-tree and group selection methods. The Uneven-aged Management Prescription produces fewer outputs than the Even-aged Prescription. Managerial and ecological constraints are incorporated into prescriptions to ensure their compatibility with the environment. To reflect this Forest’s slower growth rate and lower site quality, more time was allowed in the model for regeneration success and growth of smaller trees competing with large trees. Because of higher administrative and project costs and lower yields, uneven-aged management is less appealing economically than even-aged management. However, for lands constrained by diversity, dispersion, or a visual quality objective higher than modification, the uneven-aged prescription is more attractive than full timber management using the even-aged prescription.

The Forest has set aside four timber compartments—one on each ranger district—totaling 17,000 acres for implementing uneven-aged management.

**Limited management (Regulation Class III)** is applied to < 20 lands containing large amounts of rock mixed with small inclusions of more productive soil. (The Timber section in Chapter 3 and Appendix O describe this land more fully.) The management objective for this land is low timber yields acquired by harvesting individual trees or small groups of trees which represent 5% of the standing inventory. Harvesting is not done unless snag and diversity standards can be met, and advanced reproduction is evident or sufficient seed trees can be left to ensure natural regeneration. Limited management is neither an even- or uneven-aged silvicultural system on < 20 lands. Uneven-aged management is applied to acres allocated to the Riparian Area and Visual Retention Prescriptions.

## Allowable Sale Quantity, Long-Term Sustained Yield Capacity and Growth

The allowable sale quantity (ASQ) is the volume of timber that may be sold from the suitable land base. Because the volume of timber sold each year may vary, the ASQ is applied by decade. The Forest's previous Timber Management Plan had a decadal average ASQ of 62.3 MMBF per year.

The principle of nondeclining yield (NDY) applies to all alternatives except RPD. NDY requires that the ASQ for any decade must be equal to or greater than that of the previous decade.

The ASQ from > 20 and < 20 lands are separate. Less productive and more difficult to accurately predict yields, < 20 lands are regulated separately, as are yields from the Raptor Management and Riparian Area prescriptions.

Long-term sustained yield (LTSY) is the highest wood yield that may be sustained from lands for timber production under the silvicultural systems applied. LTSY is a function of the amount and productivity of suitable acres, and the management intensity of prescriptions assigned and scheduled for an alternative. It is larger under alternatives with greater acreages allocated to full timber management.

LTSY is the theoretical upper limit for the ASQ. When below LTSY, the ASQ is affected by the existing timber inventory and growth on the suitable land, cost efficiency, budget limitations when applied, and NDY.

Under all alternatives, timber yields in existing east-side pine stands are reduced to accommodate snag requirements. Both ASQ and LTSY are lowered by meeting this MMR.

Over time, wood growth must equal or exceed the amount harvested in order to sustain yield. Future growth is improved by regenerating poorly-stocked or poorly growing stands. The President's Revised Statement of Policy, P.L. 96-514 (December 12, 1980), calls for national forest growth increases up to at least 90% of LTSY by 2030. Growth rates in excess of LTSY indicate a high proportion of young, small, fast-growing sawtimber stands. In a perfectly regulated forest, growth equals LTSY.

## Silvicultural and Harvest Practices

**Cutting Methods:** Both even-aged and uneven-aged management prescriptions are available in all alternatives. Two regeneration cutting methods used in even-aged management are clearcutting and shelterwood

cutting. Clearcutting is the most economically efficient. In the absence of constraints by other resources, it is normally scheduled before shelterwood cutting. Young, healthy trees on the site at the time of harvest will be saved and managed as part of the new stand, if feasible. This means that some clearcuts will resemble group selection or shelterwood cut areas. Uneven-age management employs the group selection method.

Commercial thinning reduces competition among trees and improves growth in the remaining stand, while also reducing its susceptibility to pest-related damage. Nominal salvage and sanitation harvests are allowed. Reducing this cutting is necessary to meet snag MMRs.

Selection cutting is used in areas managed for resources other than timber, i.e., riparian areas, bald eagle nesting and roosting territories, and in areas where high visual quality is desired. Selection cutting is also the primary method used on < 20 lands.

**Logging Systems:** Selection of appropriate logging systems to harvest timber is done at the project level and is based on silvicultural needs, watershed and soil protection, and operational feasibility and costs. The proportions of harvest by the various systems does not vary significantly by alternative, because all alternatives use the same estimate of land classified as > 40% slope. The main logging system is ground-based equipment, while in areas with steep slopes, cable systems are used.

**Reforestation:** Reforestation practices may vary by alternative depending on the timber prescription used to manage the stand. Following harvest under the Even-aged Timber and Timber-Visuals prescriptions, site preparation provides bare mineral soil for planting seedlings. Mechanical site preparation (typically tractor piling or brushraking) may be followed by burning slash and chemically treating the area to reduce vegetative competition. Under all alternatives, planted trees are the same species harvested and reflect natural forest diversity. Under all alternatives, timber stand improvement (TSI) methods, including release from competing vegetation and precommercial thinning to accelerate the diameter growth rate of remaining trees, are employed.

When timber management uses the Timber-Forage prescription, reforestation practices follow dual objectives to: 1) maintain an understory of shrubs, grasses, and forbs desirable to deer and livestock, and 2) reforest the site. Following harvest, several options exist to prepare the site, including managing areas equally but separately for wood and forage production; modifying the site preparation technique to leave some existing ground vegetation; and preparing the site as under the Even-Aged prescription, but planting bitterbrush in conjunction with

trees. Several options also exist for planting trees, including planting at low densities (e.g., 14 ft. by 14 ft. spacing), or planting at more standard densities (i.e., 10 ft. by 10 ft.) followed by weeding trees to lower densities. TSI practices also vary and are subject to the objectives of the prescription.

**Christmas Trees:** Because removing designated trees is difficult to control, the Christmas tree program could reduce timber resource productivity. Cutters may damage wet roads on the Forest and on private land. However, damage is expected to be negligible. Consequently, under all alternatives, Christmas trees are sold individually by personal use permits.

**Rotation Age:** Rotation applies only to even-aged management. Rotation age is the period between plantation establishment and final harvest. Minimum rotation age for a stand is determined from CMAI of cubic foot volume growth; minimum rotation age is at least 95% of CMAI. Under all alternatives, minimum rotation is 55 years for red fir and 65 years of all other forest types.

**Effects of Wildfire on Plantations:** To maintain the allowable harvest on the Forest, planted trees must reach merchantable size. However, young, well-stocked plantations are more susceptible to destruction by wildfire than many existing stands. As more of the Forest is stocked with young trees, more acres will be in this hazardous condition. Reforestation of burned areas is part of the annual reforestation target.

## Timber Stand Conversion Rate and Regeneration Priorities

Timber stand conversion rate displays how rapidly existing stands are regenerated and replaced with even-aged plantations. Land regenerated is cumulative and based on the total acres available for rotation. Land scheduled for selection cutting is not included in this analysis.

Regeneration of poorly-stocked stands (less than 40% crown closure) and well-stocked stands (greater than 40% crown closure) varies by alternative.

## Consequences

### All Alternatives

The Forest data base recognizes 7,800 acres of tentatively available and suitable non-stocked timber land. Under all alternatives, these lands are uneconomical to reforest.

### PRF Alternative

Under PRF, 45.5 MMBF per year are harvested, the third highest of the alternatives. Clearcuts on 34,000 acres are made in the 1st decade from harvest of 17,200 acres (51%) of poorly-stocked stands and 16,700 acres of well-stocked stands. By the 5th decade, one-third of the existing poorly-stocked stands and about half of the well-stocked stands are cut and regenerated. Over a 16-decade planning horizon, the PRF alternative harvests timber on 519,000 acres, which represents 84% of the tentatively suitable timber land base. Twenty-eight percent of the suitable land base receives full timber management, 37% receives modified timber management, and about 35% is treated under limited timber management.

Based on proportions of the 1st decade outputs (ASQ), the species mix provided by this alternative is the best of all alternatives. PRF provides about 40% eastside pine, 52% mixed conifer, and the remaining 8% from red fir and lodgepole pine. Expected plantation loss from fire is the third highest of the alternatives with a five-decade cumulative total of 18,200 acres.

About 58,600 acres (9%) of tentatively suitable land are left unmanaged (minimum management); 23,000 acres (4%) are managed for semi-primitive non-motorized recreation; 18,700 acres (3%) for bald eagles; and 5,700 acres (1%) for riparian area objectives.

Of the suitable timberlands selected in PRF, managing for visual retention on 22,500 acres leaves large, mature trees managed under a long (250 years) rotation. Over 200,000 acres are managed for timber production in combination with protecting visual quality or producing forage. Instead of 10 to 12 years before adjacent timber stands are cut, managing for partial retention visual quality extends the interval to 20 or 25 years. On lands also managed for forage production, tree growth is slower than expected from full timber production by 10 to 15 years.

By the 5th decade, about 70% of suitable timberlands are plantations, saplings, poles, and small trees. In general, trees are less than 100 years old and less than 24 inches dbh.

### CUR Alternative

Under CUR, 51 MMBF per year are harvested, the fourth highest of the alternatives. Both CUR and PRF provide moderate levels of harvesting compared to the other alternatives. Clearcuts on 26,000 acres are made in the 1st decade from harvest of 10,000 acres (39%) of poorly-stocked stands and 16,000 acres of well-stocked stands. By the 5th decade, 20% of existing poorly-stocked

stands and a little more than 40% of well-stocked stands are cut and regenerated. Over a 16-decade planning horizon, the CUR alternative harvests timber on 520,000 acres, which represents 84% of the tentatively suitable timber land base. Full timber management is applied to 44% of the area, 26% receives modified timber management, and about 30% is treated under limited timber management practices.

Based on proportions of the 1st decade outputs (ASQ), the species mix provided by this alternative is predominantly mixed conifer. It is the highest of any alternative at 91%; 5% is red fir, and 4% is eastside pine. Expected plantation loss from fire is the fourth highest of the alternatives with a five-decade cumulative total of 16,000 acres.

A total of 98,500 acres (16%) of the tentatively suitable land base are unsuitable under this alternative. Virtually no management occurs on 56,800 acres (9%) (minimum management); 23,000 acres (4%) are managed for semi-primitive non-motorized recreation; 18,700 acres (3%) for bald eagles; and 5,700 acres (1%) for riparian area objectives.

Of the suitable timberlands selected in CUR, managing for visual retention on 22,500 acres leaves large, mature trees managed under a long (250 years) rotation. Over 130,000 acres are managed for timber production in combination with protecting visual quality or producing forage. Instead of 10 to 12 years before adjacent timber stands are cut, managing for partial retention visual quality extends the interval to 20 or 25 years. On lands also managed for forage production, tree growth is slower than expected from full timber production by 10 to 15 years.

By the 5th decade, about 65% of suitable timberlands are plantations, saplings, poles, and small trees. In general, trees are less than 100 years old and less than 24 inches dbh.

#### RPD Alternative

Under RPD, 75 MMBF per year are harvested, the highest of the alternatives. This is the only alternative which is a departure. This means that the principle of nondeclining yield does not apply in the 1st decade; it does apply in the 2nd decade and thereafter. Clearcuts on 44,000 acres are made in the 1st decade from harvest of 10,000 acres (22%) of poorly-stocked stands and 34,000 acres of well-stocked stands. By the 5th decade, one-third of existing poorly-stocked stands and about half of well-stocked stands are cut and regenerated. Over a 16-decade planning horizon, the RPD alternative harvests timber on 535,000 acres, which represents 86% of the tentatively suitable timber land base. Twenty-nine

percent of this suitable land base receives full timber management, 39% receives modified timber management, and about 27% is treated under limited timber management.

Based on proportions of the 1st decade outputs (ASQ), the species mix provided by this alternative is about 18% eastside pine, 77% mixed conifer, and the remaining 5% from red fir and lodgepole pine. Expected plantation loss from fire is the second highest of the alternatives with a five-decade cumulative total of 24,700 acres.

About 41,600 acres (7%) of tentatively suitable land are left unmanaged (minimum management); 23,000 acres (4%) are managed for semi-primitive non-motorized recreation; 18,700 acres (3%) for bald eagles; and 5,700 acres (1%) for riparian area objectives.

Of the suitable timberlands selected in RPD, managing for visual retention on 22,500 acres leaves large, mature trees managed under a long (250 years) rotation. Over 200,000 acres are managed for timber production in combination with protecting visual quality or producing forage. Instead of 10 to 12 years before adjacent timber stands are cut, managing for partial retention visual quality extends the interval to 20 or 25 years. On lands also managed for forage production, tree growth is slower than expected from full timber production by 10 to 15 years.

By the 5th decade, about 70% of suitable timberlands are plantations, saplings, poles, and small trees. In general, trees are less than 100 years old and less than 24 inches dbh.

#### IND Alternative

Under IND, 60.1 MMBF per year are harvested, the second highest of the alternatives. IND has the highest timber output without a departure. Clearcuts or group selection cuts on 40,000 acres are made in the 1st decade from harvest of 10,000 acres (21%) of poorly-stocked stands and 30,000 acres of well-stocked stands. By the 5th decade, 20% of existing poorly-stocked stands and 30% of well-stocked stands are cut and regenerated. Over a 16-decade planning horizon, the IND alternative harvests timber on 562,500 acres, which represents 91% of the tentatively suitable timber land base. Thirty-two percent of this suitable land base receives full timber management, 33% receives modified timber management, and about 35% is treated under limited timber management.

Based on proportions of the 1st decade outputs (ASQ), the species mix provided by this alternative is the second best of all alternatives. IND provides about 30% eastside pine, 60% mixed conifer, 3% lodgepole pine and

7% red fir. Expected plantation loss from fire is the highest of the alternatives with a five-decade cumulative total of 26,100 acres.

About 38,000 acres (6%) of tentatively suitable land are left unmanaged (minimum management); 18,700 acres (3%) for bald eagles; and 5,700 acres (1%) for riparian area objectives.

Of the suitable timberlands selected in IND, managing for visual retention on 14,500 acres leaves large, mature trees managed under a long (250 years) rotation. Over 170,000 acres are managed for timber production in combination with protecting visual quality or producing forage. Instead of 10 to 12 years before adjacent timber stands are cut, managing for partial retention visual quality extends the interval to 20 or 25 years. On lands also managed for forage production, tree growth is slower than expected from full timber production by 10 to 15 years.

By the 5th decade, 72% of suitable timberlands are plantations, saplings, poles, and small trees. In general, trees are less than 100 years old and less than 24 inches dbh.

#### RBU Alternative

Under RBU, 37 MMBF per year are harvested, the second lowest of the alternatives. Clearcuts on 20,000 acres are made in the 1st decade from harvest of 10,000 acres (50%) of poorly-stocked stands and 10,000 acres of well-stocked stands. By the 5th decade, one-tenth of existing poorly-stocked stands and about one-third of well-stocked stands are cut and regenerated. Over a 16-decade planning horizon, the RBU alternative harvests timber on 405,900 acres, which represents 66% of the tentatively suitable timber land base. Fifty-one percent of the suitable land base receives full timber management and 47% receives modified timber management, and 2% is managed under limited practices.

Based on proportions of the 1st decade outputs (ASQ), the species mix provided by this alternative is one of the poorest of the alternatives. This occurs because low budgets force harvesting the highest stocked timber types. RBU provides nominal amounts of eastside pine, 86% mixed conifer, and 14% red fir. Expected plantation loss from fire is the lowest of the alternatives with a five-decade cumulative total of 8,200 acres.

About 195,000 acres (31%) of tentatively suitable land are left unmanaged (minimum management); 18,700 acres (3%) are managed for bald eagles; and 5,700 acres (1%) for riparian area objectives.

Of the suitable timberlands selected in RBU, managing for visual retention on 14,500 acres leaves large, mature trees managed under a long (250 years) rotation. About 175,000 acres are managed for timber production in combination with protecting visual quality or producing forage. Instead of 10 to 12 years before adjacent timber stands are cut, managing for partial retention visual quality extends the interval to 20 or 25 years. On lands also managed for forage production, tree growth is slower than expected from full timber production by 10 to 15 years.

By the 5th decade, 60% of suitable timberlands are plantations, saplings, poles, and small trees. In general, trees are less than 100 years old and less than 24 inches dbh.

#### AMN Alternative

Under AMN, 31.6 MMBF per year are harvested, the lowest of the alternatives. Clearcuts on 20,000 acres are made in the 1st decade from harvest of 2,000 acres (10%) of poorly-stocked stands and 18,000 acres of well-stocked stands. By the 5th decade, 25% of existing poorly-stocked and well-stocked stands are cut and regenerated. Over a 16-decade planning horizon, the AMN alternative harvests timber on 487,500 acres, which represents 79% of the tentatively suitable timber land base. Six percent of the suitable land base receives full timber management, 50% receives modified timber management, and about 44% is treated through limited timber management.

Based on proportions of the 1st decade outputs (ASQ), the species mix provided is one of the better of all alternatives. AMN provides about 49% eastside pine, 47% mixed conifer, and 4% red fir. Expected plantation loss from fire is the second lowest of the alternatives with a five-decade cumulative total of 9,200 acres.

About 67,800 acres (11%) of tentatively suitable land are left unmanaged (minimum management); 45,000 acres (8%) are managed for semi-primitive non-motorized recreation; 18,700 acres (3%) for bald eagles; and 5,700 acres (1%) for riparian area objectives.

Of the suitable timberlands selected in AMN, managing for visual retention on 51,500 acres leaves large, mature trees managed under a long (250 years) rotation. Over 200,000 acres are managed for timber production in combination with protecting visual quality or producing forage. Instead of 10 to 12 years before adjacent timber stands are cut, managing for partial retention visual quality extends the interval to 20 or 25 years. On lands also managed for forage production, tree growth is slower than expected from full timber production by 10 to 15 years. In addition, 36,000 acres are allocated to



uneven-aged management—the highest of any alternative.

By the 5th decade, 65% of suitable timberlands are plantations, saplings, poles, and small trees. In general,

trees are less than 100 years old and less than 24 inches dbh.

**Table 4-14. Environmental Consequences for Timber.**

	PRF	CUR	RPD	IND	RBU	AMN
Suitable Timberlands (M Acres)	519.0	520.4	535.5	562.5	405.9	487.5
> 20 lands	366.5	389.3	390.6	385.2	395.8	330.9
< 20 lands	152.5	131.1	144.9	177.3	10.1	156.6
Not Suitable For Timber Under the Alternative (M Acres)	100.3	98.5	83.4	56.7	213.3	131.8
Minimum Level <sup>1</sup>	58.6	56.7	41.7	38.0	194.6	67.9
Semi-Primitive Non-Motorized <sup>1</sup>	23.0	23.0	23.0	0.0	0.0	45.1
Raptor Management <sup>1</sup>	18.7	18.7	18.7	18.7	18.7	18.7
Management On Suitable Timberlands (M Acres)	519.0	520.4	535.5	562.5	405.9	487.5
Full Management (Regulation Class I)	145.9	228.0	153.5	180.5	202.6	30.6
Modified Management (Regulation Class II)	194.2	135.0	210.8	186.2	174.8	244.5
Timber-Visuals <sup>1</sup>	66.8	95.0	60.8	57.4	35.3	73.0
Timber-Forage						
(Partial Retention) <sup>1</sup>	50.2	12.5	45.4	45.5	64.1	80.3
(Modification) <sup>1</sup>	60.1	25.3	101.1	75.4	75.4	54.8
Uneven-Aged Timber <sup>1</sup>	17.1	2.2	3.5	7.9	0.0	36.4
Limited Management (Regulation Class III)	178.9	157.5	171.3	195.7	28.5	211.9
< 20 cu. ft.	142.1	120.7	134.5	167.2	0.0	132.9
Retention	31.1	31.1	31.1	22.8	22.8	73.3
Riparian	5.7	5.7	5.7	5.7	5.7	5.7
Allowable Sale Quantity (MMBF)						
Average Annual for Decade 1	45.5	51.4	74.6	60.1	36.9	31.8
Long-Term Sustained Yield Capacity (MMBF)	56.3	57.4	62.4	46.4	61.9	66.3
Average Annual Growth (MMBF)						
Decade 1	66.0	53.0	52.0	73.0	56.0	64.0
Decade 5	70.0	63.0	70.0	78.0	56.0	65.0

<sup>1</sup> Management prescriptions are described in Chapter 2

**Table 4-14. Environmental Consequences for Timber (continued).**

		PRF	CUR	RPD	IND	RBU	AMN
<b>Silvicultural and Harvest Practices (Annual)</b>							
<b>Cutting Methods (M Acres)</b>							
<b>Clearcutting</b>	Decade 1	2.9	2.3	3.9	3.6	1.6	0.6
	Decade 5	2.6	2.3	4.3	4.5	0.9	1.0
<b>Shelterwood</b>	Decade 1	0.2	0.3	0.5	0.1	0.4	0.2
	Decade 5	0.9	0.3	0.4	1.3	0.2	1.7
<b>Commercial Thinning</b>	Decade 1	0.2	0.7	0.8	0.4	0.2	1.6
	Decade 5	0.3	0.1	0.5	0.4	0.5	3.1
<b>Selection</b>	Decade 1	0.3	0.0	0.0	0.3	0.0	1.2
	Decade 5	0.2	0.0	0.8	0.0	0.0	0.0
<b>Expected Plantation Acres Burned Annually or Failed</b>	Decade 1	40	30	50	50	20	20
	Decade 2	480	410	500	570	140	140
	Decade 3	420	380	530	530	280	280
	Decade 4	430	390	570	640	210	280
	Decade 5	450	390	820	820	140	200
<b>Total</b>		<b>1,820</b>	<b>1,600</b>	<b>2,470</b>	<b>2,610</b>	<b>820</b>	<b>920</b>
<b>Timber Stand Conversion Rate (Cumulative %)</b>	Decade 1	10	7	11	12	5	6
	Decade 2	19	14	18	20	11	13
	Decade 3	29	24	29	30	17	18
	Decade 4	34	29	34	35	20	25
	Decade 5	45	36	46	47	23	31
<b>Stands Regenerated in Decade 1 (%)</b>							
	Poorly Stocked	29	39	22	21	50	11
	Well Stocked	71	61	78	79	50	89
<b>Species Mix of ASQ Decade 1 (MMBF)</b>							
	Eastside Pine	17.9	2.6	12.7	18.0	nominal	15.5
	Mixed Conifer	23.6	46.8	57.4	36.0	31.7	15.0
	Red Fir	2.5	2.1	3.7	4.2	5.2	1.2
	Lodgepole Pine	1.5	nominal	0.8	1.9	nominal	nominal
<b>Total</b>		<b>45.5</b>	<b>51.5</b>	<b>74.6</b>	<b>60.1</b>	<b>36.9</b>	<b>31.8</b>

## 21. Visual Resources

### Introduction

The following discussion of environmental consequences is based on the principles derived from the Forest Service Visual Resource Management System which provides the inventory methodology and standards for management of the Forest's visual resources.

To display the effects of the alternatives on the landscape or visual resources, these indicators are used:

- Inventoried Visual Quality Objectives and Existing and Future Visual Condition (Table 4-15)
- Visual Condition (VC)– Visual Quality Objective (VQO) (Figure 3-26)
- Visual Quality Index by Alternatives (Figure 4-14)
- Visual Rehabilitation Needs (Figure 4-15)
- Visual Condition Decline (Figure 4-16)

These indicators compare the alternatives to two baselines: the inventoried visual quality objectives and the existing visual condition. Visual quality objectives (VQOs) set targets for the appearance of the landscape by a particular time in the future. The inventoried visual quality objectives evolved from an inventory of the Forest's physical and social environments, and set preliminary goals on acceptable amounts of landscape alteration. The other baseline, the existing visual condition (EVC), describes the landscape's present appearance. While the inventoried VQOs and the EVC of various areas are not necessarily the same (since the former sets a preliminary goal for the future and the latter displays a current condition), the five VQO levels do equate to the six visual conditions displayed in Figure 3-26.

Major activities affecting visual quality are:

- timber management
- livestock grazing
- wildfire and prescribed burning
- minerals, geothermal, and utilities management
- recreation management

### Timber Management

Timber harvest, site preparation, plantation establishment, firewood cutting, and associated road building can degrade visual quality. Regeneration harvests (clearcuts)

most severely affect visual quality, followed by shelterwood, group selection, and single-tree selection cutting. Intensive timber management changes from a natural-appearing landscape dominated by stands of mixed species and age classes, to one dominated by clearcut forms, stumps, slash skid roads, log landings, and even-aged stands.

### Livestock Grazing

Obvious structures associated with grazing include fences, cattleguards, and water source developments. Exotic grasses may be planted (to improve available forage) contrasting with native vegetation. Primitive access roads, cattle trails, and salt licks are secondary effects. Over time, intensive grazing changes the vegetative composition and changes the characteristic landscape. This effect is visually negative only in the immediate foreground.

### Wildfire and Prescribed Burning

Large wildfires create areas of even-aged vegetation and reduce or eliminate populations of plant species. They adversely affect visual quality by reducing the landscape's natural diversity, and forested setting. The charred remains of wildfires can be unattractive for decades.

Prescribed burning indirectly improves visual quality by reducing wildfire acres. Overall, this is a beneficial effect because the increase in charred lands is only temporary while the effects of wildfire are long-term. Building control lines and fire breaks for wildfire and prescribed burning produces adverse effects. However, the need for control lines decreases as our knowledge of prescribed burning improves, and as previously burned areas serve as control lines.

### Minerals, Geothermal, and Utilities Management

These activities create long-term visual impacts through vegetation removal, ground disturbance, road construction, or unnatural-appearing structures. Although few acres may be involved, these activities often dominate the general areas. Negative effects of some point impacts, such as microwave repeaters and open pit mining, can be mitigated through design. However, effects of major utility corridors are difficult or impossible to mitigate after the corridor is selected.

## Recreation Management

The Recreation Opportunity Spectrum (ROS) system is used to manage lands for various recreational opportunities. Visual quality objectives, which are compatible with ROS classes, are adopted to complement recreational opportunities. For example, when lands are managed for semi-primitive non-motorized (SPNM) opportunities, they must meet the retention VQO as seen from anywhere within the area. As a result, they have an untouched natural appearance. Lands managed for semi-primitive motorized (SPM) opportunities must meet the partial retention VQO and, therefore, appear nearly natural.

## Assumptions

Demand for water, power, recreation, and timber increases, causing more potential for land disturbances.

Long-term visual impacts last for more than five years.

Identifying lands that will appear disturbed assumes all lands will be altered to the maximum extent allowable under each alternative by the end of the planning period. We expect that *actual* modifications and visual impacts will be considerably fewer than indicated. These classifications allow *relative* comparisons between alternatives regarding potential alteration of the landscape.

Alteration of variety class C (monotonous) lands to partial retention VQO levels can improve visual quality.

Lands can be managed to achieve a visual quality objective of modification without a reduction in timber yield.

On the average, 30 years are required for visual recovery after final harvest on timberlands, and five years for visual recovery after application of prescribed fire in rangeland vegetation.

Most land disturbances are eventually covered by vegetation.

Most land-altering methods will not change. Bulldozers, skidders, cable systems, etc., may be refined; but road cuts and hydroelectric projects will continue.

## All Alternatives

Forest-wide Standards and Guidelines for visual resources require maintaining the highest possible visual quality throughout the Forest, commensurate with other resource needs. The foreground and middleground of

State Highways 139 and 299 appear nearly natural; so does the immediate foreground of all major roads and campgrounds. The South Warner Wilderness, special interest areas, bald eagle management areas, and riparian zones are managed in all alternatives.

The future condition of the visual resource depends on the level of activities that create disturbances and the VQO. Both factors vary by alternative. The landscape appears natural or nearly natural because of a VQO of preservation, retention, or partial retention.

## PRF, CUR, and RPD Alternatives

Under these alternatives, 45% of the Forest (754,209 acres) is managed in a natural or near-natural appearing condition. In addition to areas managed under all alternatives, the following landscapes are included:

- All distinctive scenery (variety class A).
- Lands adjacent to major roads (sensitivity level one).
- Common (variety class B) lands seen from major roads at background distances.
- The immediate foreground of variety class B lands along secondary roads.
- 225,000 acres of semi-primitive management for recreation.

This management results in a natural-appearing landscape along State Highways and major Forest roads. Large diameter trees along roadsides give the impression of driving through a natural old-growth forest. Distant views from these roads may show signs of timber management but are designed to appear natural. The Forest visitor who travels cross-country or on minor roads managed for a VQO of modification sees intensive timber harvest and other land-disturbing activities. If all lands were altered to the maximum extent allowable under these alternatives, 52% of the lands that now appear natural would appear disturbed. The RPD alternative, with its accelerated timber harvest schedule in the 1st decade, heavily impacts timberlands that are not managed for the visual resource. Clearcuts, road building, and other impacts quickly change the character of many areas. PRF and CUR distribute these impacts over space and time more evenly, avoiding concentrated impacts during the 1st decade.

## RBU and IND Alternatives

Under these alternatives, 32% of the Forest (529,953 acres) is managed in a natural or near-natural appearing condition. In addition to areas managed under all alternatives, the following landscapes are included:

- Distinctive scenery (variety class A) seen from major roads at all distances.
- Lands adjacent to major roads that are common (variety class B) seen from both foreground and mid-ground distances.
- 78,000 acres of semi-primitive management for recreation.

This management results in a nearly natural-appearing landscape along State Highways and major Forest roads. Large diameter trees along roadsides give the impression of driving through a natural old-growth forest. Middleground views from these roads may show signs of timber management but are designed to appear natural. Most background views are dominated by obvious landscape alterations. The Forest visitor who travels cross-country or off major roads sees intensive timber harvest and other land-disturbing activities. If all lands were altered to the maximum extent allowable under these alternatives, 66% of the lands that now appear natural would appear disturbed. With its greater timber harvest volume, IND results in heavy impact to timberlands that are not managed for the visual resource. Clearcuts, roadbuilding, and other impacts quickly change the character of many areas. RBU has the fewest impacts of any alternative except AMN. RPD has the highest impact followed by IND.

#### AMN Alternative

Under these alternatives, 69% of the Forest (1,149,794 acres) is managed in a natural or near-natural appearing condition. In addition to areas managed to a primarily natural condition under all alternatives, the following landscapes are included:

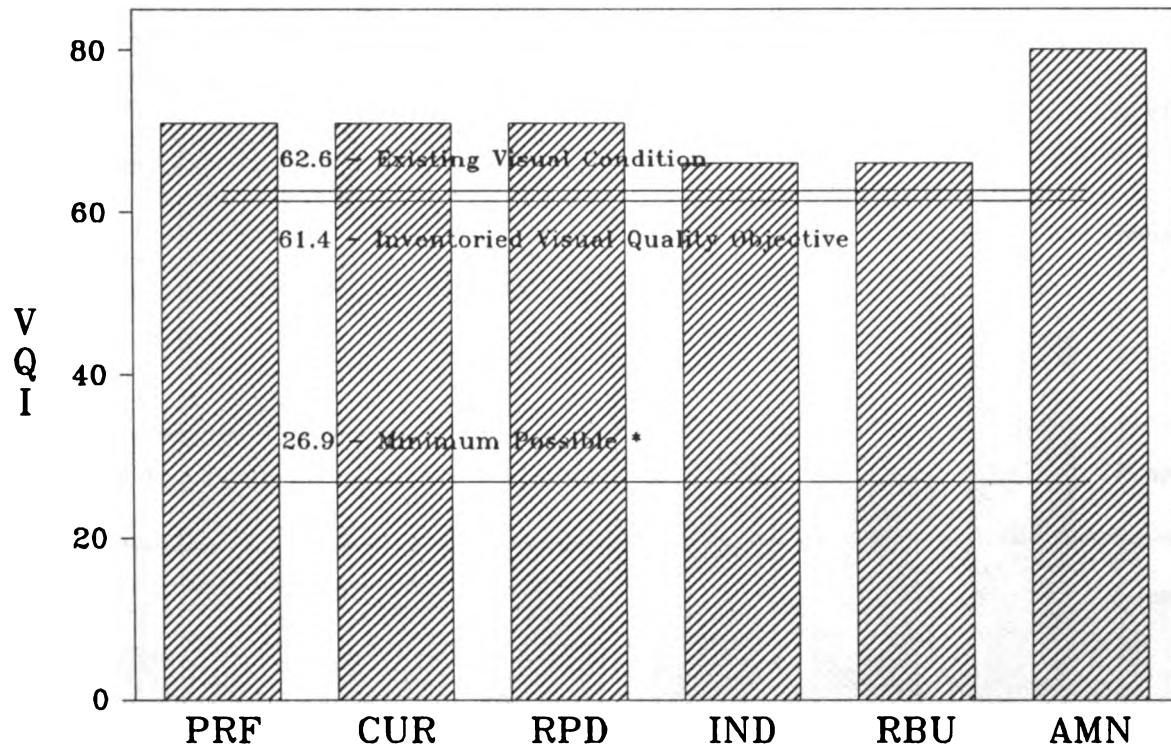
- All distinctive scenery (variety class A).
- All lands seen from major roads (sensitivity level one).
- The foreground of lands along secondary roads (sensitivity level two).
- 570,000 acres of semi-primitive management for recreation.

This management results in a nearly natural-appearing landscape on all lands seen from State Highways and major Forest roads. Large diameter trees along roadsides give the impression of driving through a natural old-growth forest. This effect also occurs along secondary roads; distant views from these roads may appear modified. The Forest visitor who travels cross-country or on minor roads managed for a VQO of modification sees intensive timber harvest and other land-disturbing activities. If all lands were altered to the maximum extent allowable under this alternative, 28% of the lands that now appear natural would appear disturbed. This alternative has the fewest impacts and the most visual resource management. Only the least visible and most remote locations are intensively managed for timber.

## Visual Resource Indicators

### Visual Quality Index

The VQI is a composite rating of the visual quality of the entire Forest. Figure 4-14 illustrates the Visual Quality Index (VQI) of each alternative for decade 5, comparing the overall visual quality (VQI) of each alternative to: (1) the other alternatives; (2) the minimum visual quality possible if the Forest landscape were dominated by very obvious alterations; (3) the existing visual condition (1980); and (4) the visual quality that would result if the inventoried VQOs were implemented. As discussed in Chapter 3, Section 21, the highest possible VQI for the Forest would be 103.65.

**Figure 4-14. Visual Quality Index (VQI) - Decade 5.**

\* Assumes all lands meet Max. Modific.

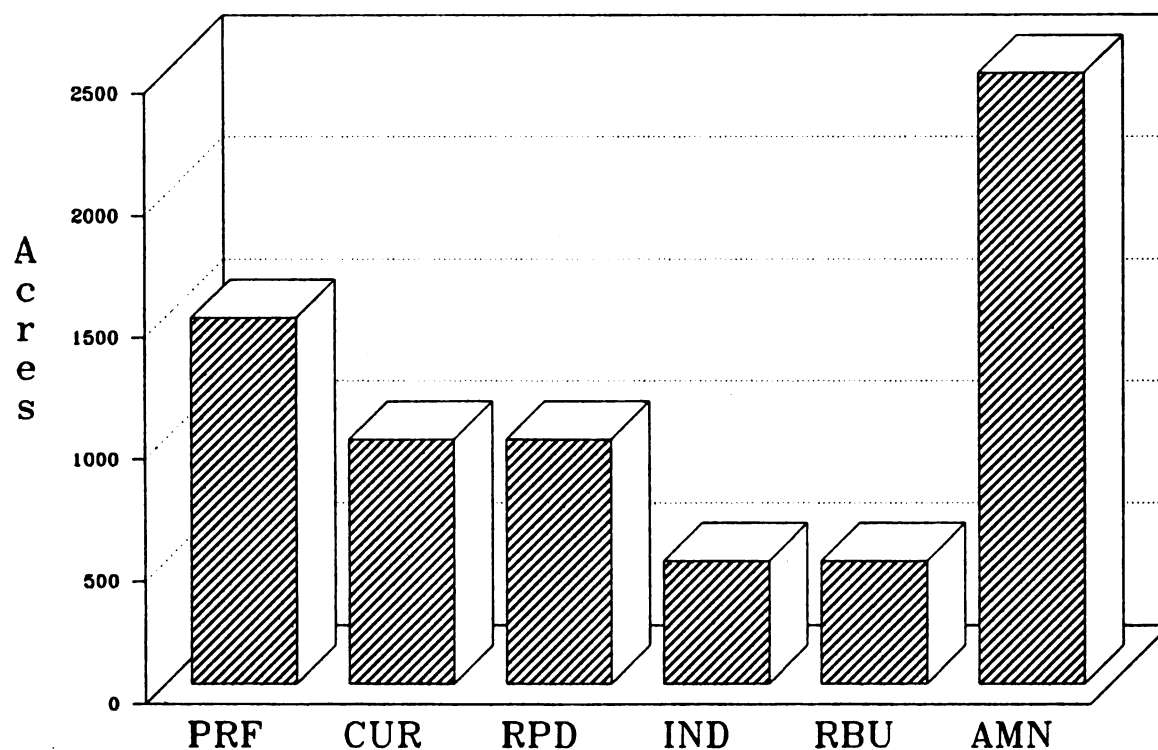
**Figure 4-15. Visual Rehabilitation Needs, Decade 1.****Visual Rehabilitation Needs**

Figure 4-15 shows the acres of Forest land that would not meet the VQOs if one of these alternatives were selected. Some of these lands would be rehabilitated

during plan implementation. Others would heal naturally until they met the specified VQO. Alternatives that set higher VQOs tend to have higher rehabilitation needs.

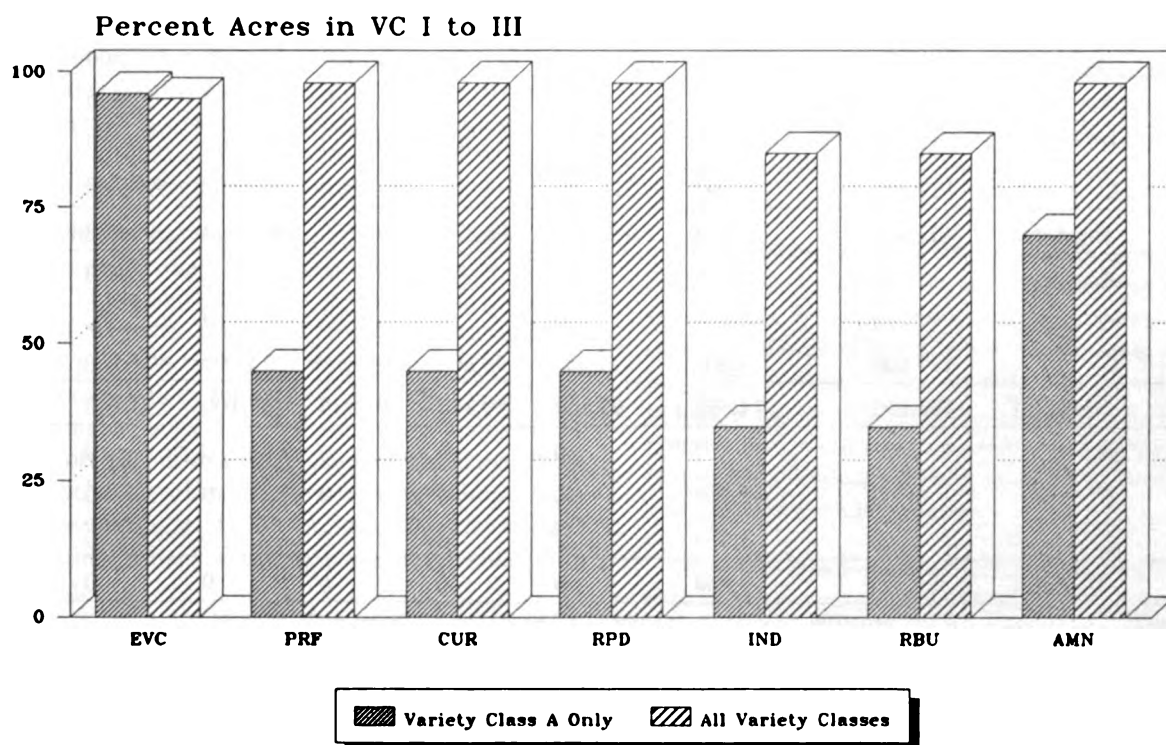


### Visual Condition

Figure 4-16 compares projected visual condition in the 5th decade by alternative to the existing visual condition (EVC). An assumption is made that by the 5th decade visual condition will reach the level of the adopted VQOs for each alternative. The figure shows the percent of the Forest retained in visual condition classes I-III. These classes equate to a natural or nearly natural landscape with management activities visually subordinate. The figure also shows the percent of variety class A lands managed to partial retention or higher VQOs. While more of the Forest will be visually disturbed, the most distinctive landscapes will be managed to a high quality level.

Table 4-15 displays the projected future visual condition (FVC) from each alternative by decade 5. It shows the predicted distribution of acreage for each FVC subdivided by variety class. By decade 5 visual condition is expected to reach the same level as the adopted VQOs for each alternative. Inventoried VQOs and existing visual condition are displayed on the left side of the table for comparing baseline indicators with the alternatives. In this way one can determine whether the areas altered or left natural would tend to be more scenic or more common (variety class B).

**Figure 4-16. Visual Condition - Decade 5.**



Acres declined from VC I-III to VC IV-V:						
	PRF	CUR	RPD	IND	RBU	AMN
Total	-868,000	-868,000	-868,000	-1,092,400	-1,092,400	-472,100
Class A	0	0	0	-23,800	-23,800	0

**Table 4-15. Inventoried Visual Quality Objectives and Acres of Existing and Future Visual Condition by Variety Class in Decade 5.**

Visual Condition <sup>1</sup>	Variety Class <sup>2</sup>	Inventoried Visual Quality Objectives <sup>3</sup>	Existing Visual Condition <sup>4</sup>	PRF	CUR	RPD	IND	RBU	AMN
I/P	A	53,300	59,800	53,300	53,300	53,300	53,300	53,300	53,300
	B	30,600	36,600	30,600	30,600	30,600	30,600	30,600	30,600
	C	800	30,400	800	800	800	800	800	800
	<b>Subtotal</b>	<b>84,700</b>	<b>126,800</b>	<b>84,700</b>	<b>84,700</b>	<b>84,700</b>	<b>84,700</b>	<b>84,700</b>	<b>84,700</b>
II/R	A	70,900	70,400	70,800	70,800	70,800	33,600	33,600	82,300
	B	52,700	441,100	38,500	38,500	38,500	14,300	14,300	125,100
	C	29,000	752,900	29,000	29,000	29,000	0	0	128,900
	<b>Subtotal</b>	<b>152,600</b>	<b>1,264,400</b>	<b>138,300</b>	<b>138,300</b>	<b>138,300</b>	<b>47,900</b>	<b>47,900</b>	<b>336,300</b>
III/PR	A	30,800	21,300	30,800	30,800	30,800	44,200	44,200	19,300
	B	272,100	136,800	273,000	273,000	273,000	215,200	215,200	255,800
	C	263,200	73,500	228,000	228,000	228,000	138,400	138,400	454,600
	<b>Subtotal</b>	<b>566,100</b>	<b>231,600</b>	<b>531,800</b>	<b>531,800</b>	<b>531,800</b>	<b>397,800</b>	<b>397,800</b>	<b>729,700</b>
IV/M	A	0	2,900	0	0	0	23,800	23,800	0
	B	281,400	11,800	294,700	294,700	294,700	376,700	376,700	225,300
	C	121,400	6,400	514,000	514,000	514,000	599,300	599,300	267,300
	<b>Subtotal</b>	<b>402,800</b>	<b>21,100</b>	<b>808,700</b>	<b>808,700</b>	<b>808,700</b>	<b>999,800</b>	<b>999,800</b>	<b>492,600</b>
V/MM	A	0	500	0	0	0	0	0	0
	B	0	8,900	0	0	0	0	0	0
	C	457,100	5,000	99,800	99,800	99,800	133,100	133,100	20,000
	<b>Subtotal</b>	<b>457,100</b>	<b>14,400</b>	<b>99,800</b>	<b>99,800</b>	<b>99,800</b>	<b>133,100</b>	<b>133,100</b>	<b>20,000</b>
VI/UM	A	0	0	0	0	0	0	0	0
	B	0	1,700	0	0	0	0	0	0
	C	0	3,300	0	0	0	0	0	0
	<b>Subtotal</b>	<b>0</b>	<b>5,000</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

**Note:** Future Visual Condition is assumed to be the same as the alternatives' Visual Quality Objectives by decade 5.

<sup>1</sup> The six Visual Condition levels measure degrees of human-caused alteration of the landscape. They indicate levels of alteration ranging from untouched, pristine lands (Visual Condition I) to extremely altered, unnatural landscapes (Visual Condition VI). See Figure 3-26. Beside the Visual Condition number is a letter designating the equivalent Visual Quality Objective as follows: P for Preservation, R for Retention, PR for Partial Retention, M for Modification, MM for Maximum Modification, and UM for Unacceptable Modification.

<sup>2</sup> The three Variety Classes indicate the natural scenic quality of landscapes. Variety Class A refers to highly scenic distinctive areas; Variety Class B is associated with common or typical landscapes; and Variety Class C corresponds to monotonous landscapes.

<sup>3</sup> Initial Visual Quality Objectives are derived from an inventory system that does not generate any Preservation acres unless the land has been classified as Wilderness, Research Natural Areas, etc. The initial VQO is the result of an inventory process and sets preliminary goals on predicted acceptable amounts of landscape alteration prior to the consideration of other resource values.

<sup>4</sup> The Existing Visual Condition is a baseline measure of the current level of visual quality on the Forest. It is displayed here to allow comparison of current conditions to Future Visual Conditions that would be generated by each alternative in order to show how conditions will change.

Predictions of FVCs are largely based on the percentage of timberland harvested each decade, because timber harvests affect visual quality more than any other management activity. By decade 5, the overall visual condition probably reaches a steady state as the regrowth of old harvest units balances the effects of new harvesting.

## 22. Water and Riparian Areas

The following discussion focuses on water quantity, water quality, riparian areas, and cumulative watershed impacts.

Water quantity, or total streamflow is increased when vegetative cover is removed during timber harvesting. Decreasing vegetative cover also decreases evapo-transpiration; as a result, water quantity increases.

Water quality and riparian areas are primarily affected by grazing, timber harvesting, site preparation, road construction, wildfire, and watershed improvement. Hydroelectric and mineral developments can also adversely impact water quality. The extent and location of the activities are the most important factors determining their impact. These activities change ground cover and compact soil, thereby influencing erosion and the amount of sediment delivered to streams.

Cumulative watershed impacts may result from changes in peak stream flow, sedimentation rates or combinations of the two that occur in response to the interaction of physical processes and land management activities, primarily timber harvesting, roading, and grazing. If cumulative watershed impacts exceed the watershed's capacity to withstand further impacts, the result is off-site, downstream channel problems. Problems associated with cumulative watershed impacts include channel aggradation or incision, stream bank undercutting or bank sheering, and adverse changes in fish habitat.

Major activities effecting water quantity and quality, and riparian areas are:

- grazing
- timber activities
- watershed and range improvements
- wildfire

Improper grazing management practices can degrade water quality and riparian area condition. Effects are most significant when season-long or extended hot-

season use (late summer/fall) is permitted. Timing and duration in riparian areas varies by grazing strategy (Plan Appendix O). Grazing strategies favoring cool season (early spring/summer) or short duration result in rapid riparian area improvement. Water quality parameters adversely affected by improper grazing use include sediment, temperature, nutrients, and fecal contamination. Riparian area characteristics influenced are vegetative abundance and condition, channel morphology (width, depth, and length), and instream habitat (bank stability and channel bottom composition). The extent and intensity of impact depend on the grazing system used and the number of animals permitted to graze (Chapter 3, Section 16).

Timber activities, including harvesting, road construction and site preparation, are activities which can increase water quantity. Timber harvesting increases cumulative watershed impacts by inducing changes in peak stream flow, sedimentation rates, or combinations of the two. Water quality parameters most affected are sediment and temperature. Riparian habitat is affected by compaction, erosion, and removal of streamside vegetation. Removing large woody debris by over-harvesting mature timber within streamside management zones is one of the most significant impacts to riparian areas. Without large debris to dissipate a stream's energy, pool-riffle ratio changes and the fisheries resource is degraded.

Watershed and range improvements improve water quality and riparian areas by rehabilitating degraded watersheds. Rehabilitation includes fencing sensitive areas, stabilizing gullies and stream channels, obliterating roads, and reestablishing vegetation. Consequently, sediment, temperature, nutrients, and fecal contamination decrease while riparian characteristics, such as vegetative abundance and condition, channel morphology, and instream habitat, improve.

Wildfires lower water quality by removing vegetation over extensive areas. Soil erosion and stream sedimentation increase. Wildfires in combination with grazing prevent the recovery of natural riparian vegetation, and cause channel morphology changes discussed under the grazing resource.

### Consequences – Water Quantity

Table 4-16 displays the expected induced water yield by alternative. Timber harvest in all alternatives produces less than 1% of additional water.

**Table 4-16. Induced Water Yield.**

(Thousands of acre-feet per year)						
Decade	PRF	CUR	RPD	IND	RBU	AMN
1	567.0	567.0	567.7	567.9	566.9	567.0
2	568.3	568.3	568.2	568.5	567.8	567.7
3	568.9	568.6	568.8	569.1	568.1	567.8
4	568.5	568.5	568.5	568.8	567.8	567.7
5	568.6	568.1	568.4	568.8	567.5	567.5

### Consequences — Water Quality and Riparian Areas

Table 4-17 displays output from activities influencing water quality and riparian areas. Grazing, timber harvest-

ing, road construction, site preparation, and wildfires slow the recovery process initiated by investments in range and watershed improvement.

**Table 4-17. Activities Affecting Water Quality and Riparian Areas. (Decade 1)**

Activities	PRF	CUR	RPD	IND	RBU	AMN
M AUMs/Yr	118.8	120.0	122.5	138.4	100.0	97.3
Timber Harvest (MMBF/Yr)	45.5	51.4	74.6	60.1	36.9	31.8
New Roads (Miles/Yr)	11.5	8.0	16.6	15.0	5.7	10.0
Site Prep (Acres/Yr)	3,375	2,720	4,600	4,009	2,100	1,955
Wildfire (Acres/Yr)	6,236	6,258	6,236	6,236	6,258	6,236
Watershed Improvements <sup>1</sup> (Acres/Yr)	100.0	100.0	100.0	100.0	100.0	100.0
Allotments Receiving Additional Riparian Area Improvement <sup>2</sup>	15	14	22	17	17	23

<sup>1</sup> Improvements reflected in this table are only associated with problems which degrade water quality. Watershed improvement acres listed in Table 2-11, Chapter 2, are also associated with problems reducing soils productivity. Therefore, the figures do not agree.

<sup>2</sup> AMN includes 10 allotments closed to grazing.

About 63% (355,400 acre-feet) of surface water currently meets water quality objectives, and 37% (208,700 acre-feet) does not. Of those 208,700 acre-feet, about 62,600 acre-feet do not meet water quality objectives because of erosion and sedimentation. These problems are outlined in "Watershed Improvement Needs Inventory on the Modoc National Forest" (Water Analysis of the Management Situation, Appendix E, in the Forest planning records). Erosion and sedimentation will be corrected through the watershed improvement projects described above, and are scheduled for treatment in all alternatives in the first two decades.

The remaining 146,000 acre-feet do not meet State water quality objectives because of current problems with livestock grazing in riparian areas detailed in Chapter 3, Section 16. To correct these problems, the Forest will apply BMPs 8.1-8.4 listed in Appendix N of the Forest Plan. Implementing BMPs for grazing takes longer than most BMPs. First, range analyses and allotment management plans are necessary to identify appropriate management practices, including streambank and range structural improvements; and controlling livestock num-

bers, season of use, and distribution. After improvements are in place, complete vegetation recovery and gradual improvements of stream channel morphology may take decades. When recovery is complete, stream temperature and sedimentation problems are resolved and quality fisheries or riparian areas, or both, are established. Appendix S in the Forest Plan lists streams and allotments most in need of review and treatment.

BMPs for timber harvesting, road construction, and recreation and mineral development are applied during project design, construction and operation. In combination with cumulative watershed impacts analysis, applying these BMPs will adequately protect water quality. Water quality improves by combining these BMPs with grazing BMPs and watershed improvements. Table 4-18 displays the percent of water yield meeting objectives by alternative.

BMPs apply to individual projects. If numerous projects occur in a single watershed, the cumulative effects of increased runoff and disturbed acres could create impacts to stream channels.

**Table 4-18. Estimated Percent of Water Yield Meeting Objectives.**

Decade	PRF	CUR	RPD	IND	RBU	AMN
1	63.0	63.0	63.0	63.0	63.0	63.0
2	80.6	77.3	75.6	69.8	89.2	93.4
3	94.8	91.4	89.8	83.9	100.0	100.0
4	100.0	100.0	98.4	92.5	100.0	100.0
5	100.0	100.0	100.0	94.3	100.0	100.0

Table 4-19 shows cumulative watershed impacts by disturbed acres. Each alternative is compared to the management threshold. For this analysis, all alternatives are restricted to a maximum number of acres (watershed threshold) which may be disturbed at one time. Only the management areas shown below have potential for cumulative watershed impacts. Within ten years, most dis-

turbed watersheds will naturally recover to levels below threshold. In watersheds which apparently exceed threshold, the Forest will defer, modify, or more intensively analyze management activities to ensure that resource values are protected.

**Table 4-19. Watershed Acres Disturbed. (Decade 1)**

Management Area	Watershed Threshold (acres)	PRF	CUR	RPD	IND	RBU	AMN
31	984	578	755	984	984	744	412
32	2,991	1,167	1,194	1,291	876	1,329	1,505
33	444	111	253	444	305	279	76
34	2,012	1,121	1,417	1,918	2,012	1,758	699
36	1,831	451	541	1,413	1,497	598	494
44	3,349	2,828	2,891	2,751	2,748	3,349	2077

## All Alternatives

Riparian areas improve in all alternatives because grazing is properly managed through adjustments in permitted numbers or seasons of use; and structural improvements are added. Adjustments in numbers of livestock or seasons of use and range structural improvements effect the recovery of water quality by improving several streams and watersheds (Table 3-18). However, the rate of recovery depends on the alternative. Degraded watershed lands contributing to water quality degradation (Appendix E of the Water Analysis of the Management Situation) are restored within 20 years. Forest-wide Standards and Guidelines ensure that impacts are held to acceptable levels. Further, State water quality objectives are met by implementing BMPs and maintaining watershed condition below cumulative watershed thresholds. Improved riparian areas and water quality provide better wildlife and fisheries habitat, recreation potential and visual quality. Applying BMPs raises management costs (see the analysis of minimum management requirements in Chapter 2, Section E.2.).

## PRF Alternative

Riparian areas and water quality improve because of adjustments in permitted numbers or seasons of use, and investments made in structural range improvements. Riparian areas in 15 allotments receive structural range improvements. By the 3rd decade, nearly 95% of the Forest's runoff meets State water quality objectives. By the 4th decade, 100% of the Forest's runoff meets State water quality objectives. Timber harvesting in all management areas maintains watershed condition below the cumulative watershed threshold.

## CUR Alternative

Riparian areas and water quality improve because of structural range improvements in 14 allotments. By the 3rd decade, about 92% of the Forest's runoff meets State water quality objectives. By the 4th decade, 100% of the Forest's runoff meets State water quality objectives. Timber harvesting in all management areas maintains watershed condition below the cumulative watershed threshold.

## RPD Alternative

Riparian areas and water quality improve because of structural range improvements in 22 allotments. By the 4th decade, over 98% of the Forest's runoff meets State water quality objectives. By the 5th decade, 100% of the Forest's runoff meets State water quality objectives. Timber harvesting in Management Areas 31 and 33 reaches the cumulative watershed threshold in the 1st decade.

## IND Alternative

Riparian areas and water quality improve more slowly under IND than under other alternatives because of a 10% increase in grazing with virtually no increase in structural range improvements for riparian areas. Riparian areas in 17 allotments receive structural range improvements. By the 5th decade about 94% of the Forest's runoff meets State water quality objectives. Timber harvesting in Management Areas 31 and 34 reaches the cumulative watershed threshold in the 1st decade.

## RBV Alternative

Riparian areas and water quality improve faster under RBV than under any alternative except AMN because grazing use is adjusted by about 18%, while structural range improvements in riparian areas are emphasized. Riparian areas in 17 allotments receive structural range improvements. By the 2nd decade nearly 90% of the Forest's runoff meets State water quality objectives. By the 3rd decade 100% of the Forest's runoff meets State water quality objectives. Timber harvesting in Management Area 44 reaches the cumulative watershed threshold in the 1st decade.

## AMN Alternative

Riparian areas and water quality improve faster under AMN than under any other alternative because grazing use is adjusted by about 31%, ten allotments are closed, and range structural improvements in riparian areas are emphasized. Riparian areas in 13 range allotments receive structural range improvements. By the 2nd decade about 94% of the Forest's runoff meets State water quality objectives. By the 3rd decade 100% of the Forest's runoff meets State water quality objectives. Timber harvesting in all management areas maintains watershed condition below the cumulative watershed threshold.

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## 23. Wilderness and Roadless Areas

Environmental consequences to Wilderness are changes in biological integrity (as compared to an environment free of human influence) and changes to the recreation experience as defined by the Recreation Opportunity Spectrum (ROS) system (Appendix K of the Forest Plan).

Activities which have major impacts on Wilderness are:

- Recreation Management
- Visual Resource Management Intensity
- Range Management
- Wildlife Management
- Fire Management

### Recreation Management

The standard management level provides a high quality recreation experience by:

- trail maintenance and reconstruction;
- interpretive services programs, including visitor contacts through wilderness rangers; and
- regulations and enforcement.

Low standard management focuses on keeping trails open and preventing resource damage. A high-quality recreation experience may not be possible and maximum capacity may be reduced.

### Visual Resource Management (VRM)

A high intensity VRM program for Wilderness manages the views from the Wilderness to achieve a nearly natural appearance. Land altering activities, such as timber harvest and road construction, are managed to maintain a natural setting in areas viewed from the Wilderness. A low intensity VRM program may permit obvious land altering activities.

### Range Management

Domestic livestock may alter the natural character of the Wilderness and offend some users. Numbers of animals and their management influence the quality of the recreation experience.

### Wildlife Management

Wildlife management programs for bighorn sheep or endangered species may dictate restrictions that affect the amount and quality of recreation use.

### Fire Management

Fire suppression activities over the past century have altered natural vegetation within the Wilderness. Prescribed burning and allowing natural fires to burn under controlled conditions can improve the biological integrity of the Wilderness.

### Assumptions

The existing Wilderness does not qualify for the Primitive ROS setting but can be managed for primitive experiences.

Maintaining or increasing livestock grazing limits opportunities for Wilderness users to achieve primitive experiences.

The trail system is essentially complete with little opportunity for new construction.

### All Alternatives

Reintroducing peregrine falcons into the Wilderness adds to the biological integrity of the area. Habitat is managed for minimum disturbance. Trails are kept open and available for public use.

### PRF Alternative

This alternative maintains the Wilderness setting and experience, but foregoes some opportunities. Some areas are managed as semi-primitive non-motorized (SPNM), and 131 miles of new trails are constructed outside the Wilderness. Consequently, future use is accommodated that otherwise would be absorbed by the Wilderness. Trails within the Wilderness are reconstructed and maintained, an improvement over base year management.

Standard management maintains Wilderness values by educating users, dispersing campers, and correcting problems. However, by the 4th decade, recreation use approaches capacity and additional controls are needed to maintain a quality experience. Livestock, horses, pack animals, and people conflict with each other and leave evidence of their visit. Biological integrity of the Wilderness is compromised and a primitive experience is diffi-



cult to achieve. To reduce this effect, a portion of the Wilderness is managed for primitive values with more controls on uses that create impacts. For example, livestock grazing is reduced in certain areas, and overnight camping is limited to specific numbers of recreationists. While these controls may reduce capacity and deny opportunities to some users, they enhance biological integrity and provide a more primitive environment for other users.

A moderate level of visual resource management adjacent to the Wilderness results in a nearly natural appearance. Some areas along the west and north boundaries offer views of timber harvest activities at a distance. Views from access roads and trails leading into the Wilderness are managed to appear nearly natural. Natural fires used under prescribed conditions improve the vegetative diversity of the Wilderness.

### **CUR & RPD Alternatives**

These alternatives maintain the Wilderness setting and experience, but quality declines over time. Some areas are managed as semi-primitive non-motorized (SPNM), and 131 miles of new trails are constructed outside the Wilderness. Consequently, future use is accommodated that otherwise would be absorbed by the Wilderness. Trails within the Wilderness are reconstructed and maintained, an improvement over base year management.

Standard management maintains Wilderness values by educating users, dispersing campers, and correcting problems. However, by the 4th decade, recreation use approaches capacity. Emphasis on livestock grazing Forestwide continues to decrease the quality of the Wilderness setting and the recreation experiences of some visitors. Livestock, horses, pack animals, and people conflict with each other and leave evidence of their visit. Biological integrity of the Wilderness is compromised and a primitive experience is difficult to achieve.

A moderate level of visual resource management adjacent to the Wilderness results in a nearly natural appearance. Some areas along the west and north boundaries offer views of timber harvest activities at a distance. Views from access roads and trails leading into the Wilderness are managed to appear natural. Natural fires used under prescribed conditions improve the vegetative diversity of the Wilderness.

### **IND Alternative**

This alternative maintains the Wilderness setting and experience, but quality declines over time. A high level of timber harvest outside the Wilderness causes a more rapid loss of SPNM areas than under the RBU alternative. Consequently, more people seeking a primitive environment use the Wilderness. Eighty-two miles of new trail construction outside the Wilderness helps to offset this impact. Trails within the Wilderness are reconstructed and maintained, an improvement over base year management.

Standard management maintains Wilderness values by educating users, dispersing campers, and correcting problems. However, by the 4th decade, recreation use approaches capacity. Emphasis on livestock grazing Forestwide adversely impacts the Wilderness setting. Livestock, horses, pack animals, and people conflict with each other and leave evidence of their visit. Biological integrity of the Wilderness is compromised and a primitive experience is difficult to achieve.

A low level of visual resource management adjacent to the Wilderness causes a loss of visual quality. Some areas along the west and north boundaries offer views of intensive timber harvest activities. Views from access roads and trails leading into the Wilderness may not appear natural. Natural fires used under prescribed conditions improve the vegetative diversity of the Wilderness.

### **RBU Alternative**

Under this alternative the Wilderness setting and experience deteriorates over time from the combined effects of increased use and low standard management. Due to fewer SPNM areas and trails outside the Wilderness, Wilderness use increases. Trails are maintained at a low level after initial reconstruction of high maintenance sections.

Low standard management reduces the primitive character of the Wilderness as physical impacts accumulate and popular areas are overused. Livestock, horses, pack animals, and people conflict with each other and leave evidence of their visits. Those seeking a pristine environment are most offended by the conditions likely to evolve, because the most attractive areas are impacted heaviest. However, many of these negative effects can be reduced if volunteers are available and effectively used. A low level of visual resource management adjacent to the Wilderness causes a loss of visual quality. Some areas along the west and north boundaries offer views of timber harvest activities. Views from access roads and trails

leading into the Wilderness may not appear natural. All fires are suppressed; as vegetation in the Wilderness matures, the risk and hazard of fires increase.

## AMN Alternative

This alternative enhances the Wilderness setting and provides experiences more primitive than currently available. By managing many SPNM areas and constructing 250 miles of new trails outside the Wilderness, some use is directed away from the Wilderness. Trails within the Wilderness are reconstructed and maintained with an emphasis on challenging opportunities. Standard management maintains Wilderness values by educating users, dispersing campers, and correcting problems.

Additional controls throughout the Wilderness are needed to encourage uses compatible with a primitive setting. While these controls may reduce capacity and deny opportunities to some users, they enhance biological integrity and provide a more primitive environment for other users. Livestock are eliminated for the benefit of bighorn sheep which dramatically improve the biological integrity of the Wilderness. Wildlife, wildflowers, and fish are abundant. Users seeking a pristine environment and willing to abide by additional regulations are satisfied.

A high level of visual resource management adjacent to the Wilderness results in a natural appearance. Distant timber harvest activities within view from the Wilderness appear natural. Views from access roads and trails leading into the Wilderness are managed to appear natural. Natural fires and prescribed fires restore natural vegetation conditions and improve the biological integrity of the Wilderness.

- road management (construction and use)
- fire management (suppression and prescribed burning)
- habitat improvement (structural and nonstructural)

Other programs and activities, such as recreation, lands, minerals, and special uses, generally affect fish and wildlife habitat on a localized or limited basis. Effects generated by these programs will be assessed only when an alternative emphasizes the programs.

**Timber Management**—harvest alters vegetation and seral stages (Appendix M) and is detrimental to species requiring late successional stages. On the other hand, harvest may be beneficial to species preferring early seral stages. The treatment of each stand determines how valuable it will be for various groups of species. For example, clearcutting eliminates all trees, but may increase overall diversity of an area and increase forage. Harvest may also reduce vegetative diversity, decrease or eliminate future snag production, or disturb wildlife that is sensitive to human activities. Effects on fisheries include shade reduction in streamside management zones (SMZs), increased stream sediment load from skid trails and landings, and changes in stream hydraulics due to increased flows. Standards and guidelines in Chapter 4 of the Forest Plan are designed to mitigate these impacts.

Reforestation, particularly the method and degree of site preparation, also determines the value of a harvest unit for wildlife. Intensive site preparation methods, including total ground scarification and use of herbicides, can reduce forage values over the life of the opening and can increase sediment loads in streams. If clearcut openings are large and all vegetative cover is removed, use of these openings by wildlife is limited. As a regenerated stand matures, the value of openings for forage is reduced. The potential for snags on these units is foregone until regenerated stands are old and large enough to produce new snags.

**Range Management**—this land use has the most significant effect on fisheries and rangeland wildlife species of any Forest program. The number of livestock, season of grazing, length of grazing season, susceptibility of an area to damage by grazing, and the intensity of management (administration and improvements to control livestock use) are major factors governing the effects of grazing. Fish habitat and riparian areas are often severely damaged by improper grazing. Under heavy grazing, riparian woody vegetation disappears, species composition of herbaceous vegetation changes, banks erode, streams widen from downcuts and flow is reduced. This affects fish habitat by increasing water temperature and

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## 24. Wildlife and Fish

All Forest land management activities affect fish and wildlife habitat and, subsequently, the fish and wildlife populations which depend on this habitat. Effects are beneficial or detrimental, significant or insignificant, depending on how, how long, when and where a project or activity occurs.

Major impacts to wildlife and fish result from:

- timber management (harvest, reforestation, and other activities)
- range management (livestock grazing and range improvements)

widening diurnal temperature fluctuations, reducing pool/riffle ratios and instream cover, reducing aquatic and terrestrial insects (food), and silting of spawning gravels. Habitat capability is reduced, resulting in decreased fish population and production (pounds of fish). The overall average size of individual fish is reduced as well. Under extreme conditions, some stream reaches may no longer support fish.

**Road Management**—road construction can affect wildlife species by physically removing or destroying habitat, and by increasing human-related activities within area accessed by road. Impacts associated with roads vary based on road location, standard to which the road is built, purpose and use of the road, and density (number) of roads within an area. Roads located within limited, heavily used, or fragile habitats can significantly impact wildlife or fish species. For example, roads constructed along streams or in meadows can increase sediment, destroy vegetation, or reduce wildlife use within these valuable, limited habitats.

The standard to which a road is built can induce habitat loss and wildlife mortality. Roads which are designed for fast vehicle speeds increase the probability of collisions with deer, and may increase disturbance and reduce wildlife use due to heavier traffic loads. Road density may reduce habitat capability for some species, such as deer, by reducing escape habitat or increasing hunter pressure. High road densities and unsurfaced roads can also significantly change the rate of runoff within a watershed, and cause increased sediment loads and scouring in streams.

**Fire Management**—fire suppression activities can affect wildlife and fish habitat directly and indirectly. For example, wildfire can increase runoff and sediment loads in fisheries streams, affect water quality by suspended material, destroy riparian cover, and increase water temperature. It can also change wildlife habitat from late to early successional stages. This is initially beneficial to species such as deer, but is detrimental to mature forest species and snag-dependent species. Large wildfires eventually lose habitat capability for early successional species as regenerated stands mature and generally grow for 50 to 100 years providing little or no habitat.

Fire suppression can have indirect effects on habitat by eliminating fire from natural communities. Eventually, desirable browse or other forage species are eliminated, or natural fuels accumulate creating hazardous fire risk. Prescribed burning is a tool for reintroducing fire into these plant communities, improving forage and reducing fuels. However, prescribed burning in forested habitats eliminates down logs or snags used by many wildlife species.

**Habitat Improvement**—habitat improvements are designed to alter or correct features of one or more species' habitat which are limiting the species population or viability. Habitat improvements are designed and executed based on surveys which identify habitat conditions below optimum for the species. Examples of habitat improvement are brushfield rejuvenation to improve deer forage, log placement in streams to create pools for fish, and topping green trees to create snags. In some cases, however, if projects are improperly designed or executed, habitat for other species or even the target species may be detrimentally affected.

Mitigation measures have been developed to reduce or eliminate detrimental effects or enhance wildlife and fish habitat during project activities described above. Mitigation measures are presented in Forest-wide Standards and Guidelines (S&Gs) and within each Management Prescription (See Chapter 4, Forest Plan, for full text). Where prescriptions have been developed to enhance a species or group of species, mitigation measures are included for other species which could be detrimentally affected.

## Consequences

Alternatives are assessed for their predicted effects on management indicator species (MIS). Most MIS are selected as representatives of a larger group of species which use the same vegetation, seral stage or special habitat, or have the same general requirements. Other species were selected because they are threatened, endangered, or sensitive; they are game species; or they are of concern to the public (Table 3-20). Land managers assume that if they maintain viable populations of these species, they will maintain viability of all species which use the Forest.

For this Plan, effects of alternatives are measured by one or more of the following: 1) predicted changes in populations of selected wildlife species; 2) habitat capability indices which use both the quantity and quality of wildlife habitat to measure effects on wildlife species; 3) acres of habitat maintained or improved (vegetation or habitat types and/or successional stages); 4) pounds of fish produced; 5) quantity of special habitats; and 6) qualitative assessments of various resource activities on wildlife or fish based on historical trends or literature.

The following describes effects of each alternative on each MIS. Species which are affected the same in all alternatives are presented once. Species which realize little or no effect from an alternative are not discussed. Some species may be discussed as a group rather than individually.

## All Alternatives

### Bald Eagle

Under all alternatives, management objectives contribute to bald eagle recovery goals and provide high capability habitat.

The Forest currently has 10 active bald eagle nests and 11 potential nest territories. Management provides for expected occupancy of 21 nest territories by the 2nd decade. All active and potential bald eagle areas are managed under the Raptor Management prescription. Active nest territories are managed to maintain current vegetation characteristics and insure protecting stands from wildfire, insects, and disturbance. Areas identified as potential nest territories are managed to achieve open-canopied stands of large eastside pine. Winter roosts are managed to reduce or eliminate current tree disease problems within the stands and reduce loss from wildfire. If predicted levels of occupancy are not met by the 2nd decade, habitat and program management are reevaluated to determine suitability of the potential habitat identified.

### Peregrine Falcon

Under all alternatives, the objectives are to reintroduce peregrine falcons to the Warner Mountains and establish a breeding population on the Forest. Although peregrine falcons may displace prairie falcons at nest sites, this does not affect overall prairie falcon populations within the area.

Recovering three active eyries during the 1st decade is another management objective under all alternatives. Suitable historic nest sites are currently available and funds are identified for reintroduction; but these efforts depend on the availability of young for hacking or for cross-fostering. Peregrine reintroduction is focused on other parts of the State, and reintroduction efforts on this Forest may not occur until the 2nd decade.

### Northern Spotted Owl

The Forest will continue surveys for spotted owls in the Medicine Lake Highlands and other portions of the Forest which provide suitable habitat. Where owls are documented, we will consult with the U.S. Fish and Wildlife Service to determine the biological significance of our findings.

### Modoc Sucker

All alternatives provide measures to increase Modoc sucker populations and improve critical habitat for the species.

Currently, 13.4 miles of moderate to high suitability streams are identified as Modoc sucker habitat. By the 1st decade, an additional six miles of stream are improved to moderate and high suitability standards. Two other streams outside the species' current range will be evaluated for habitat suitability and possible reintroduction of the Modoc sucker. These streams are selected by the end of the 1st decade. Management of the species is based on the current Action Plan for Recovery of the Modoc Sucker or on the Recovery Plan when developed. Exclusion of livestock, habitat improvements, and implementation of the Riparian Area prescription are the focus of recovery efforts on Forest-administered lands.

### Lost River and Shortnose Suckers

All alternatives provide measures to increase Lost River and shortnose sucker populations and improve critical habitat for the species.

The U.S. Fish and Wildlife Service is currently developing a Recovery Plan for Lost River and shortnose suckers; therefore, no recovery goals for the species have been established. Critical habitat for the species includes the Clear Lake and Lost River drainages. Until a Recovery Plan is developed, the Forest will focus recovery efforts on Forest-administered lands by implementing the Riparian Area Management Prescription, and rehabilitating and maintaining habitat of the drainages.

### Prairie Falcon, Osprey, Swainson's Hawk, and Golden Eagle

Habitat and protection of these species are maintained at or above current population levels under all alternatives. Populations do not significantly change over the next 50 years under management emphases in any alternative. Management direction is provided in Forest S&Gs and the Raptor Management prescription under all alternatives.

### Sandhill Crane

Under all alternatives, sandhill crane populations will increase. The Forest will provide habitat for at least 20 nesting pairs. Habitat improvement will result from wetland developments and livestock management strategies that maintain the integrity of nesting and brood-rearing habitat. Site-specific analysis and allocation of habitats for sandhill cranes generally occur at the allotment management planning level.

## PRF Alternative

### Bighorn Sheep

According to the *California Mountain Sheep Recovery Guidelines for Northeastern California*, bighorn sheep are reintroduced into the Warner Mountains by the end of the 1st decade. The population increases to an estimated 100 animals by the 3rd decade. Because only Raider and Hornback Canyons in the South Warner Wilderness are allocated to bighorn under this alternative, the bighorn population is managed at or below 100 animals to keep them within the carrying capacity of the range. Animals must be trapped and transported to other suitable ranges in the State. As the herd approaches carrying capacity, interactions with domestic sheep and cattle to the north and south of the current range may increase. This increases the risk of disease introduction into the herd. Herd productivity may decline within the next two decades because of disease, direct competition with livestock, or increasing interactions with recreationists in the Wilderness.

### Goshawk

Although enough suitable habitat is available, the amount of medium to high capability habitat for the goshawk is reduced by clearcutting. One hundred active nest territories is the desired population level under this alternative, but reductions in the acreage of old growth and mature conifer stands may preclude meeting this goal, especially on the Big Valley and Doublehead Ranger Districts where the minimum number of territories are not yet designated. Most territories on the Warner Mountain and Devil's Garden Districts are identified and protected. Goshawk territories are managed under the Raptor Management prescription which minimizes effects associated with road construction, recreation and other activities.

### Hairy Woodpecker/Cavity-Dependent Species

Overall, habitat for this and other cavity-dependent species increases in decades 1 through 5. Snag densities in mixed conifer, red fir and white fir will probably decrease because many acres are scheduled for regeneration harvest. These areas will still have densities greater than 1.5 snags per acre through the 1st decade. In addition, decreases in these conifer types are offset by increases in snag densities within eastside pine and natural snag recruitment.

Snag densities in eastside pine increase from 0.5 snags per acre in the 1st decade to 1.1 snags per acre in the 5th. Under this alternative densities of 1.5 snags per acre should be achieved by the 7th decade.

Forest-wide Standards and Guidelines provide 1.5 snags per acre on treated acres of well-stocked ponderosa pine stands. Replacement trees are retained to ensure that snag densities are met throughout the rotation.

In poorly stocked ponderosa pine sites, snag recruitment is slower. Forest-wide Standards and Guidelines provide for 0.3 snags per acre consisting of trees greater than 24" dbh. When these stands have completed a rotation cycle, then snag densities are managed to meet the 1.5 snag per acre standard.

### Pronghorn

Pronghorn populations meet currently established State goals for each herd, that is, they remain at current levels. Reducing AUMs allocated to livestock and establishing pronghorn AUM allocations on allotments within pronghorn range ensure enough forage to meet population needs. Current trends in vegetation succession may reduce habitat capability and pronghorn populations during the next 50 years. Habitat improvements occur for pronghorn following analysis of limiting factors. Habitat improvement for riparian areas provides additional high quality forage for pronghorn.

### Sage Grouse

Sage grouse populations are expected to remain at currently low levels for the 1st decade, but may slightly increase in future years. Habitat improves with improved range condition and special management around leks. This results from implementing Forest S&Gs and the Riparian Area and Rangeland prescriptions, reducing livestock AUM levels, and completing range improvements. These improvements in habitat may be offset by changes in vegetation resulting from natural succession.

### Deer

Sufficient habitat is provided to meet population goals agreed to under California Department of Fish and Game (CDFG) Deer Herd Plans. Populations are expected to increase by about 10,000 animals Forestwide within the next decade. About 29,000 acres are clearcut during the 1st decade, partly the result of the Timber-Forage Prescription which maintains high yields of forage production and provides for other deer needs, such as cover and water. AUMs are available to meet deer population needs and adjustments in livestock use, or range improvements provide these AUMs. Annually, over 300 acres of habitat improvements for deer occur during the 1st decade. Road construction and other short-term effects, such as cover reduction, may decrease habitat capability for deer in limited areas. But in many instances the effects are mitigated by road closures,

screening and other measures. Natural succession may reduce habitat capability on some deer ranges, but habitat improvement and/or resource coordination compensates for this habitat decline based on priority needs.

#### **Canada Goose and Mallard**

The Forest wetland development program continues under this alternative. Development of 6,474 acres of currently undeveloped wetlands for waterfowl production is planned, subject to funding from Duck Stamp funds and other sources. Total wetlands by the end of the 2nd decade cover 8,474 acres — 6,474 new acres plus 2,000 current acres. The basic character of the wetlands are not altered, but increased waterfowl production is achieved by constructing nesting islands. Livestock grazing is permitted in most wetlands, but selected wetlands may be excluded from grazing to enhance habitats for waterfowl or other wetland species, such as sandhill cranes.

#### **Pileated Woodpecker, Pine Marten**

Habitat for both species declines as older seral stages are harvested in red fir and mixed conifer. Old-growth habitat in these types decreases from 12% to 9% by the 5th decade. However, beyond the 5th decade, old growth increases as younger seral stages grow into this component. By the 10th decade, about 16% of Forest timberlands > 20 cu. ft. will be old growth.

The Forest contributes to these species' viability by managing 13 territories for pine marten and 5 territories for pileated woodpeckers on the Big Valley, Doublehead and Warner Mountain Ranger Districts. Within these territories, protection and enhancement of the species' habitat are emphasized.

The Forest applies diversity guidelines, down log and snag standards, and the Riparian Area Prescription outside the territories to ensure that adequate corridors are maintained for effective territory linkage.

Pine marten territories are approximately 2,000 acres within moderately suitable habitat. These territories, located on the Doublehead and Warner Mountain Ranger Districts, also can provide habitat for pileated woodpeckers.

Five territories (approximately 600 acres) are managed specifically for pileated woodpeckers on the Big Valley Ranger District. Each territory is managed to provide 300 contiguous acres of old growth within a 600-acre area.

#### **Western Gray Squirrel and Blue Grouse**

Western gray squirrel populations decline in some areas due to harvest of mature stands of eastside pine and

mixed conifer. Populations remain stable in areas containing mature oak and open-canopied, mature pine. Forest-wide S&Gs for oaks maintain viable populations of this species.

Effects of this alternative on blue grouse may vary. During the first 50 years, acres of 4A habitat types remain high (15-20%) and acres of feeding areas increase due to clearcutting. However, wintering habitat (mixed conifer and red fir 4B/C) decline. The effect of this is unknown, but blue grouse populations probably decline in some areas and increase in others. Increases or declines depend on the pattern and composition of the vegetation. Forest-wide S&Gs maintain viable populations of the species.

#### **Red-breasted and Red-naped Sapsuckers, Willow Flycatcher, and Yellow Warbler**

Habitat capability for these species improves as the condition of riparian areas improves. Riparian areas approach ecological potential by the 4th decade, which means increased woody vegetation in many of these areas. This benefits these species by providing more nesting habitat and cover. Riparian areas improve by improving livestock management, implementing structural range improvements to manage riparian areas, and implementing the Riparian Area prescription. Full ecological potential of riparian areas is realized by the 5th decade.

#### **Trout**

Stream habitat for trout improves; and pounds of trout produced increase approximately 2,000 pounds during the 1st decade and 7,000 pounds over the base year by the end of the 5th decade. Stream habitat improves as a result of implementing the Riparian Area prescription, improving livestock management, and providing structural and direct fish habitat improvements. Annually, 1-1/2 miles of streams are improved through structural and direct habitat improvement. Ten miles of streams are improved because of changes in managing riparian areas, which is accomplished by implementing the Riparian Area Management Prescription. These improvements increase invertebrate populations, instream cover, and instream pools. Woody vegetation, shade, and watershed stability increase while water temperatures and sedimentation decrease.

#### **Largemouth Bass**

Ten acres of annual habitat improvements in reservoirs increase bass production by 1,000 pounds in each decade. These improvements provide additional cover, spawning areas, and forage for this species within se-

lected reservoirs. Improvements do not change the basic character of the reservoirs.

## **CUR Alternative**

### **Bighorn Sheep**

The consequences to bighorn sheep are the same as described in the PRF alternative.

### **Goshawk**

A viable population of 73 active nest territories is the objective under this alternative. Although enough suitable habitat is available, the amount of medium to high capability habitat for the goshawk is reduced due to clearcutting. Providing the most suitable habitat necessary to maintain minimum numbers is difficult due to reduced acres of old growth and mature conifer stands. Goshawk territories are managed under the Raptor Management prescription which minimizes effects associated with road construction, recreation and other activities.

### **Hairy Woodpecker/Cavity-Dependent Species**

Habitat for cavity-dependent species increases substantially in the first three decades in eastside pine. Snags are created from green trees to achieve 1.5 snags per acre Forestwide by the 4th decade. Essentially all areas of available eastside pine are treated under this alternative.

### **Pronghorn**

Pronghorn populations meet currently established State goals for each herd, i.e., they remain at current levels. Pronghorn AUM allocations on allotments within pronghorn range ensure enough forage to meet these population levels. Current trends in vegetation succession may reduce habitat capability and pronghorn populations during the next 50 years. No habitat improvements are made directly for pronghorn because improvement needs are not known.

### **Sage Grouse**

Sage grouse populations are expected to remain at currently low levels for the 1st decade, but may slightly increase in future years. Improvements in habitat occur due to improved range condition and special management around leks. This results from implementing Forest S&Gs and the Riparian and Rangeland Management prescriptions, reducing livestock AUMs after the 1st decade, and completing range improvements. These improvements in habitat may be offset by changes in vegetation resulting from natural succession.

### **Deer**

Population goals identified in CDFG Deer Herd Plans are not met the 1st decade. Populations are expected to increase by 6,000 animals during the 1st decade, and the goals are met in the second and 3rd decades. However, populations again decrease in the 4th and 5th decades. Decreases are the result of maintaining livestock AUMs during the 1st decade and restricting acres for the Timber-Forage prescription. Fewer acres are clearcut, which also reduces forage production from timber lands. Habitat improvements are made on about 100 acres to meet deer forage needs.

### **Canada Goose and Mallard**

The Forest Wetland Development Program continues under this alternative. Development of 4,059 acres of currently undeveloped wetlands for waterfowl production is planned, subject to funding from Duck Stamp funds and other sources. Total wetlands by the end of the 2nd decade cover 6,059 acres — 4,059 new acres plus 2,000 current acres. Only wetlands identified as low investment or those needed for eagles will be developed. The basic character of the wetlands are not altered, but increased waterfowl production is achieved by constructing nesting islands. Livestock grazing is permitted in most wetlands, but selected wetlands may be excluded from grazing to enhance habitats for waterfowl or other wetland species, such as sandhill cranes.

### **Pileated Woodpecker, Pine Marten**

Habitat for both species declines with reduction in acres of old-growth conifer habitat. By the 5th decade, old-growth habitat declines steadily to approximately 75% of the base year. Populations of both species are maintained by preserving at least 5% of capable timber lands in old growth.

### **Western Gray Squirrel and Blue Grouse**

Consequences for gray squirrel and blue grouse are the same as described in the PRF Alternative.

### **Red-breasted and Red-naped Sapsuckers, Willow Flycatcher, Yellow Warbler**

Habitat capability for these species improves as the overall condition of riparian areas improves. However, conditions in many areas do not improve until the 2nd decade, because current livestock levels are maintained in the 1st decade. By the 4th decade, riparian areas approach ecological potential, which means increased woody vegetation in many of these areas. The sapsucker, flycatcher, and warbler benefit from increased nesting habitat and cover. Improvement in riparian areas is accomplished by reducing livestock AUMs, implementing

structural range improvements to manage riparian areas, implementing the Riparian Area prescription, and making direct riparian improvements. Full ecological potential of riparian areas is realized by the 5th decade.

#### **Trout**

Stream habitat for trout improves; pounds of trout produced increases approximately 2,800 pounds during the 1st decade and more than 10,000 pounds over current by the end of the 5th decade. Stream habitat improves as a result of implementing the Riparian Area prescription, reducing livestock AUMs and structural improvements, and making direct fish habitat improvements. Annually, 2-1/2 miles of streams are improved through structural and direct habitat improvement. Ten miles of streams improve because of changes in managing riparian areas, which is accomplished by implementing the Riparian Area Management Prescription. These improvements increase instream cover, invertebrate populations, and the number of pools. Woody vegetation, shade and watershed stability increase, while water temperatures are lowered and sedimentation reduced.

#### **Largemouth Bass**

Annual bass production remains virtually unchanged from current production. No habitat improvements occur for this species.

### **RPD Alternative**

#### **Bighorn Sheep**

Consequences to bighorn sheep are the same as described in the PRF Alternative.

#### **Goshawk**

Consequences to goshawk are the same as described in the CUR Alternative.

#### **Hairy Woodpecker/Cavity-Dependent Species**

Consequences to hairy woodpecker and cavity-dependent species are the same as described in the CUR alternative.

#### **Pronghorn**

Consequences to pronghorn are the same as described in the CUR Alternative.

#### **Sage Grouse**

Consequences to sage grouse are the same as described in the CUR Alternative.

#### **Deer**

Deer populations exceed State deer herd goals after the 3rd decade. Populations increase and remain high due to large acreages of early successional stages created through timber harvest. The Timber-Forage prescription is applied to 22,000 acres the 1st decade, which maintains high forage production in harvest units. About 2,800 acres of habitat per year are improved to sustain high populations.

#### **Canada Goose and Mallard**

Consequences to Canada goose and mallard indicator species are the same as described in the PRF Alternative.

#### **Pileated Woodpecker, Pine Marten**

Habitat for both species declines as acres of old-growth conifer habitat is reduced. By the 5th decade, old-growth habitat declines steadily to approximately 60% of the base year. Viable populations of both species are maintained by preserving at least 5% of capable timber lands in old growth.

#### **Western Gray Squirrel and Blue Grouse**

Consequences to gray squirrel and blue grouse are the same as described in the PRF Alternative.

#### **Red-breasted and Red-naped Sapsuckers, Willow Flycatcher, Yellow Warbler**

Habitat capability for these species improves as the overall condition of riparian areas improves. Most riparian areas develop woody vegetation where it does not currently exist; however, many areas do not reach full ecological potential by the 5th decade, and improvements are slower. Livestock production remains near current levels, and structural improvements alone are not enough to achieve objectives in all riparian areas.

#### **Trout**

Consequences to trout are the same as described in the PRF Alternative.

#### **Largemouth Bass**

Ten acres of annual habitat improvements in reservoirs increase bass production by 1,000 pounds during each decade. Improvements provide additional cover, spawning areas, and forage for this species within selected reservoirs. Improvements do not change the basic character of these reservoirs.



## IND Alternative

### Bighorn Sheep

Consequences to bighorn sheep are the same as described in the PRF Alternative.

### Goshawk

Consequences to goshawk are the same as described in the CUR Alternative.

### Hairy Woodpecker/Cavity-Dependent Species

Consequences to hairy woodpecker and cavity-dependent species are the same as described in the PRF alternative.

### Pronghorn

Consequences to pronghorn are the same as described in the CUR Alternative.

### Sage Grouse

Consequences to sage grouse are the same as described in the CUR Alternative.

### Deer

Deer populations remain near current population levels during the 1st decade due to availability of forage for livestock. For the next four decades, deer populations exceed State deer herd goals as AUMs are available to deer, and large acreages of early successional stages are created through timber harvest. No habitat improvements are planned under this alternative.

### Canada Goose and Mallard

Consequences to Canada goose and mallard indicator species are the same as described in the CUR Alternative.

### Pileated Woodpecker, Pine Marten

Habitat for both species declines as acres of old-growth conifer habitat are reduced. By the 5th decade, old-growth habitat declines steadily to approximately 40% of the base year. Habitat for both species are maintained by preserving at least 5% of capable timber lands in old growth.

### Western Gray Squirrel and Blue Grouse

Consequences to gray squirrel and blue grouse are the same as described in the PRF Alternative.

### Red-breasted and Red-naped Sapsuckers, Willow Flycatcher, Yellow Warbler

Consequences to these riparian-dependent species are the same as described in the CUR Alternative.

## Trout

Stream habitat for trout improve; estimated pounds of trout produced increase 1,800 pounds during the 1st decade and more than 5,000 pounds above the base year by the end of the 5th decade. Stream habitat improves as a result of implementing the Riparian Area prescription, reducing livestock AUMs and structural improvements, and making direct fish habitat improvements. Annually, one mile of streams is improved through structural and direct habitat improvement. Ten miles of streams are improved because of changes in managing riparian areas, which is accomplished by implementing the Riparian Area Management Prescription. These improvements increase instream cover, invertebrate populations, and the number of pools. Woody vegetation and shade increase, while water temperatures are lowered. Suspended sediment and deposition in streams are likely to remain high because of increased ground disturbance.

### Largemouth Bass

Annual bass production remains virtually unchanged from current production. No habitat improvements are made for this species.

## RBV Alternative

### Bighorn Sheep

Consequences to bighorn sheep are the same as described in the PRF Alternative.

### Goshawk

Goshawk populations increase to 90 pairs by the 3rd decade due to a reduced level of timber harvest. Dense-canopied old growth and mature timber remain at relatively high levels for the next 50 years. All nest territories meet at least moderate habitat capability standards. Territories are managed under the Raptor Management prescription which maintains or improves habitat capability of the nest stands.

### Hairy Woodpecker/Cavity-Dependent Species

Consequences to hairy woodpecker and cavity-dependent species are the same as described in the CUR alternative.

### Pronghorn

Pronghorn populations meet currently established State goals for each herd, and may exceed these goals in the future as livestock AUMs are substantially reduced. The increase in forage available to pronghorn might be offset by natural succession as climax or subclimax communities replace early successional stages. No habitat

improvements are made directly for pronghorn because improvement needs are not known.

#### **Sage Grouse**

Sage grouse populations are expected to remain at currently low levels for the 1st decade, but may increase as a result of livestock reductions and improved range management. Habitat improves due to improved range condition and special management around leks. This results from implementing of Forest S&Gs and the Riparian Area and Rangeland prescriptions, reducing livestock AUM after the 1st decade, and completing range improvements. Habitat improvements may eventually be offset by changes in vegetation resulting from natural succession.

#### **Deer**

Population goals identified in CDFG Deer Herd Plans are exceeded in all decades. Populations are expected to increase from reducing livestock and allowing more forage available for deer. Timber harvest volume is lower than the base year, but substantial acres are allocated under the Timber-Forage prescription. No habitat improvements are made for deer.

#### **Canada Goose and Mallard**

The Forest Wetland Development Program continues under this alternative, but only those wetlands needed to meet bald eagle objectives are developed. Approximately 1,084 acres are developed contingent on funding by Duck Stamp funds and other sources. The basic character of these wetlands is not altered, but construction of nesting islands increases waterfowl production. Livestock grazing is permitted in new wetlands only if it is compatible with bald eagle objectives.

#### **Pileated Woodpecker, Pine Marten**

By the 5th decade, habitat for both species declines slightly (about 10%). Populations of both species are maintained by preserving at least 5% of capable timber lands in old growth.

#### **Western Gray Squirrel and Blue Grouse**

Western gray squirrel populations remain near current levels. Reduced timber harvest levels result in more acres of mature successional stages left as suitable habitat.

Blue grouse populations may remain near current levels or increase slightly. Timber harvest increases interdispersion of feeding areas; and mature, closed-canopied stands are maintained above minimum levels.

#### **Red-breasted and Red-naped Sapsuckers, Willow Flycatcher, Yellow Warbler**

Habitat capability for these species improves as the overall condition riparian areas improves. By the 3rd decade, riparian areas approach ecological potential, which means increased woody vegetation in many of these areas. The species benefit from increased nesting habitat and cover. Riparian areas improve by reducing livestock AUMs, implementing structural range improvements to manage riparian areas, implementing the Riparian Area prescription, and making direct riparian improvements. Full ecological potential of riparian areas is realized by the 4th decade.

#### **Trout**

Consequences for trout are the same as described in the PRF Alternative.

#### **Largemouth Bass**

Annual bass production remains virtually unchanged from current production. No habitat improvements are made for this species.

### **AMN Alternative**

#### **Bighorn Sheep**

According to the *California Mountain Sheep Recovery Guidelines for Northeastern California*, bighorn sheep are reintroduced into the Warner Mountains. The population increases to an estimated 300 animals by the end of the 4th decade. Bighorn are reintroduced into all suitable habitat in the Warner Mountains. In the South Warner Wilderness, the bighorn population expands into suitable habitat north and south of their current range. Bighorn are also reintroduced into the Soldier Creek and Mount Bidwell areas. To prevent interactions with domestic sheep and cattle, allotments or portions of allotments within suitable bighorn range are closed and domestic livestock excluded. Closures and exclusions reduce the risk of disease introduction into the herds and maximize the habitat available to bighorn. Seasonally, roads are closed where needed to reduce conflicts with other Forest users.

#### **Goshawk**

Goshawk populations steadily increase to 110 pairs by the 5th decade as timber harvest levels are reduced. Dense canopied old growth declines in eastside pine, but remains high in the 4B/C and 3B/C seral stages. Ten percent old-growth habitat in mixed conifer and red fir also adds more habitat. All nest territories meet at least moderate habitat capability standards. Goshawk territo-

ries are managed under the Raptor Management prescription which maintains or improves habitat capability of the nest stands.

#### **Hairy Woodpecker/Cavity-Dependent Species**

Consequences to hairy woodpecker and cavity-dependent species are the same as described in the PRF alternative.

#### **Pronghorn**

Consequences to pronghorn are the same as described in the RBU Alternative.

#### **Sage Grouse**

Consequences to sage grouse are the same as described in the RBU Alternative.

#### **Deer**

Population goals identified in CDFG Deer Herd Plans are exceeded in all decades. Populations are expected to increase as livestock AUMs are reduced and more forage is available for deer. Timber harvest is lower than the base year, but substantial acres are allocated under the Timber-Forage prescription. No habitat improvements are made for deer.

#### **Canada Goose and Mallard**

Consequences to Canada goose and mallard indicator species are the same as described in the PRF Alternative.

#### **Pileated Woodpecker, Pine Marten**

Habitat for both species remains relatively stable. Management contributes to population viability by (1) preserving at least 5% of capable timber lands in old growth, and (2) managing 13 territories for pine marten and 5 for pileated woodpeckers (see also the PRF alternative narrative). By the 10th decade, old growth comprises 21% of the > 20 cu. ft. lands.

#### **Western Gray Squirrel and Blue Grouse**

Consequences to gray squirrel and blue grouse are the same as described in the RBU Alternative.

#### **Red-breasted and Red-naped Sapsuckers, Willow Flycatcher, Yellow Warbler**

Consequences to these riparian-dependent species are the same as described in the RBU Alternative.

#### **Trout**

Consequences to trout are the same as described in the PRF Alternative.

#### **Largemouth Bass**

Annual bass production remains virtually unchanged from current production. No habitat improvements are made for this species.

## **25. Wild and Scenic Rivers**

The Forest identified Willow and Boles Creeks as eligible for inclusion in the National Wild and Scenic River System. A suitability determination is pending further study and will be accomplished following release of the Forest Plan.

Under all alternatives, cultural resource values—which led to the eligibility determination—will receive interim protection through the application of cultural resource standards and guidelines. Further, no alternative proposes activities which will modify the undeveloped nature of these drainages.

#### **Consequences**

Under all alternatives, Willow and Boles Creek, and their inherent resource values, will remain virtually unchanged throughout the interim protection period. Any impacts resulting from the suitability determination will be analyzed and disclosed at the time of that decision.

## **26. Woodlands**

Woodlands on the Forest are composed of aspen, black oak, and western juniper. Activities affecting woodlands are:

- Timber harvest
- Firewood cutting
- Habitat improvement

Timber harvest affects woodlands when the incidental harvest or damage of oaks, aspen, or juniper occurs during conifer removal. Although no stands which are composed of a majority of these species are scheduled to be harvested, scattered oaks, aspen, and juniper are sometimes removed during commercial conifer logging.

Timber harvest also affects woodlands, specifically oak woodlands, when the overstory pine trees and smaller diameter pine are removed. Removal reduces competition for moisture and nutrients and benefits the residual oak trees.

Juniper woodlands are affected the most by firewood cutting. In most cases, woodcutters remove large trees which provide the best wildlife habitat and are the most aesthetically pleasing. On the other hand, firewood cutting reduces juniper trees on rangelands, allowing forage to grow for livestock and wildlife. Under a well-planned firewood program, like the one used on the Doublehead Ranger District, firewood cutting will accommodate local demand and enhances grass production.

Aspen is not a popular firewood and few gathered it when the Forest offered it for personal use without charge. When the Forest offers oak for sale, although infrequently, it is readily purchased.

Habitat improvement projects are designed to improve aspen, oak and juniper woodlands as habitat for wildlife. Within 100 years aspen die naturally. Rejuvenation projects, i.e., clearcutting aspen, is necessary for the

stand to regenerate and grow. Commercial thinning sales are periodically offered to promote oak regeneration (necessary for stump-sprouting), and improve growth and mast production for wildlife habitat.

## Consequences

Under all alternatives, aspen is managed to achieve multi-aged stands. Oaks are not usually cut on the Forest unless it benefits the residual stand or improves wildlife habitat. Minimum basal area per acre are contained in Forest Standards and Guidelines for deer intermediate and winter ranges, and for other areas where oaks occur. Although more juniper is removed for firewood over the next 50 years, growth rate easily exceeds removal rate. (See Firewood section of this Chapter for further discussion.)

## **C. Means to Mitigate Adverse Impacts**

Mitigation measures are an inherent part of each alternative. They are applied as minimum management requirements, timber policy constraints, minimum implementation requirements, Regional herbicide policy, and Forest-wide Standards and Guidelines. These measures are discussed in Chapter 2, Section E of the DEIS. The full text of Standards and Guidelines is in Chapter 4 of the Forest Plan. The most significant mitigating measures are highlighted below.

### **Air Quality**

Prescribed burning will be conducted in compliance with federal, State, and local air quality regulations. Smoke management plans will be incorporated into project level prescriptions.

### **Cultural Resources**

Cultural resources will be inventoried before project implementation on Forest activities affecting those resources. Projects will be designed to protect significant cultural sites or provide for recovery of their values.

### **Diversity**

Standards and Guidelines requiring 5% of each successional stage will be evaluated at the project, compartment, management area and Forest level to track compliance. Improved old-growth and vegetation surveys will be conducted to determine specific seral stages and needs for maintenance. Habitat and wildlife populations will be monitored to ensure that viability or population targets are met.

### **Facilities**

Roads and trails will be designed to protect and enhance resources, and will be subject to Best Management Practices (BMPs).

### **Soils**

Land-disturbing activities will be located and scheduled to minimize cumulative watershed effects in sensitive watersheds. Order 2 or field verified Order 3 soil surveys will be conducted on projects to assess soil capability and suitability. Compliance and effectiveness of site-specific recommendations will be monitored.

### **Visual Resource**

Effects of management activities on visual quality will be mitigated by considering locations, sizes, shapes, colors, screening, textures, densities, types of prescriptions, construction concepts, and cumulative effects. Clearcuts

and other vegetative treatments will have irregular shapes, edges, islands, and leave-strips to emulate natural landscapes.

### **Water and Riparian Areas**

Land-disturbing activities will be located and scheduled to minimize risk of cumulative watershed impacts. All activities will be subject to BMPs. Structural range improvements, such as fencing, will mitigate the effects of grazing riparian areas.

### **Wildlife and Fish**

Inventories will be conducted before project implementation to assess potential impacts to fish and wildlife. Long-term plans, such as allotment and timber sale plans, will be compared to fish and wildlife direction to ensure compliance. Standards and guidelines and management prescriptions will be implemented to ensure species emphasis where appropriate and long-term viability for all species.

## **D. Adverse Environmental Effects Which Cannot be Avoided**

Although mitigation measures will be applied to all Forest activities, some adverse environmental effects are inevitable. The most significant of these are:

### **Air Quality**

Short-term impairment of air quality will occur from dust and auto emissions as a result of increased vehicle use. Smoke from prescribed burning will impair visibility for Forest visitors and local residents for less than a day at a time. Large wildfires will continue to reduce air quality; the effect will last from one to several days at a time.

### **Cultural Resources**

Cultural resource sites will be disturbed by vehicles and unauthorized collection of surface artifacts if public access, firewood cutting and dispersed recreation use are not strictly controlled. Increased ground-disturbing activities will also increase potential for inadvertent damage to cultural resources. Natural phenomena, such as wildfires, erosion, and flooding, will continue to disturb sites.

### **Diversity (see Wildlife)**

### **Soils**

Road construction and reconstruction will increase erosion and permanent loss of productive land. Vegetation management activities, including prescribed burn-

ing, will cause short-term erosion and sedimentation in streams. Skid trails will remove a small portion of the land base from production.

#### **Special Interest Areas**

Attributes for which special interest areas were designated will naturally deteriorate.

#### **Visual Resource**

Periodic regeneration timber harvests and road construction will decrease visual quality seen from travel corridors and use areas. Prescribed burns will create texture and color changes in conifer landscapes. Firelines around wildfires will continue to create unnatural contrast to the landscape.

#### **Water and Riparian Areas**

Management activities such as timber harvesting, site preparation, and road construction will cause temporary sedimentation at levels below State water quality objectives. Grazing will continue causing sedimentation for several decades. Riparian areas will not fully recover to satisfactory ecological condition for 3-5 decades because of the time needed to implement improved grazing strategies.

#### **Wildlife**

As mature and old-growth timber is harvested, populations of wildlife species dependent on these vegetation types for habitat will decline. Snags in eastside pine do not meet the 1.5 snags per acre management requirement for at least three decades. Snags and cavity-dependent species will also decline in the 6th to 7th decades due to the increase of conifer stands in the under-80-year age class. New road construction will permanently reduce some wildlife habitats.

Management areas which currently provide less than 5% old growth will not meet the standard within the management area for several decades.

### **E. Relationship Between Short-Term Uses and Long-Term Productivity**

Forest management is a long-term venture serving the year-to-year needs of society. Long-term productivity is the land's continued ability to provide resource outputs. This inherent ability is lost if soil productivity and water quality are impaired. Consequently, long-term productivity depends on soil conservation and the sustained health of its living systems.

The Forest Plan incorporates the sustained yield of resource outputs while maintaining productivity of the resources. Imposing specific direction and constraints on each alternative ensures that short-term management practices will not impair long-term production. Plan implementation will be monitored and evaluated to determine whether standards and guidelines are met. Chapter 5 of the Plan describes monitoring and evaluation.

### **F. Irreversible or Irretrievable Commitment of Resources**

Irreversible commitments of resources are decisions causing changes that cannot be reversed; once used, the resources cannot be reinstated nor can opportunities be renewed. Examples of irreversible commitments include road and dam construction, cultural resource disturbance, and mineral extraction.

Irretrievable commitments are opportunities for production or use of resources that are foregone because of land use decisions, allocations, or constraints. Examples are loss of timber production, livestock grazing, or developed recreation outputs to provide for enhanced wildlife habitat or visual quality. The decisions are reversible, but the production opportunities foregone while the constraints are in effect are irretrievable.

Specific irreversible and irretrievable commitments determined by land uses within the alternatives are summarized below.

#### **Cultural Resources**

Under all alternatives some irretrievable loss of cultural resources occurs from increased dispersed recreation, project damage, and unauthorized surface collection of artifacts.

#### **Diversity**

Under all alternatives timber harvest, grazing and other activities will irreversibly and irretrievably alter the current arrangement of vegetation types and wildlife populations on the Forest. Most of the old growth and mature stands are foregone until future decades when existing young stands enter late seral stages. Habitats are managed to ensure viability of species dependent on old growth.

#### **Facilities**

Under all alternatives, road construction causes irreversible loss of land productivity, cultural resources, and wildlife habitat.

## **Minerals**

Under all alternatives, extracting valuable mineral material is likely. Such extraction is an irreversible commitment of mineral resources. Extraction of some types of minerals may be foregone or delayed as a result of management constraints throughout all alternatives. Foregone opportunities for mineral production are considered irretrievable commitments.

## **Pest Management**

In alternatives with fewer pest management opportunities, there is greater loss in timber volume through mortality or slowed growth from pests. Although the decision to engage in less pest management is not irreversible, the loss of timber volume is irretrievable. RBU and AMN alternatives result in the most volume loss; RPD and IND result in the least loss; and PRF and CUR result in moderate loss.

## **Soils**

In all alternatives, some soil productivity would be irreversibly lost due to land-disturbing activities such as OHV use, timber harvesting, road construction, livestock grazing, and fire. Losses are heaviest under IND, RPD and PRF.

## **Timber**

In all alternatives, opportunities for full production are foregone on those acres to which these prescriptions are applied: Minimum Level, Semi-Primitive Non-Motorized, Visual Retention, Raptor Management, Timber-Visuals, Timber-Forage, Uneven-Aged Management, and Riparian Area. These opportunities are not irreversible and, in many cases, are not irretrievable.

## **Water and Riparian Areas**

Under all alternatives, livestock grazing causes irretrievable loss of water quality and riparian area production.

## **Wildlife and Fish**

Alternatives emphasizing timber and livestock forage production result in irretrievable reductions in wildlife and fish habitat and deer forage. Loss of various habitat types typically results in reductions of those species dependent on them.

## **G. Possible Conflicts with Federal, Regional, State, and Local Land Use Plans**

Under CUR and IND alternatives possible conflict could arise with the following plans:

- State of California, Department of Fish and Game, Deer Herd Plans

The following plans could conflict with the PRF alternative:

- State of California Off-Highway Vehicle (OHV) Plan
- Oregon Department of Fish and Wildlife herd management objectives

The State's planned route through the Warner Mountains conflicts with lands designated as semi-primitive non-motorized.

## **H. Energy Requirements and Conservation Potential**

All Forest activities consume or produce various forms of energy. For ease of comparison, energy is converted into an equivalent form, the British Thermal Unit (BTU). Forest activities that use or provide significant levels of energy are fire, firewood, range, recreation, road construction, and timber management. Their equivalent BTU levels of yield and consumption are shown in Table 4-20. Efforts to reduce consumption include retrofitting buildings with energy-efficient materials during routine maintenance, and replacing fleet vehicles with smaller, gas-saving vehicles when possible. Forest users can increase energy yields through hydroelectric power and biomass conversion (other than sawmill residue utilization).

### **Fire**

Fire management activities are always energy consumptive. The amount of wood energy consumed is based on acres of fuel treatment and fire suppression. Fire management or fire itself yields no useful energy.

### **Firewood**

Firewood is used mostly for home space heating, and is, therefore, directly comparable to other energy sources such as electricity, natural gas or oil. Generally, more energy is produced using firewood than is expended in its production. Consumption is minor, involving transportation and gathering.

## Range

Energy is consumed in range management by vehicle operation, livestock transportation, structural improvements, water source developments, and forage improvement activities such as seeding or herbicides. Energy yield is measured in terms of meat production.

## Recreation

Transportation to campgrounds and other recreational sites, and construction, maintenance and operation of recreation facilities are consumptive activities associated with recreation. Similar to meat production from range, deer harvest yields a small amount of energy.

## Roads

Road construction, reconstruction and maintenance produces no energy. Much energy is consumed during the operation of heavy construction equipment. Using roads for all activities consumes energy.

## Timber

Timber management consumes and produces the most energy on the Forest. Processing Forest products is the major energy consumer associated with timber, followed by transportation, logging, and management (e.g., sale administration and reforestation). Biomass conver-

sion produces energy, usually from sawmill residue-powered boilers.

## All Alternatives

Under all alternatives, energy consumption or production from recreation and firewood are constant. Net energy consumption is directly correlated to timber yields; the higher the timber yields, the higher the net energy consumption.

## PRF, CUR, RPD and IND Alternatives

Generally, under these alternatives energy consumption or production from road construction, and timber, fire and range management is higher than under RBU and AMN. Each of these alternatives have higher net energy consumption than RBU and AMN.

## RBU and AMN Alternatives

Energy consumption or production under these alternatives is typically lower than under other alternatives. However, consumption by recreation under AMN is higher than any other alternative.

Energy consumption or production under these alternatives is typically lower than under other alternatives. However, consumption by fire under RBU and PRF are comparable in the 1st decade.

**Table 4-20. Energy Consumption and Yield by Alternative.**

Resource		PRF	CUR	RPD	IND	RBU	AMN
		(average annual million BTUs for the 1st decade)					
Fire Management	consume	51,193	48,736	55,693	53,143	48,436	50,941
Firewood	consume	1,725	1,725	1,725	1,725	1,725	1,725
	yield	156,825	156,825	156,825	156,825	156,825	156,825
Range	consume	15,790	16,680	16,319	18,292	13,900	13,066
	yield	22,720	24,000	23,480	26,320	20,000	18,980
Recreation	consume	75,054	71,669	80,772	68,984	75,718	81,386
	yield	1,011	899	1,237	775	1,070	1,302
Roads	consume	37,315	34,797	42,216	39,595	31,586	32,923
Timber	consume	1,169,124	1,153,416	1,674,024	1,402,500	828,036	713,592
	yield	229,240	226,160	328,240	275,000	162,360	139,920
Total Consumption		1,350,201	1,327,023	1,870,749	1,584,239	999,401	893,633
Total Yield		409,796	407,884	509,782	458,920	340,255	317,027
Net Consumption		940,405	919,139	1,360,967	1,125,319	659,146	576,606









# GLOSSARY

## Acronyms

<b>AIRFA</b>	American Indian Religious Freedom Act	<b>MMR</b>	Minimum management requirement
<b>AMN</b>	Amenity alternative	<b>NDY</b>	Non-declining yield
<b>AMS</b>	Analysis of the management situation	<b>NEPA</b>	National Environmental Policy Act
<b>ASQ</b>	Allowable sale quantity	<b>NFMA</b>	National Forest Management Act
<b>AUM</b>	Animal unit month	<b>NIIPA</b>	National Historic Preservation Act
<b>BLM</b>	Bureau of Land Management	<b>NIC</b>	Separate non-interchangeable component
<b>BMP</b>	Best Management Practice	<b>NNL</b>	National Natural Landmark
<b>CDF</b>	California Department of Forestry	<b>NPS</b>	National Park Service
<b>CDFG</b>	California Department of Fish and Game	<b>NRHP</b>	National Register of Historic Places
<b>CEQ</b>	Council on Environmental Quality	<b>NSO</b>	No surface occupancy
<b>CFR</b>	Code of Federal Regulations	<b>OIIV</b>	Off-highway vehicle
<b>CMAI</b>	Culmination of mean annual increment	<b>ORV</b>	Off-road vehicle
<b>CSO</b>	Conditional Surface Occupancy	<b>P.L.</b>	Public law
<b>CUR</b>	Current alternative	<b>PAOT</b>	Persons at one time
<b>CWI</b>	Cumulative watershed impacts	<b>PNV</b>	Present net value
<b>DBH</b>	Diameter at breast height	<b>PRF</b>	Preferred alternative
<b>DEIS</b>	Draft environmental impact statement	<b>RBU</b>	Reduced budget alternative
<b>EA</b>	Environmental assessment	<b>RIM</b>	Recreation Information Management
<b>EFFALT</b>	Effective alteration	<b>RNA</b>	Research natural area
<b>EPA</b>	Environment Protection Agency	<b>ROS</b>	Recreation opportunity spectrum
<b>ESI</b>	Erosion and sedimentation index	<b>RPA</b>	Forest and Rangeland Renewable Resources Planning Act
<b>EVC</b>	Existing visual condition	<b>RPD</b>	Resource Planning Act alternative with departure
<b>FERC</b>	Federal Energy Regulatory Commission	<b>RVD</b>	Recreation visitor day
<b>FLPMA</b>	Federal Land Policy and Management Act of 1976	<b>RX</b>	Prescription
<b>FSH</b>	Forest Service Handbook	<b>SHPO</b>	State Historic Preservation Officer
<b>FSM</b>	Forest Service Manual	<b>SIA</b>	Special interest area
<b>FUD</b>	Future use determination	<b>SPM</b>	Semi-primitive motorized
<b>FY</b>	Fiscal year	<b>SPNM</b>	Semi-primitive non-motorized
<b>ICOs</b>	Issues, concerns and opportunities	<b>SRI</b>	Soils resource inventory
<b>IND</b>	Industry alternative	<b>T&amp;E</b>	Threatened and endangered species
<b>IPM</b>	Integrated pest management	<b>TSI</b>	Timber stand improvement
<b>IVQO</b>	Initial visual quality objective	<b>USC</b>	United States Code
<b>K-V</b>	Knutsen-Vandenberg Act	<b>USDA</b>	U. S. Department of Agriculture
<b>LBNM</b>	Lava Beds National Monument	<b>USDI</b>	U. S. Department of the Interior
<b>LTSY</b>	Long-term sustained yield	<b>USFWS</b>	U. S. Fish and Wildlife Service
<b>MBF</b>	Thousand board feet	<b>VQI</b>	Visual quality index
<b>MCF</b>	Thousand cubic feet	<b>VQO</b>	Visual quality objective
<b>MIR</b>	Minimum implementation requirement		
<b>MIS</b>	Management indicator species		
<b>MMBF</b>	Million board feet		

## Definitions

### A

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**ASQ** See allowable sale quantity.

**AUM** See animal unit month.

**acre-foot** The amount of water or sediment that would cover one acre to a depth of one foot (43,560 cubic feet; 326,000 gallons).

**activity** A work process that is conducted to produce, enhance, or maintain an output or achieve an administrative and/or environmental quality objective.

**activity fuels** Fuels which have been directly generated or altered by management activity.

**activity outputs** The quantifiable goods or services resulting from any management actions taken on the Forest.

**administrative cost** Costs of required general administration which are prorated over fixed, variable, and investment costs.

**administrative unit** All the national forest system lands for which one Forest Supervisor has responsibility.

**administratively-designated areas** Areas designated by the Secretary of Agriculture, the Chief of the Forest Service, or the Regional Forester because they merit special attention and management, such as scenic or geological areas.

**affected environment** The physical, biological, social, and economic environment within which human activity is proposed.

**age class** One of the intervals, usually 10 to 20 years, into which the age range of vegetation is divided for classification or use.

**aggradation** Accumulation of sediment or other debris in a reach of stream.

**aggregate sources** Areas where mineral materials (rock, sand, gravel, etc.) can be extracted.

**allocation** The assignment of sets of management practices to particular land areas to achieve the goals and objectives of the alternative.

**allotment** See range allotment.

**allowable sale quantity (ASQ)** The maximum quantity of timber that may be sold from land capable, available, and suitable for timber production for a time period; usually expressed on an average annual basis.

**alternative** In Forest planning, a given combination of resource uses and a mix of management practices that achieve a desired management direction, goal, or emphasis.

**amenity (amenity value)** Typically used in land management planning to describe those resources for which market values (or proxy values) are not or cannot be established. See also non-market outputs.

**AMS** See Analysis of the Management Situation.

**anadromous fish** Fish that live in saltwater and migrate to fresh water to spawn. Salmon, steelhead, and shad are examples.

**analysis areas** An aggregation of like capability areas with sufficiently similar physical, biological, and administrative conditions such that they would probably respond in a like manner to management activities. See also capability areas.

**analysis of the management situation (AMS)** A step in Forest planning in which the Forest's ability to supply goods and services in response to society's demand for those goods and services is determined.

**animal unit month (AUM)** A base line value considered to be one mature cow (1,000 pounds) or the equivalent based upon average daily forage consumptions. (For land management planning purposes, Region 5 uses 1,000 pounds of air dried forage per month).

**appropriate suppression response** The planned strategy for suppression action (in terms of kind, amount, and timing) on a wildfire which most efficiently meets fire management direction under current and expected burning conditions. The response may range from a strategy of prompt control to one of containment or confinement.

**aquifer** A water-bearing bed or stratum of permeable rock, sand, or gravel capable of yielding water to wells or springs.

**area of influence** A delineated geographic area within which the present or proposed actions of a forest unit exert an important influence on residents and visitors.

**arterial roads** See roads.

**aspect** The compass direction that the slope of a land surface faces.

**assigned value** A monetary value that represents the price consumers would be willing to pay for Forest outputs, whether or not such prices are actually paid to the Federal Government by consumers. In Forest planning the term assigned values refers to both market and nonmarket outputs because it is National policy to provide most Forest outputs at either no charge to consumers or at a price less than the willingness to pay price.

**average annual cut** The volume of timber harvested in a decade, divided by 10; used as a basis for comparison of alternatives.

## B

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**BLM** See Bureau of Land Management Planning.

**BMPs** See Best Management Practices.

**BSS** See Base Sale Schedule.

**backcountry** An undeveloped area where dispersed, off-road recreation such as hiking and trail bike riding may occur. Generally describes semiprimitive motorized and semiprimitive nonmotorized recreation opportunities.

**background** The view beginning 3-5 miles from the observer and as far into the distance as the eye can detect the presence of objects.

**background level (background, natural background level)** The ever-present environmental conditions or effects above which the phenomenon must manifest itself in order to be detected.

**backlog** Work done by the Forest Service, such as reforestation, timber stand improvement, slash disposal and land line location, which needs to be completed.

**basal area** The cross-sectional area of a stand of trees measured at 4.5 feet above the ground; expressed in square feet.

**base sale schedule (BSS)** The timber sale schedule in which the quantity of timber planned for sale and harvest for any future decade is equal to or greater than the planned sale and harvest for the preceding decade of the planning period and this planned sale and harvest for any decade is not greater than the long-term sustained yield capacity.

**base timber harvest schedule** See base sale schedule.

**benchmark** An analysis of the supply potential of a particular resource, or of a set of resources subject to specific management objectives or constraints. Benchmarks define the limits within which alternatives can be formulated.

**benefit** The total value of an output or other outcome.

**benefit-cost analysis** An analytical approach to making choices on the basis of receiving the greatest benefit for a given cost or producing the required level of benefits at the lowest cost. Also referred to as cost effectiveness analysis when the benefits cannot be quantified in terms of dollars.

**benefit-cost ratio** Measure of economic efficiency, computed by dividing total benefits by total costs. Usually both benefits and costs are discounted to present. See also discounting.

**best management practices (BMPs)** Management actions which are designed to maintain water quality by preventative rather than corrective means.

**biological control** A method to control insect populations or tree diseases through the use of applied biology.

**biological growth potential** The average net growth attainable in fully stocked natural forest land.

**biomass** The total mass (e.g., weight, volume) of living matter in a biological system.

**board foot** The amount of wood contained in an unfinished board one inch thick, 12 inches long, and 12 inches wide.

**broadcast burning** A technique of applying fire to target fuels which ignites all burnable materials over the entire unit being treated.

**browse** Leaf and twig growth of shrubs, woody vines and trees available for animal consumption; act of consuming browse.

**burning prescription** Written direction stipulating fire environment conditions, techniques, and administrative constraints necessary to achieve specified resource management objectives by use of fire on a given area of land.

## C

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**CEQ** See Council on Environmental Quality.

**CFR** Code of Federal Regulations.

**CMAI** See culmination of mean annual increment.

**canopy** The more or less continuous cover of leaves and branches collectively formed by the crowns of adjacent trees in a stand or forest.

**capability** The potential of land to produce resource, and supply goods and services under a set of management practices and at a given level of management intensity. Capability depends upon site conditions such as climate, soils, and geology, as well as the application of management practices, such as silviculture.

**capability areas** The smallest unit of land or water used in Forest planning. They are discrete and recognizable units classified primarily according to: physical (soil), administrative, and biological factors. All land within a capability area is homogeneous in ability to produce resource outputs and in production limitations.

**carbon-14 (C-14) dating technique** An absolute archaeological dating technique developed after WWII. This method was devised to measure the amount of low-level radioactivity of carbon remaining in ancient and dead material of organic origin. The practical limit for dating objects by current techniques is 50,000-70,000 years.

**carrying capacity** The number of organisms of a given species and quality that can survive in, (and not cause deterioration of), an ecosystem through the least favorable environmental conditions that occur within a stated interval of time.

**Class I Area** An area designated for the most stringent degree of protection from future degradation of air quality. The Clean Air Act designates as mandatory Class I areas each national park over 6,000 acres and each national wilderness area over 5,000 acres.

**clearcutting** Harvesting of all trees in one cut or area for the purpose of creating a new, even-aged stand. The area harvested may be a patch, stand, or strip.

**climax** The culminating stage in plant succession for a given site where the vegetation has reached a highly stable condition. See also succession.

**closed canopy** A condition that exists when the crowns of the trees in a stand cover 100 percent of the potential open space.

**closest forces concept** The principle in fire management that, regardless of agency jurisdiction, those firefighters who can reach the fire first will initiate suppression actions.

**codominant** One main crown class of trees with their tops in the upper canopy but lower than the dominant trees. See also dominant.

**collector roads** See roads.

**commercial species** Tree species suitable for industrial wood products.

**commercial thinning** See thinning.

**commodity** A resource product with commercial value.

**community cohesion** The degree of unity and cooperation within a community in achieving its goals.

**community stability** The capacity of a community to absorb and/or cope with change without major hardships to groups or institutions within the community.

**compartment** A division of forest land defined by natural and manmade features usually between 3,000 and 15,000 acres in size used to facilitate timber planning.

**confine** To limit fire spread within a predetermined area principally by use of natural or preconstructed barriers or environmental conditions. Suppression action may be minimal and limited to surveillance under appropriate conditions.

**conifer** Tree that bears cones and in most cases has needle or scale-like leaves, such as pine, spruce, hemlock, or fir.

**constraints** Limitations; actions which cannot be taken or which must be taken.

**consumer surplus** The difference between the amount actually paid by consumers for a good or service and the amount each individual would be willing to pay.

**consumptive use** Use of a resource that reduces the supply.

**contain** To surround a fire, and any spot fires therefrom, with control line as needed which can reasonably be expected to check the fire's spread under prevailing and predicted conditions.

**control** To complete the control line around a fire, any spot fires therefrom, and any interior islands to be saved; burn out any unburned area adjacent to the fire side of the control line; and cool down all hot spots that are immediate threats to the control line until the line can reasonably be expected to hold under foreseeable conditions.

**cord** A stack of wood measuring four feet high, four feet deep, and eight feet long. In wood volume, two cords roughly equal 1 MBF.

**corridor** A strip of land, varying in width, where existing or planned transportation and utility facilities are or will be located.

**cost** The price paid or what is given up in order to acquire, produce, accomplish, or maintain anything.

**cost effective** Achieving a specified level of outputs under given conditions for the least cost.

**cost efficiency** A means of measuring how productive an input is in producing outputs. Measured by present net value in Forest planning.

**Council on Environmental Quality (CEQ)** An advisory council to the President established by the National Environmental Policy Act of 1969. It reviews federal programs for their effect on the environment, conducts environmental studies, and advises the President on environmental matters.

**cover** Vegetation used by wildlife for protection from predators and weather conditions, or in which to reproduce.

**crown** The upper part of a tree carrying the main branch system and foliage.

**cubic foot** A unit of volume measure; a cube 12 inches on a side.

**cubic foot per second (cfs)** Unit measure of stream flow or discharge, equivalent to 449 gallons per minute or about 2 acre-feet per day.

**cull** Logs or trees too rotten or defective to be economically harvested for sawtimber.

**culmination of mean annual increment (CMAI)** The point where the average annual growth of a stand of timber no longer increases.

**cultural resources** Cultural resources are the tangible and intangible aspects of cultural systems, living and dead, that are valued by a given culture or contain information about the culture. Cultural resources include, but are not limited to sites, structures, buildings, districts, and objects associated with or representative of people, cultures, and human activities and events.

**cumulative watershed impacts** All impacts on beneficial uses of water and soil located outside of primary land use sites. They are the additive or synergistic effects of multiple actions within a watershed. Cumulative effects occur as a result of more than one action and the changes may be either enhance or degrade water quality.



**cutting cycle** A 20-year period between entries into a tree stand to harvest timber.

## D

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**DBH** See diameter breast high.

**DEIS** Draft Environmental Impact Statement

**dacite** An extrusive rock that is sometimes partly glassy and is composed of plagioclase and quartz with biotite, hornblende, or pyroxene.

**decadence** Refers to decaying or declining tree stands.

**decision space** The limits within which Forest planning alternatives occur. The outer limits are defined by benchmarks in Forest planning.

**demand analysis** A study of the factors affecting the quantity and price of a good or service that would be used or purchased by consumers if made available.

**demand schedule** The relationship between price and quantity demanded. The demand schedule expresses how much of the good or service would be bought or consumed at various prices at a particular point in time.

**departure** A level of timber production that allows the planned sale and harvest to drop in a future decade (as opposed to non-declining yield). See also non-declining yield.

**dependent communities** Communities whose social, economic, or political life would become discernably different in important respects if outputs from the National Forest were significantly altered.

**dependent species** A species for which a habitat element (e.g., snags, vegetative type) is deemed essential for the species to occur regularly or to reproduce.

**developed recreation site** Distinctly defined area where facilities are provided for concentrated public use, e.g., campgrounds, picnic areas, boating sites and ski areas.

**diameter breast high (DBH)** The diameter of a tree measured 4 feet 6 inches from the ground.

**discount rate** The interest rate which is used to reduce costs and benefits occurring in the future to their value in the present. The higher the discount rate, the lower the present value of future benefits and costs. See discounting and present value.

**discounted benefit** The present value of future benefits.

**discounted cost** The present value of future costs.

**discounting** An adjustment made to costs and benefits to compensate for the fact that dollars received or spent in the future have a lower value today than dollars in the present. For example, it would be preferable to receive \$100 this year rather than in one year from now because it could be invested at 4 percent simple interest and be worth \$104 in one year. Thus, given the choice between receiving benefits worth \$100 today or benefits worth \$100 one year from today, one would choose to receive it today. Discounting reduces future costs and benefits to reflect that fact and enables comparisons to be made of benefits and costs occurring at different points in time.

**dispersed recreation** Outdoor recreation which occurs outside of planned and maintained recreational facilities, e.g., scenic driving, hunting, backpacking.

**distance zone** One of three categories used in the Visual Management System to divide a view into near and far components. The three categories are (1) foreground, (2) middleground, and (3) background. See individual entries.

**diversity** The distribution and abundance of different plant and animal communities and species within an area.

**dominant** One main crown class of trees with their tops in the uppermost layers of the canopy.

## E

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**EA** See Environmental Assessment.

**EFFALT** The Effective Alteration (EFFALT) approach is a means of quantifying the degree of visibly detectable alteration of the landscape caused by even-aged timber management. The EFFALT index is a means to compare the overall visual impact of each alternative.



**EIC** See Ending Inventory Constraint.

**EIS** See Environmental Impact Statement.

**EPA** Environmental Protection Agency.

**early forest succession** The plant and animal community that develops immediately following the removal or destruction of the vegetation in an area.

**ecology** The study of plants and animals in relation to their environment.

**economic cost** Total fixed and variable costs for inputs, including costs incurred by other public and private parties, opportunity costs, and cost savings.

**economic efficiency** A measure of how efficiently inputs are used to achieve outputs when all costs and benefits can be identified and valued. Usually measured by present net value or benefit-cost ratios.

**ecotone** The transitional zone between two overlapping habitats or plant communities.

**edge** The area where plant communities meet or where successional stages or vegetative conditions within plant communities come together. See also edge contrast.

**edge contrast** A qualitative measure of the difference in structure of two adjacent vegetated areas; for example, "low," "medium," or "high" edge contrast.

**electronic sites** Areas designated for the operation of equipment which transmits and receives radio signals, excluding television aeriels and antennas.

**encumbrance** See title claim.

**endangered species** Any species listed as such in the Federal Register which is in danger of extinction throughout all or a significant portion of its range.

**endemic plant** A plant confined to a certain country or region and with a comparatively restricted geographic distribution.

**ending inventory constraint (EIC)** Constraint to ensure that the total timber volume left at the end of the planning horizon will equal or exceed the volume that would occur in a managed Forest.

**environmental analysis** An analysis of alternative actions and their predictable short- and long-term environmental effects, which include physical, biological, economic, social, and environmental design factors and their interactions. The environmental analysis is documented in an environmental assessment (EA) or environmental impact statement (EIS).

**environmental assessment (EA)** A concise public document required by the regulations implementing the National Environmental Policy Act which briefly provides sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact.

**environmental impact statement (EIS)** A statement of the environmental effects which would be expected to result from proposed alternative management actions.

**ephemeral stream** A stream which flows only from storm runoff and receives no contribution to flow from ground water.

**equivalent road acres** Equivalent Road Acres (ERA) is a method of categorizing the amount of soil compaction resulting from land management activities in terms of a common base—a compacted road surface. Roads are assigned an ERA value of 1.00 and all other disturbed areas are assigned ERA values that are less than or equal to one. The values are generally less than one as most other management activities do not cause 100 percent of the ground surface to become compacted.

**erosion** The detachment and movement of soil from the land surface by wind, water, or gravity.

**escaped fire** A fire which has exceeded, or is anticipated to exceed, preplanned initial action capabilities or fire management direction.

**even-aged management** Management of forest stands that results in trees of essentially the same age growing together. Cutting methods producing even-aged stands are clearcut, shelterwood, and seed tree.

**even-aged stand** A forest stand composed of trees having no or relatively small differences in age.

**even-flow** Maintaining a relatively constant supply of timber from decade to decade.

**existing visual condition (EVC)** The degree of visual alteration which currently exists on the landscape.

## F

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**FORPLAN** A linear programming model used for developing and analyzing Forest planning alternatives. Also see linear programming and Appendix B.

**FSH** Forest Service Handbook.

**FSM** Forest Service Manual.

**FY** Fiscal Year.

**fee ownership** Ownership of property that has no limitation, qualification, or condition affecting it. The maximum ownership possible in real estate under the system of property rights founded on English common law.

**fee site** A Forest Service recreation area in which users must pay a fee.

**final cut** Generally, removal of the last trees left in a stand; specifically, removal of the last seed bearers or shelter trees after regeneration is established under a shelterwood system.

**firebreak** A wide strip of land from which fuels have been removed down to the soil. Used to stop or check fires and to provide access for fire fighting. See also fuelbreak.

**firewood** Wood cut into short lengths for burning.

**fixed cost** A cost committed for the planning period. In Forest planning, the total cost of the minimum level benchmark.

**forage** All browse and nonwoody plants used for grazing or harvested for feeding livestock or game animals.

**forb** Any nongrass-like plant having little or no woody material on it. A palatable, broad-leaved, flowering herb whose stem, above ground, does not become woody and persistent.

**foreground** The portions of a view between the observer and up to 1/4 or 1/2 mile distant.

**forest cover type** A classification of forest land referring to a group of timber stands of similar development and species composition. Examples in California include the Douglas fir, mixed conifer, and the true fir types.

**forest land** Land at least 10 percent occupied by forest trees of any size or formerly having had such tree cover and not currently developed for non-forest use.

**forest survey site classes** A measure of the maximum capacity of an area to produce timber, measured in cubic feet per acre per year:

<u>Site Class</u>	<u>Max. Cu. Ft./Ac./Yr.</u>
1	225 +
2	165-224
3	120-164
4	85-119
5	50-84
6	20-49
7	less than 20

**FORPLAN** A linear programming model used for developing and analyzing Forest planning alternatives. Also see linear programming and Appendix B.

**fuelbreak** A wide strip of land, strategically placed for fighting anticipated fires, where hazardous fuels have been replaced with less burnable fuels (like grass). They divide fire-prone areas into smaller parcels for easier fire control and provide access for fire fighting. See also firebreak.

**fuels** Any material capable of sustaining or carrying a forest fire, usually natural material both live and dead.

**fuelwood** See firewood.

**fuel treatment** The rearrangement or disposal of fuels to reduce fire hazard or to accomplish other resource management objectives.

## G

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**geologic resource inventory** The systematic examination, description, classification and mapping of geological hazards and resources.

**geomorphology** A science that deals with the land and submarine relief features of the earth's surface.

**geothermal** Pertaining to the natural heat of the earth retained in subsurface rock or fluids.

**goal** As used in the Forest Service, a concise statement that describes a desired condition to be achieved sometime in the future. It is normally expressed in broad, general terms, and may not have a specific date for completion.

**goods and services** Outputs, including on-site uses, produced from forest and rangeland resources.

**grazing** Consumption of herbage or artificial pasture forage by animals.

**grazing permittee** An individual who has been granted written permission (a grazing permit) to graze livestock for a specific period on a range allotment.

**greater than 20 lands (> 20 lands)** Land capable of producing more than 20 cu. ft. of timber per acre per year.

**groundwater** Subsurface water in the part of the ground that is wholly saturated.

**group selection** The cutting method in which trees are removed periodically in small groups resulting in openings that do not exceed an acre or two in size; results in an uneven-aged stand.

**guideline** An indication or outline of policy or conduct that is not a mandatory requirement (as opposed to a standard, which is mandatory).

## H

**habitat** The sum of environmental conditions of a specific place that is occupied by an organism, a population, or a community.

**hard snag** A dead tree that has not started to rot.

**harvest species** Species of animals or fish that are hunted or fished for human consumption.

**herbicide** A substance used to inhibit or destroy plant growth.

**heliport** An area used by helicopters for landing and takeoff. Generally has supporting facilities and is accessible by road or boat.

**heliport** Any designated landing spot for helicopters. It is distinguished from a heliport by lack of supporting facilities.

**hiding cover** Trees of sufficient size and density to conceal wildlife from view at 300 feet.

**home range** An area in which an individual animal spends all, or most of, its time.

**horizontal diversity** The distribution and abundance of different plant and animal communities across a specified area of land.

## I

**ICOs** See issues, concerns, and opportunities.

**implementation plans** Short-range plans implementing the Forest Plan management direction.

**incompetent bed** In geology, not combining sufficient firmness and flexibility to transmit a thrust and to lift a load by bending; consequently, admitting only the deformation of flowage: said of strata and rock structure.

**initial action** The prompt, preplanned response to a wildfire.

**inputs** Land, labor, and capital required to produce outputs. Inputs are generally represented by activity costs.

**institutional analysis** An examination of the institutions within the area of influence and their expected responses to Forest Service actions. See also area of influence.

**instream flow** The volume of surface water in a stream system passing a given point at a given time.

**integrated pest management** A process wherein pests and their impacts are considered an integral part of resource management planning and decision making.

**interdisciplinary team** A group of individuals with different training who solve a problem or perform a task through frequent interaction so that disciplines can combine to provide new solutions.

**intensive timber management** Timber management practices carried out to increase timber yield per acre.

**intermediate harvest** Any removal of trees from a stand between the time of its formation and the regeneration cut. Most commonly used intermediate cuttings are release, thinning, improvement, and salvage.

**intermittent streams** Streams which do not contain water year-round.

**interpretive services** Activities and displays that interpret the natural and social history of the National Forest environment for the visiting public and inform them about National Forest goals, programs, and services.

**intolerant** As applied to a tree species; relatively unable to compete under conditions of low light and/or high root competition. Ponderosa pines are intolerant.

**irretrievable commitments** Applies to losses of production of use of renewable natural resources for a period of time. For example, timber production from an area is irretrievably lost during the time an area is used for skiing. If the use is changed, timber production can be resumed. The production lost is irretrievable, but the action is not irreversible.

**irreversible commitments** Decisions causing changes which cannot be reversed. Once used, the resource cannot be reinstated, nor can opportunities be recovered. Applies to nonrenewable resources such as minerals and cultural resources.

**isocosts** Points plotted on a map to show equal costs of transporting material between areas.

**issues, concerns, and opportunities (ICOs)** Refers to the public issues, management concerns and opportunities identified in the Forest planning process.

## K

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**KGRA** See known geothermal resource area

**known geothermal resource area** An area in which the geology, nearby discoveries, competitive interests, or other indicators would lead experienced people to believe that prospects for extraction of geothermal resources are good enough to warrant spending money for that purpose. Leases within a KGRA are issued as the result of competitive bidding only.

**K-V funds** Funds set aside from timber sale receipts to finance reforestation, wildlife habitat, and other improvements in the timber sale area.

## L

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**LTSYC** See long-term sustained yield capacity (LTSYC).

**Land and Water Conservation Act** Provides funds for and authorizes Federal assistance to the states in planning, acquisition, and development of needed land and water areas and facilities; provides funds for the Federal acquisition and development of outdoor recreation resources.

**landform** A natural landscape that exists as a result of wind, water, or geologic activity; e.g., a plain plateau, basin, mountain, etc.

**land line location** To locate, survey, mark, and post the boundaries of national forest lands.

**landownership adjustment** The transfer of the ownership of lands by land exchange, land purchase, donations or other methods.

**land status** The ownership status of lands within a national forest boundaries.

**leasable minerals** Minerals which are developed (i.e., explored, mined, extracted, etc.) by a permit or lease, in contrast to minerals development through claims staking. Congress has specified the following as leasable minerals: coal, oil, gas, potassium, sodium, phosphate, oil shale, native asphalt, solid and semisolid bitumen and bituminous rock, geothermal resources; deposits of sulfur in Louisiana and New Mexico; and all minerals including hardrock on acquired land. See also locatable mineral and salable mineral.

**less than 20 lands (<20 lands)** Land capable of producing less than 20 cu. ft. of timber per acre per year.

**lifestyle** Characteristic way people live, indicated by consumption patterns, work, leisure, expressed values, and other behavior.

**linear programming** A mathematical method used to determine the most effective allocation of limited resources between competing demands when both the objective (e.g., profit or cost) and the restrictions on its attainment are expressible as a system of linear equalities or inequalities (e.g.,  $y = a + bx$ ).

**local roads** See roads.

**locatable minerals** Generally refers to hardrock minerals on public domain lands which are mined and processed to recover valuable metals, such as gold and copper, chemical grade limestone and asbestos. May include any solid, natural inorganic substance occurring in the crust of the earth except for common mineral materials and leasable minerals. Generally developed through a claims location and patent process. See also leasable mineral and salable mineral.

**long-term effects** Those outcomes that will be significant beyond the RPA planning horizon of 50 years.

**long-term sustained yield capacity (LTSYC)** The highest uniform wood yield from lands being managed for timber production that may be sustained in perpetuity under a specified management intensity consistent with multiple-use objectives.

**low standard service** A level of recreation management prescribed when recreation costs are reduced in an alternative and would therefore require different management direction.

## M

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**MBF** Thousand board feet. A measure of lumber volume equal to 1' x 1" x 1000'.

**MCF** Thousand cubic feet. A measure of wood volume.

**MIS** See Management Indicator Species.

**MMBF** Million board feet. A measure of lumber volume equal to 1' x 1" x 1,000,000'.

**MMCF** Million cubic feet. A measure of wood volume.

**maintenance level costs (long-term)** Costs required to keep capital assets at a given level of service and availability. These are variable costs.

**maintenance level costs (short-term)** Costs incurred to keep capital assets at a given level of service and availability. These are fixed costs.

**management area** A contiguous area of land used in planning, usually consisting of differing analysis areas, to which one or more prescriptions are applied. Management areas do not vary between alternatives; however, the prescriptions applied to them vary.

**management concern** An issue or problem requiring resolution.

**management direction** A statement of multiple-use and other goals and objectives, the management prescriptions, and the associated standards and guidelines for attaining them.

**management indicator species (MIS)** A particular type of plant or animal whose presence in a certain situation or location is a fairly certain sign or symptom that particular environmental conditions are also present.

**management intensity** The management practice or combination of management practices and their associated costs designed to obtain different levels of goods and services.

**management practice** A specific action, measure, or treatment.

**management prescription** Management practices selected and scheduled for application on a specific area to attain multiple-use benefits and other goals and objectives.

**market outputs** Outputs normally exchanged in markets as evidenced by transactions: timber, range, developed recreation, minerals, and commercially utilized fish.

**mass movement** Downslope movement of a portion of the land's surface, i.e., a single landslide or the gradual downhill movement of the whole mass of loose earth material on a slope face.

**mast** Nuts, acorns, and similar products of hardwood species, which are consumed by animals.

**maximum erosion hazard** An assessment of the relative hazard of the loss of surface soil that would occur in an average year if protective vegetation were removed.

**maximum modification** See Visual Quality Objectives.

**mean annual increment** The average yearly growth of a tree, calculated by dividing the volume of the tree by its age.

**merchantable timber** Timber of salable quality.

**middleground (middle distance)** The space between the foreground and the background in a picture or landscape. The area located from 1/4 - 1/2 to 3-5 miles from the viewer.

**mineral development** The preparation of a proven deposit for mining.

**mineral entry** Filing a claim to hold or purchase public land in order to claim the rights to minerals it contains.

**mineral withdrawal** The withholding of an area of federal land from mineral entry or development in order to reserve the area for a particular public purpose or program.

**minimum implementation requirement (MIRs)** Requirements which ensure that alternatives are minimally acceptable and implementable on the ground. Generally, the requirements are within agency control, but there is little discretionary control at the Forest level.

**minimum management requirements (MMRs)** Requirements taken from 36 CFR 219.17 and generally outside Forest Service authority to change. MMRs cover suitable lands, Threatened and Endangered species, viable wildlife populations, diversity, riparian areas, and soil and water protection.

**mitigation** Action to avoid, minimize, reduce, eliminate, or rectify the adverse impacts of a management practice.

**modification** See Visual Quality Objectives.

**monitoring and evaluation** The evaluation on a sample basis of Forest Plan management practices to determine how well objectives have been met, as well as the effects of those management practices on the land and environment.

**mortality** Dead or dying trees resulting from forest fire, insects, diseases, or climatic factors.

**multiple use** The management of all renewable surface resources of the National Forests so that they are utilized in the combination that will best meet the needs of the American people.

**municipal watershed** The watershed from which the runoff is used for drinking purposes in a city.

## N

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**NEPA** See National Environmental Policy Act.

**NFMA** See National Forest Management Act.

**natural opening** A break in the forest canopy; an area of essentially bare soil, grasses, forbs, or shrubs in an area dominated by trees.

**National Environmental Policy Act (NEPA)** A 1969 Act of Congress which is our basic national charter for protection of the environment.

**national natural landmark (NNL)** A site or area that possesses exceptional values or qualities which illustrate or interpret the natural heritage of the nation.

**National Register of Historic Places** A listing maintained by the U.S. National Park Service of areas which have been designated as historically significant. The Register includes places of local and State significance, as well as those of value to the Nation in general.

**National Wild and Scenic River System** Rivers with outstanding remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values designated by Congress under the Wild and Scenic Rivers Act for preservation of their free-flowing condition.

**National Wilderness Preservation System** All lands covered by the Wilderness Act and subsequent wilderness designations, irrespective of the department or agency having jurisdiction.

**natural opening** A break in the forest canopy; the existence of an area of essentially bare soil, grasses, forbs, or shrubs in an area dominated by trees.

**net public benefit** The overall 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 qualitative and quantitative criteria rather than a single measure or index.

**NIC** See non-interchangeable component

**no action alternative** The alternative which continues current management direction.

**non-competitive lease** A lease issued for an area outside a KGRA and issued to the first qualified applicant without any bidding taking place.

**nonconsumptive species** Wildlife species not used as food for human consumption, but normally observed, studied, photographed, etc. (as opposed to harvest or consumptive species).

**nondeclining yield** Timber scheduled for harvest so that any given decade's production does not fall below the previous decade's production.

**nondiscretionary resources** Resources considered in the Plan where the choices of allocation are limited by law and/or regulation, or by unique, site-specific sets of physical-environmental requirements, e.g., Research Natural Areas, Wild and Scenic Rivers.

**non-interchangeable component** The allowable sale quantity comes from lands identified as suitable and unsuitable for timber production. Suitable lands provide most of the volume. Unsuitable lands are referred to as NIC lands, which is a collective term for the volume produced on land managed by the Raptor, Riparian Areas, and timberlands prescriptions. The volume produced from NIC lands may not be substituted for or with volume produced from suitable timberlands.

**nonmarket outputs** Forest outputs not normally exchanged in markets. In the Forest Service, the following resource outputs are classified as nonmarket outputs: dispersed recreation, wildlife and fish user days, water. Although not normally exchanged in markets, the Forest Service assigns proxy values for analysis purposes.

**nonpoint source pollution** Pollution occurring at many diffuse locations, as opposed to pollution from a specific site, such as a factory.

**nonstructural range improvements** Silvicultural practices (type conversions, noxious weed control, seeding, etc.) that are carried out to increase forage production and enhance or protect the other resources.

**NSO** See no surface occupancy stipulation

**no surface occupancy stipulation** A stipulation in a lease that prohibits the lessee from drilling or otherwise directly occupying the surface of a particular portion or all of an area being leased. Drilling may occur diagonally from outside the restricted area to tap the resource beneath the area.

## O

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**OHV** Off-highway vehicle; examples include 4-wheel drives, jeeps, motorcycles.

**objective function** A term used in linear programming referring to the item to be maximized (or minimized) in the problem's solution, e.g., maximize PNV, maximize timber.

**old growth** A stand that is past full maturity and showing signs of decadence; the last stage in forest succession. Although the tree age, size, height, or density will vary by timber type, trees are usually 24" or larger DBH and 190 years or older.

**opening** An area of land from which timber has been harvested (generally using even-aged management). In Region 5 the maximum size openings is 5 to 60 acres for Douglas-fir and 5 to 40 acres for all other forest types. An opening is no longer considered an opening when a specific number of trees per acre within a specific forest type and site class have reached 4.5 feet in height. The 4.5 feet is the earliest that an opening is "no longer an opening" in some cases the height standard is modified to require a greater height; e.g. 20 feet, which implies that more time is required before another opening can be adjacently located.

**opportunity cost** The value of the benefits foregone when a management alternative is chosen.

**output** A good, service, or on-site use produced from forest and rangeland resources.

**overmature timber** Trees that have attained full development, particularly in height, and are declining in vigor, health, and soundness.

**overstory** That portion of the trees in a forest which forms the upper or uppermost layer.

## P

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**pahoehoe** Cooled hard lava marked by a smooth often billowy shiny surface.

**PAOT** See persons-at-one-time.

**PNV** See present net value.

**partial retention** See Visual Quality Objectives.

**particulates** Small particles suspended in the air and generally considered pollutants.

**patented mining claim** When patented, a mining claim becomes private property and is land over which the United States has no property rights except as may be reserved in the patent. After a mining claim is patented, the owner does not have to comply with requirements of the General Mining Law of implementing regulations.

**perennial stream** Streams that flow throughout the year and from source to mouth.

**persons-at-one-time (PAOT)** A term used to measure recreation capacity which means the number of people that can use a facility or area at one time.

**pilot tree** A snag usually adjacent to a nest tree used by osprey or bald eagles for roosting or resting by one member of the nesting pair.

**planned ignition** A prescribed fire whose exact date and location are specified by Forest personnel prior to its occurrence.

**planning area** The area of the National Forest System covered by a Regional or Forest plan.

**planning horizon** The overall time period considered in the planning process that spans all activities covered in the analysis or plan and all future conditions and effects of proposed actions which would influence the planning decisions. In Region 5 the planning horizon is 160 years.

**planning period** One decade. The time interval within the planning horizon that is used to show incremental changes in yields, costs, effects, and benefits.

**planning records** A system that documents data collections, analysis, interdisciplinary team decisions, and activities that result from the process of developing a Forest Plan, revision, or significant amendment.

**plantation** A stand of trees resulting from planting or artificially seeding an area.

**point pollution source** An identifiable source from which pollutants are or may be discharged, e.g., a pipe, ditch, channel, tunnel, conduit, well.

**poletimber trees** Live trees of commercial species at least 5 inches in diameter at breast height but smaller than sawtimber, and of good form and vigor.



**precommercial thinning** See thinning.

**preferred alternative** The alternative recommended for implementation as the Forest Plan.

**prescribed fire** Intentional use of fire under predetermined weather and fuel conditions to achieve specific objectives, e.g., dispose of slash, control unwanted vegetation.

**prescription (RX)** The set of management practices applied to a specific area to attain specific objectives. Region 5 distinguishes between FORPLAN prescriptions and management prescriptions. FORPLAN prescriptions are sets of "pure" activities without spatial allocation and standard and guidelines. Management prescriptions are written as a result of allocating FORPLAN solutions to management areas and imposing standards and guidelines. See also Management Areas.

**present net value (PNV)** The difference between the value of discounted benefits derived from all outputs to which monetary values or established market prices are assigned, and the total discounted costs of managing the planning area.

**present value** The value which results when benefits or costs expected to occur in the future are discounted. See also discounting.

**preservation** See Visual Quality Objectives.

**presuppression** The planning and preparatory work done before a fire occurs to ensure effective fire suppression action. Includes: (1) recruiting and training fire forces; (2) planning and organizing attack methods; (3) procuring and maintaining fire equipment; and (4) maintaining structural improvements necessary for the fire program.

**proxy value** A value assigned to a good or service for evaluation purposes when the good or service is not bought nor sold and an established monetary price does not exist.

## R

**RARE II** See Roadless Area Review and Evaluation II.

**RIM** See Recreation Information Management.

**RNA** See Research Natural Area.

**ROS** See Recreation Opportunity Spectrum.

**RPA** The Forest and Rangeland Renewable Resources Planning Act of 1974. Also refers to the national assessment and recommended program developed every five years to fulfill the requirements of the Act.

**RVD** See Recreation Visitor Day.

**RX** See prescription.

### range

*primary* - includes areas which are readily accessible, have available water and will be overused before livestock significantly graze other areas.

*secondary* - areas less preferred by livestock which will ordinarily not be grazed significantly until the primary range has been overused.

*suitable* - land that is or can be made accessible to livestock, that produces forage or has inherent forage producing capabilities, and that can be grazed on a sustained yield basis under given management goals.

*transitory* - land temporarily suitable for grazing; but transient over time and/or location. For example, grass may cover an area for a period before being replaced by growth not suitable for forage.

*unsuitable* - area that should not be grazed by livestock because of unstable soils, steep topography, or inherent low potential for forage production.

**range allotment (allotment)** An area designated for grazing a prescribed number and kind of livestock.

**range condition** The current productivity of a range relative to what that range is naturally capable of producing.

**range condition trend** The direction of change in range condition and usually expressed as upward (improving), static (remaining unchanged), or downward (deteriorating).

**range permittee** See grazing permittee.

**raptor** A bird of prey, e.g., eagle, hawk, owl.

**rare species** One that, although not presently threatened with extinction, is in such small numbers throughout its range that it may be endangered if its environment worsens.

**rate-of-return** Rate of interest at which the net discounted benefits equal the net discounted costs. (Internal rate-of-return is a similar measure appropriate to private firms.)

**real dollar value** A monetary value which compensates for inflation.

**receipt shares** A percentage of revenue collected by National Forests which is given to state and county governments where the Forest is located for use on county roads and schools.

**recovery goal** Population level assigned to a specific area that if achieved would contribute fully to removing the species from a threatened or endangered classification.

**recovery species** Federally listed threatened or endangered wildlife and fish species for which an objective has been set to raise the population to a viable level.

**Recreation Information Management (RIM)** The Forest Service system for recording recreation facility condition and use.

**Recreation Opportunity Spectrum (ROS)** A means of classifying and managing recreation opportunities based on physical setting, social setting, and managerial setting. The six different ROS classes briefly described are:

- Primitive - An area 3 miles or more from roads and trails with motorized use; generally 5,000 acres or more in an essentially unmodified natural environment.
- Semi-Primitive-Non-Motorized - An area 1/2 mile from roads and trails with motorized use; generally 2,500 to 5,000 acres with only subtle modifications to an otherwise natural setting.
- Semi-Primitive-Motorized - Same as semi-primitive non-motorized but with motorized use of roads and trails, including OHV touring, snowmobile, hiking, cross-country skiing, etc.
- Roaded Natural - An area 1/2 mile or less from roads; resource modifications range from evident to strongly dominant.
- Rural - The setting is substantially modified with structures or other cultural modifications.
- Urban - The setting is strongly dominated by structures, highways and streets.

**Recreation Visitor Day (RVD)** Twelve hours of recreation use in any combination of persons and hours, i.e., one person for 12 hours, 3 persons for 4 hours, etc.

**reforestation** Reestablishing a crop of trees on forest land by natural or artificial methods.

**reforestation backlog** Suitable timber land which is currently not stocked with commercial tree species. Lands occupied mainly with hardwoods, brush, or grasses scheduled or conversion to commercial conifers through reforestation.

**regeneration** Reestablishing a crop of trees on forest land by natural or artificial methods.

**regeneration cutting** Refers to logging stands to allow new crops to be planted; usually applied on stands which cannot economically be held because of poor stocking, health thrift, quality, or composition.

**regulated timber land** Land which is capable and is managed to produce regular periodic yields of commercial timber in perpetuity. Ideally, a regulated forest would consist of equal areas in each age class so that the oldest stands could be cut annually to produce a sustained yield.

**release** Freeing a tree or group of trees from immediate competition by eliminating growth that is overtopping or closely surrounding them.

**Research Natural Area (RNA)** An area established specifically to preserve a representative sample of an ecological community; primarily for scientific and educational purposes.

**resource element** A major category of activity required to accomplish the Forest Service mission. The eight resource elements are recreation, wilderness, wildlife and fish, range, timber, water, minerals, and human and community development.

**retention** See Visual Quality Objectives.

**revetment** A facing of stone, concrete, vegetation, or other material to sustain an embankment.

**right-of-way** An accurately located land area within which a user may conduct operations approved or granted by the landowner. May also refer to a permit, easement, lease, license, or Memorandum of Understanding (MOU) used to authorize the use.

**right-of-way acquisition** Acquiring rights-of-way for Forest Service use of lands owned by others.

**right-of-way grant** Rights of way granted to others to use National Forest land in the manner specified.

**riparian area** Land situated along the bank of a stream or other body of water and directly influenced by the presence of water, e.g., streamsides, lake shores, etc.

**Roadless Area Review and Evaluation (RARE)II** The assessment of "primitive" areas within the National Forests as potential wilderness areas as required by the National Wilderness Act. This refers to the second such assessment which was documented in the final environmental impact statement of the Roadless Area Review and Evaluation, January 1979.

**roads** A general term denoting a way for purposes of travel by vehicles greater than 40 inches in width. Roads are functionally classified as:

- arterial roads - Typically two-lane, surfaced roads serving large land areas and usually connecting with public highways.
- collector roads - Single-lane or double-lane roads which are typically surfaced and serve smaller land areas. They usually form a link between arterial and local roads.
- local roads - Typically native surface, single-lane roads accessing a single resource terminal facility such as a log landing, a campground, trailhead, or ski facility.

**roaded natural** See Recreation Opportunity Spectrum, Roaded Natural.

**roadless area** As defined by the Roadless Area Review, an area of undeveloped federal land within which there are no improved roads or roads maintained for use by motorized vehicles; generally 5,000 acres or larger unless adjacent to an existing Wilderness.

**rotation** The length of time between the formation or regeneration of a tree stand and its final cutting.

## S

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**SMZ** Streamside Management Zone.

**SNIC** See separate non-interchangeable component

**saleable minerals** Minerals occurring in high volume, low-unit-value deposits which don't have a distinct or special economic value over similar materials and are therefore usually sold rather than leased or claim staked. Examples are sand, gravel, stone and clay.

**sale schedule** The quantity of timber planned for sale by time period from an area of suitable land covered by a forest plan.

**salvage** Dead or deteriorating trees often cut before their timber becomes worthless.

**sanitation cutting** The removal of dead, diseased, insect, infested, damaged, or otherwise low vigor trees to minimize losses from pests.

**saw log** A log meeting minimum standards of diameter, length, and defect. For softwoods, they are at least 8 feet long, sound and straight, and with a minimum diameter inside bark of 6 inches.

**sawtimber** Trees that will yield logs suitable in size and quality for producing lumber.

**scoping process** Process used to identify issues and concerns which are within Forest Service authority to resolve. See also Appendix A.

**secondary road** A collector road; not a primary travel road.

**seed tree cutting** Harvesting all trees in one cut except for a small number of seed bearers left singly or in small groups, usually 8 to 10 per acre. An even-aged stand results.

**seismic hazard** Potential hazard due to earthquake activity.

**selection cutting** See group selection and single tree selection.

**sensitive species** Species which have appeared in the Federal Register as proposed additions to the endangered or threatened species list; those which are on an official state list or are recognized by the Regional Forester to need special management in order to prevent them from becoming endangered or threatened.

**sensitivity level** A particular degree or measure of viewer interest in the scenic qualities of the landscape.

**seral** A biological community which is a developmental, transitory stage in an ecologic succession.

**shelterwood cutting** Cutting a timber stand in two or more stages. The first cutting leaves some mature trees which provide shade to help seedlings get established. The shelterwood system is a form of even-aged timber management.

**silviculture** Generally, the science and art of cultivating forest tree crops.

**silviculture system** The entire process by which forest stands are tended, harvested, and replaced. It includes all cultural practices performed during the life of the stand such as regeneration cutting, fertilization, thinning, improvement cutting, and use of genetically improved sources of tree seeds and seedling to obtain multiple resource benefits. Silvicultural systems are classified as even or uneven-aged.

**single tree selection cutting** The cutting method in which individual trees are removed to provide a stand with trees of different sizes and age classes on the same site. This method results in an uneven-aged stand.

**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.

**site preparation** The preparation of an area for regeneration. It involves the removal of slash and/or competing vegetation and usually the exposure of bare mineral soil.

**size class** For purposes of Forest planning, size class refers to the three intervals of tree stem diameter used for classification of timber.

seedling/sapling -	less than five-inch diameter
pole timber -	five- to eight-inch diameter
sawtimber -	greater than eight-inch diameter

**slash** The residue left on the ground after timber cutting, or after storms, fire, etc. It includes unutilized logs, uprooted stumps, broken stems, branches, twigs, leaves, bark, and chips.

**snag** A standing dead tree from which the leaves and most of the branches have fallen.

**social category** People with a common social characteristic such as age, nationality, occupation, hobby, interest, or educational level.

**social group** People who cooperate to pursue common interests and/or attain mutual goals.

**social impact** Changes in social or cultural conditions that directly or indirectly result from a Forest Service program, project, or activity.

**social impact analysis** The social component of the environmental analysis process; a systematic effort to determine how present programs or proposed actions affect the human environment.

**social organization** The structure of a society described in terms of roles, relationships, norm, institutions, and/or community cohesiveness and stability.

**social value** A shared standard of preference or desirability, as wealth, beauty, good health, honesty, or privacy.

**social variable** A social or cultural element such as population size, employment, opinion on an issue, crime rates, satisfaction with community life or recreation-use patterns, that can be evaluated at different time or places to show the effects of a Forest Service action.

**soft snag** A standing dead tree from which the leaves and most of the branches have fallen and which has started to rot internally.

**softwood** Pertaining to conifer trees. See also Conifer.

**soil horizons** Layers of the soil each of which has comparatively uniform characteristics different from adjacent layers.

**soil order** The degree of soil mapping and information provided by a soil survey. Order 1 is the most detailed for intensive management, and order 5 the most general for broad planning.

**soil productivity** The natural capacity of a soil to produce a specified plant or sequence of plants under a specified system of management.

**soil resource inventory** The systematic examination, description, classification and mapping of soil.

**special interest area** Areas established and managed for their unique special feature. They include geological, historical, archaeological, botanical, and other memorable features.

**special use permit** A permit authorizing the occupancy and use of National Forest land in the manner specified.

**stand** A community of trees or other vegetation which is sufficiently uniform in composition, constitution, age, spatial arrangement, or condition to be distinguishable from adjacent communities and to thus form a management entity.

**standard service** Management of recreation facilities which provides for vegetation management, full maintenance of facilities, appropriate toilet cleaning and garbage pick up, and information and interpretive services for the recreation user.

**stocking level** The degree to which land is occupied by trees, (measured by basal area and/or number of trees by size and spacing), compared with a stocking standard which establishes the stocking required to utilize fully the growth potential of the land.

**stream class** A classification given to all named drainages or stream channels on the Forest, based on stream size, season, amount of flow, importance as a fishery or water source, and other characteristics. They range from Class I (Largest, most important) to Class IV (small, often intermittent).

**streamside management zone (SMZ)** An area of land extending beyond the riparian area commonly managed with caution as a buffer to protect riparian areas and water quality.

**structural range improvements** Those range improvements constructed and maintained (fences, cattleguards, after developments, etc.) to facilitate the management of the range resource.

**stumpage** Timber as it stands uncut.

**subculture** A distinctive pattern of beliefs, values, norms, and customs shared by a portion of the population, often because of a common ethnic heritage, occupation, or religious or ideological orientation.

**succession** The gradual supplanting of one plant community by another as the site changes over time until the climax community is reached.

**suitable lands** Acres of land selected for management of timber production on a regulated basis from land which has been identified as tentatively suitable. Thus, it is land which meets criteria a. through e. of the tentatively suitable definition and which is to be managed for timber production.

**suppression** Actions taken to extinguish or confine a fire.

**sustained yield** See long-term sustained yield.

## T

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**T & E** Threatened and endangered species. See separate listing.

**TSI** See Timber Stand Improvement.

**target** A statement used to express planned results to be reached within a stated time period.

**tentatively suitable lands** Tentatively suitable lands are defined as those:

- presently forested, currently producing, or capable of producing, crop of industrial wood.
- not withdrawn from timber production by Congress, the Secretary of Agriculture, or the Chief of the Forest Service.

- for which technology and knowledge exist and are available to ensure timber production without irreversible damage to soils, productivity, or watershed conditions.
- where there is reasonable assurance that adequate restocking can be attained within 5 years after final harvest.
- where adequate information is available to project responses to timber management activities.

**territory** An area within a habitat that is occupied by an individual or group and is defended against other individuals or groups of the same species.

**thermal cover** Trees of at least sapling size of sufficient density to provide shelter for wildlife from winter winds.

**thinning** Cutting timber to improve the quality and growth of the trees that remain. In commercial thinning, merchantable timber, i.e., timber of salable quality is cut. In precommercial thinning, non-merchantable trees are cut.

**threatened species** Any species which is likely to become an endangered species within the foreseeable future and which has been designated in the Federal Register as threatened species.

**tiering** Refers to the practice of covering general matters in broader environmental impact statements which are subsequently incorporated by reference into narrower environmental impact statements or environmental assessments, allowing them to concentrate solely on the issues relevant to a specific project.

**timber harvest schedule** The quantity of timber planned for sale and harvest, by time period, from the area of land covered by the Forest plan.

**timber production** The growing, tending, harvesting, and regeneration of regulated crops of trees to be cut into logs and bolts for industrial or consumer use. Does not include firewood.

**Timber Stand Improvement (TSI)** The use of noncommercial thinning, cleaning, weeding and intermediate cuttings to eliminate or suppress less desirable vegetation and improve composition, condition, structure, or growth of a stand.

**title claim (encumbrance)** Claim of ownership of National Forest land by others.

**tolerant** As applied to tree species: relatively successful in competing under conditions of low light and/or high root competition. White firs are tolerant.

**tradeoff** The impact on a output or cost caused by changing another output or cost.

**type conversion** The conversion of one type of vegetation cover to another, e.g., forested to nonforested; one tree species to another.

## U

**USC** United States Code.

**understory** Low-growing vegetation (herbaceous, brush or reproduction) growing under a stand of trees. Also, that portion of trees in a forest stand below the overstory.

**uneven-aged management** Management of forest stands which results in trees of several or many ages growing together. Cutting methods producing uneven-aged stands are single-tree and group selection.

**unplanned ignition** A fire started at random by either natural or human causes, or a deliberate incendiary fire.

**unregulated timber** Timber on commercial forest land that is not considered part of the annual harvest because other resource values, e.g., recreation, aesthetics, etc., are greater.

**unsuitable lands** Refers to land which is not suited for timber production according to the following criteria defined in NFMA Regulations, 36 CFR 219.14:

- is not at least 10 percent occupied by forest trees of any size or formerly having had such tree cover and not currently developed for nonforest use.
- there is not reasonable assurance that such land can be adequately restocked within 5 years after final harvest.
- technology is not available to ensure timber production from the land without irreversible resource damage to soils productivity or watershed.
- land has been withdrawn from timber production for Congress, the Secretary of Agriculture or the Chief of the Forest Service.

**utilization standards** The minimum size of tree that may be cut as sawtimber or roundwood.

## V

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**VIS** Visitor Information Service.

**VQO** See Visual Quality Objectives.

**variety class** A classification system with three visual landscape categories:

- Distinctive (Variety Class A) - Unusual and/or outstanding landscape variety that stands out from the common features in the landscape.
- Common (Variety Class B) - Prevalent, usual, or widespread landscape variety; also refers to ordinary or undistinguished visual variety.
- Minimal (Variety Class C) - Little or no visual variety in the landscape; monotonous or below average compared to the common features in the landscape.

**vertical diversity** The distribution and abundance of different plant and animal communities from the ground level up.

**viable populations** Populations of reproductive plants or animals of sufficient numbers and distribution to assure perpetuation of the species.

**viewshed** The landscape seen or potentially seen from all or a logical part of a travel route, use area, or water body.

**Visual Absorption Capability (VAC)** The ability of the landscape to withstand management manipulation without significantly affecting its visual character. Rated as high, moderate, and low.

**visual quality index** A numerical rating of scenic quality that reflects both the condition of the landscape and the acreage of land in each of the six condition levels ranging from Type I which appears to be untouched by human activities to Type VI where changes in the landscape appear to be drastic disturbances and are in glaring contrast to the natural appearance.

**visual quality objectives (VQO)** A set of measurable maximum levels of future alteration of a characteristic landscape. These levels are:

- Preservation - Ecological change only here.
- Retention - Human activities are not evident to the casual Forest visitor.
- Partial Retention - Human activity may be evident but must remain subordinate to the characteristic landscape.
- Modification - Human activity may dominate the characteristic landscape but must, at the same time, follow naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed in foreground or mid-ground.
- Maximum Modification - Human activity may dominate the characteristic landscape but should appear as a natural occurrence when viewed as background.

## W

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**WFHR** See Wildlife and Fish Habitat Relationships.

**WFUD** See Wildlife and Fish User Day.

**water influence zone** Areas oriented to outdoor water recreation.

**water rights** The legal right to use water.

**watershed** The entire area that contributes water to a drainage system or stream.

**water yield** The total amount of water coming from an area of land, commonly a watershed, over a specific period of time.

**wetlands** An area at least periodically wet or flooded, where water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface, e.g., bogs and marshes.

**wild and scenic river** Under the 1968 Wild and Scenic Rivers Act, a river set aside to preserve its natural environment and water quality.

**wilderness** Briefly, under the Wilderness Act of 1964, wilderness:

- is undeveloped Federal land without permanent improvements or human habitation; is protected

and managed so as to preserve its natural conditions;

- has outstanding opportunities for solitude or primitive recreation;
- has at least 5,000 acres or is of sufficient size to make practical its condition; and may contain features of scientific, educational, scenic, or historical value, as well as ecologic and geologic interest.

**wildfire** An unplanned fire requiring suppression action.

**Wildlife and Fish Habitat Relationships (WFHR)** A system for organizing information about wildlife and fish species, their habitats, and relationships between them which is used in land and resource management planning to set standards and guidelines, evaluate species and habitat diversity, identify special habitat needs, etc.

**wildlife and fish user day (WFUD)** Twelve hours of recreation use oriented to wildlife and fish.

**wildlife habitat diversity** The distribution and abundance of various plant communities and age classes of these communities within a specific area.

**withdrawal** Withholding an area of Federal land from settlement, sale, location, or entry allowed under the general land laws to reserve the area for a particular purpose or program.

## X

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**xeric** Characterized by dry conditions rather than mesic (moderate) or hygric (wet) conditions.

## Y

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**yield table** A tabular statement of timber volumes expected to be produced under a specified set of conditions.







## BIBLIOGRAPHY

- Airola, D. A.** 1982. Osprey habitat capability model. Pages 113-123 in Shimamoto, K. and D. Airola (eds). Fish and wildlife habitat capability models and special criteria for the northeast zone national forests. Lassen, Mendocino, Modoc, and Plumas National Forests. 260 pp.
- Alvarado, R.** 1978. Minimum design standards for log weirs. USDA Forest Service. Malheur National Forest. Unpubl. manuscript.
- Ames, C. R.** 1977. Wildlife conflicts in riparian management. Pages 175-182 in Importance, preservation, and management of riparian habitat: a symposium. USDA Forest Service. Gen. Tech. Rep. RM-43 217 pp.
- Behnke, R.J.** 1979. Monograph of the native trouts of the Genus *Salmo* of western North America. USFWS, BLM and USFS publ. 163 pp.
- Bellrose, F.C.** 1976. *Ducks, geese and swans of North America*. Stockpole Books, Harrisburg, PA. 543 pp.
- Bloom, P.H.** 1979. The status of the Swainson's hawk in California, 1979. Publ. by Calif. Dept. of Fish and Game (Job II-8.0), and USDI, Bur. of Land Manage. (Proj. W-54-R-12), 2800 Cottage Way, Sacramento, CA. 42 pp.
- Bostick, V. B., W. E. Niles, W. A. McClellan, E. H. Oakes, and J. R. Wilbanks.** 1975. *Inventory of natural landmarks of the Great Basin*: Section I. USDI National Park Service. 342 pp.
- Bowers, W., B. Hosford, A. Oakley, and C. Bond.** 1979. Wildlife habitats in managed rangelands - the Great Basin of southeast Oregon - native trout. Pac. NW For. and Range Exper. Sta. Gen. Tech. Rpt. PNW-84. 16 pp.
- Call, M.** 1979. Habitat requirement and management recommendations for sage grouse. USDI. Bureau of Land Management Tech. Note. 37 pp.
- Camilleri, E.** 1982. Goshawk habitat capability model. Pages 83-91 in Shimamoto, K. and D. Airola (eds). Fish and wildlife habitat capability models and special habitat criteria for the northeast zone national forests. Lassen, Mendocino, Modoc, and Plumas National Forests. 260 pp.
- \_\_\_\_\_. and K. Shimamoto. 1981. Habitat suitability assessment of resident trout streams on the Warner Mountain Ranger District, Modoc National Forest. Modoc N.F. white paper. 9 pp.
- Chatolan, J.** 1983. Personal communication. USDA Forest Service. Region Five.
- Claire, E. W. and R. Storch.** 1977. Streamside management and livestock grazing: An objective look at the situation. Unpublished paper presented at symposium on livestock interactions with wildlife, fish and their environments. Sparks, NV. May 1977.
- Clair, E. W.** 1980. Stream habitat and riparian restoration techniques—guidelines to consider in their use. Oregon Department of Fish and Wildlife.
- Clark, W. B.** 1957. Gold in mineral commodities of California—geologic occurrence, economic development, and utilization of the State's mineral resources. California Division of Mines and Geology Bulletin 176. pp. 215-226.
- Detrich, P.** 1981. Results of the California winter bald eagle survey, 1979-1981. USDI Fish and Wildlife Service. 15 pp. and appendices.
- \_\_\_\_\_. 1982. Results of the California winter bald eagle survey. USDI Fish and Wildlife Service. 16 pp.
- Duffield, W. and R. Weldin.** 1984. South Warner Wilderness, California Wilderness Mineral Potential, Geological Survey professional paper 1300 pp. 377-378.
- Estep, J.A.** 1989. Biology, movements and habitat relationships of the Swainson's hawk in the Central Valley of California, 1986-1987. Calif. Dept. of Fish and Game, Nongame Bird and Mammal Section, Sacramento, CA. 52 pp.
- Ford, T.** 1977. Status summary report on the Modoc sucker. (*Catostomus microps* Rutter) Unpublished report, U.S. Forest Service, Modoc National Forest, Alturas, CA, 43 pp.
- Gay, T. E.** 1966. Economic mineral deposits of the Cascade Range, Modoc Plateau, and Great Basin of northeastern California. California Division of Mines and Geology Bulletin 190. pp. 97-104.
- Gibbons, D.R. and E.O. Salo.** 1973. An annotated bibliography of the effects of logging on fish on the western United States and Canada. Pacific Northwest Forest

- and Range Experiment Station. USDA Forest Service. PNW-10.
- Hickey, J.J. and D.W. Anderson. 1968. Chlorinated hydrocarbons and eggshell changes in raptorial and fish-eating birds. *Science*. 162:271-273.
- Keeler-Wolf, T. 1983. An ecological survey of the Devil's Garden RNA, Modoc National Forest, California. Modoc National Forest, Alturas, CA.
- King, V. 1984. Personal Comm. Unit Fisheries Manager, Calif. Dept. Fish and Game, Redding.
- Koch, D.L. and G.P. Contreras. 1973. Preliminary survey of the Lost River system including Lower Klamath Lake and Klamath Strait Drain with special reference to the shortnose (*Chasmistes brevirostris*) and Lost River (*Catostomus luxatus*) suckers. Center for Water Resources Research, Desert Research Institute, Univ. of Nevada, Reno. 45 pp.
- \_\_\_\_\_, J.J. Cooper, G.P. Contreras, and V. King. 1975. Survey of the fishes of the Clear Lake Reservoir drainage. Project Report No. 37, Center for Water Resources Research, Desert Research Institute, Univ. of Nevada, Reno. 38 pp.
- Kovalchik, B. 1987. Riparian zone association, Deschutes, Ochoco, Fremont and Winema National Forests. USDA Forest Service, Pacific Northwest Region. R6-ECOL-TP-279-87, 171 pp.
- Laudenslayer, W. F. Jr. 1982. California wildlife habitat relationships program: Northeast Interior Zone. Vol 1: Introduction and species - habitat relationships matrix. USDA Forest Service, Pacific Southwest Region. 161 pp.
- Littlefield, C.D. 1982. The status and distribution of greater sandhill cranes in California, 1981. Calif. Dept. of Fish and Game, Nongame Bird and Mammal Section, Sacramento, CA. 27 pp.
- \_\_\_\_\_. 1987. Personal Communication with C. McCarthy. July 17, 1987.
- \_\_\_\_\_. 1989. Status of greater sandhill crane breeding populations in California, 1988. Calif. Dept. of Fish and Game, Nongame Bird and Mammal Section, Sacramento, CA. 40 pp.
- Luckow, K. 1984. Soil resource inventory for the Modoc National Forest. Modoc National Forest, Pacific Southwest Region. USDA Forest Service. Draft manuscript 500 pp.
- Marcuson, P.E. 1970. The effect of cattle grazing on brown trout in Rock Creek, Montana. Montana DFG Fish. Div. Sp. Rpt. No. F-20-R-21, II-a. 26 pp.
- Meehan, W. R., and W. S. Platts. 1978. Livestock grazing and the aquatic environment: a review. *J. Soil and Water Conserv.* 33(6):274-278.
- Modoc National Forest. 1975. Timber management plan. 1976-1985. USDA Forest Service.
- Monk, J. G., M. N. Kirven and B. J. Walton. 1989. California peregrine falcon monitoring and management effort in 1989 with a discussion of population trend analysis. The Peregrine Fund. Santa Cruz Pred. Bird Res. Group. Univ. of Calif. Santa Cruz, CA. 21 pp.
- Moyle, P.B. 1974. Status of the Modoc sucker, (*Catostomus microps*) Pisces: Catostomidae. *Cal-Neva Wildlife*. 1974: 35-38.
- \_\_\_\_\_. 1976. Some effects of channelization on the fishes and invertebrates of Rush Creek, Modoc County, California. *California Fish and Game*. 62(3):179-186.
- \_\_\_\_\_. and A. Marciochi. 1975. Biology of the Modoc sucker, *Catostomus microps* (Pisces: Catostomidae) in northeastern California. *Copeia* 1975:556-560.
- Oliver, W.W. and R.F. Powers. 1978. Growth models for ponderosa pine: I. yield of unthinned plantations in northern California. Res. Pap. PSW-133. USDA Forest Service, Pacific Southwest Region Range & Expt. Stat. 21 pp.
- Parker, I. and W. J. Matyas. 1981. CALVEG: a classification of California vegetation. USDA Forest Service, Pacific Southwest Region. 161 pp.
- Platts, W.S. 1979. Livestock grazing and riparian ecosystems - an overview. Pages 39-45 in *Trout Unlimited*. 1979. Grazing and riparian stream ecosystem forum. Proc., Vienna, VA.
- \_\_\_\_\_. 1981. Impairment, protection and rehabilitation of Pacific salmonid habitats on sheep and cattle ranges. Paper presented at the symposium on protection, enhancement, and rehabilitation of Pacific salmonid habitat. Arcata, CA.
- \_\_\_\_\_. 1989. Compatibility of livestock grazing strategies with fisheries. in *Practical approaches to riparian resource management; an educational workshop*. May 8-11, 1989, Billings, Montana. P. 103-110.
- Pyshora, L. 1982. Pronghorn antelope management plan. Calif. Dept. of Fish and Game. 122 pp.

- Remsen, J.V. Jr.** 1978. Bird species of special concern in California: an annotated list of declining or vulnerable bird species. Calif. Dept. Fish and game. 54 pp.
- Ruyle, G. B.** 1977. Effects of rest, season-long, and delayed grazing of wet lands and adjacent uplands on cattle and waterfowl use. M.S. Thesis, University of California, Berkeley. 66 pp.
- Salwasser, H.** 1979. Ecology and management of the Devil's Garden Interstate deer herd and range. Ph.D. Thesis, Univ. of California, Berkeley. 377 pp.
- \_\_\_\_\_, and **K. Shimamoto.** 1981. Pronghorn, cattle, and feral horse use of wetlands and upland habitats. Paper presented at the California riparian systems conference, Davis, CA, September 1981. 4 pp.
- Schweitzer, D.L.** 1980. Wildlife values information—Forest Service requirements and availability. Pages 91-98 in Shaw, W.W. and E.H. Zube (eds). Wildlife values. Center for Assess. of Noncommodity Natural Resource Values. Instit. Series Report #1. 117 pp.
- Seidelman, P.** 1981. Methodology for evaluating cumulative watershed impacts. USDA Forest Service. Region Five.
- Sheeter, G. R. and E. W. Claire.** 1981. Use of juniper trees to stabilize eroding streambanks on the South Fork John Day River. USDI Bureau of Land Management. Technical note OR-1.
- Shimamoto, K. and D. Airola (eds.)** 1982. Fish and wildlife habitat capability models and special habitat criteria for the northeast zone forests. Lassen, Mendocino, Modoc, and Plumas National Forests. 260 pp.
- \_\_\_\_\_, and **T. Newman.** 1982. Bald eagle (nesting) habitat capability model. Pages 105-112 in Shimamoto, K. and D. Airola (eds.). Fish and wildlife habitat capability models and special habitat criteria for the northeast zone national forests. Lassen, Mendocino, Modoc, and Plumas National Forests. 260 pp.
- Smith, J. P., Berg, K.** 1988. Inventory of rare and endangered vascular plants of California. California Native Plant Society; 168 pp.
- Sonnevil, G.** 1972. Abundance and distribution of the Lost River sucker (*Catostomus luxatis*) and the shortnose sucker (*Chasmistes brevirostris*) in Boles and Willow Creek, Modoc County. Project Report, California Fish and Game, 19 pp.
- State of California, Department of Parks and Recreation.** 1980a. California Statewide Recreation Plan.
- \_\_\_\_\_. 1980b. Recreation Outlook in Planning District 2. 88 pp.
- \_\_\_\_\_. 1982. Recreation Needs in California. 39 pp.
- Thayer, D.** Personal communication. Unit Manager, Calif. Dept. Fish and Game.
- Townsend, J. E. and R. V. Smith.** 1977. Proceedings of a seminar: improving fish and wildlife benefits in range management. USDI Fish and Wildlife Service. 118 pp.
- USDA Forest Service.** 1973. National Forest Landscape Management, Volume 2, Chapter 1. Agricultural Handbook No. 462. 47 pp.
- \_\_\_\_\_. 1980. Outdoor recreation and wilderness. Pages 92-158 in An assessment of the forest and range land situation in the United States. FS-345. 631 pp.
- \_\_\_\_\_. 1983. Water quality management for national forest system lands in California. Pacific Southwest Region.
- \_\_\_\_\_. 1984a. Draft environmental impact statement for 1985 Resources Planning Act Program. Washington, D.C.
- \_\_\_\_\_. 1984b. Land management planning direction. Pacific Southwest Region. January 15, 1984.
- USDA Soil Conservation Service.** 1974. Surprise Valley-Home Camp area, California-Nevada. April 1974.
- Vale, T. R.** 1977. Forest changes in the Warner Mountains, California. Ann. Assoc. Amer. Geographers. Vol. 67(1):28-45.
- Walton, B.** 1983. Santa Cruz Predatory Bird Research Annual Report.
- Wheeler, L. C.** 1938. *Polygonum kelloggii* and its allies. Rhodora 40:309.
- Woodbridge, B.** 1987. Habitat use and productivity of Swainson's hawks nesting in Butte Valley, California—Project Summary. Presentation at Status, Biology and Manage. Needs of Swainson's Hawks on USFS Region 5 Lands. Unpub. Abstract.











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*Copies of the Record of Decision, Environmental Impact Statement and Forest Plan were distributed to the following agencies, individuals, and organizations.*

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U.S. Congressman John Doolittle

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Animal & Plant Health Inspection Service (APHIS)  
Bonneville Power Administration  
Office of Architectural & Environmental Preservation  
Army Corps of Engineers  
Department of Transportation  
Occupational Safety & Health  
Interstate Commerce Commission  
Department of Defense – Explosives Safety Board  
National Endowment for the Arts  
Department of the Interior  
Department of Energy  
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Federal Aviation Administration  
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Soil Conservation Service  
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Lassen N. F.  
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Klamath N. F.  
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U. S. Fish & Wildlife Service

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CA Department of Forestry, Alturas

CA Department of Parks and Recreation  
CA State Lands Commission  
CA State Lahontan Water Quality Control Board  
CA State Central Valley Water Quality Control Board  
CA State Department of Boating and Waterway  
CA State Department of Conservation  
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*At their request, the following individuals and organizations were sent only a copy of the Record of Decision. Copies of the full set of documents are available upon request.*

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## A

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