

SPECIAL INTEREST AREAS AND NATIONAL NATURAL LANDMARKS

Issues, Concerns, and Opportunities

Public issues center on the need to establish Special Interest Areas (SIAs) to protect archaeological sites, habitat for threatened and endangered species, and areas with botanical, geological, or scenic values.

Management concerns include the need to identify candidates for SIA designation and to evaluate National Natural Landmark (NNL) candidates.

Background

The only existing Special Interest Area on the Forest is the Ancient Bristlecone Pine Forest Botanical Area. This area encompasses 28,887 acres in the White Mountains and is managed with an emphasis on natural history interpretation and scientific research. This area is internationally significant, as it contains the world's oldest living tree and has been the site of important tree-ring dating (dendrochronological) studies.

The Botanical Area is withdrawn from mineral entry and is isolated geographically from timber harvest, intensive range management, and intense recreation use. The only people who visit the area are those specifically attracted by the Special Interest Area, typically those who have scientific interest in the ancient bristlecone pines. Due to these factors, and to limitations stipulated in the management plan for the botanical area, there is little concern that Forest management would have adverse impacts on the area under any alternative.

Interest in considering the establishment of additional Special Interest Areas on the Forest has focused on potential geologic areas. Outstanding geologic features are found throughout the Forest. "Textbook examples" of volcanic, metamorphic, and glacial geology attract large numbers of students and scientists to the area. Of a preliminary inventory of sixty geologic features on and near the Forest, the following eight have been selected as candidates for further evaluation because of their unique characteristics.

1. Papoose Flat granitic intrusion
2. Granitic domes in the Buttermilk area and on Egypt Creek
3. Hot Creek
4. Starkweather Lake glacial polish
5. Tioga Tarns
6. Inyo Craters group: Inyo Craters, Deadman glass flow, Obsidian Dome, Devils Punchbowl
7. Earthquake Fault
8. Convict Lake/lower Convict Creek (including moraines).

The Forest intends to evaluate these candidates and to make recommendations to the Regional Forester for possible designation during Plan implementation. The Forest has identified no candidates for scenic, archaeological, or zoological areas to be evaluated at this time.

The Department of Interior has developed a listing of National Natural Landmarks (NNLs). NNL designation of an area does not change its management

jurisdiction or affect how the area is managed. For example, if the White Mountains were designated as a National Natural Landmarks, the area would continue to be managed by the Forest Service under the direction specified in the Plan.

Following is a preliminary list prepared by the National Park Service of possible NNLs on the Forest. The right-hand column indicates any existing Congressional or administrative designations affecting the area.

Table 47
Potential NNL Candidates Identified by
National Park Service Theme Studies

Name	Existing Designation(s)
1. White Mountains	McAfee Meadow Research Natural Area (RNA), White Mountains RNA, Ancient Bristlecone Pine Forest Botanical Area
2. Mono Lake and Mono Craters	Mono Basin National Forest Scenic Area
3. Indiana Summit	Research Natural Area
4. Monache Meadow vicinity	None
5. Harvey Monroe Hall	Research Natural Area
6. Last Chance Meadow	Research Natural Area, Golden Trout Wilderness
7. Long Valley	None
8. Mono Mesa	Feature not known
9. North Fork Oak Creek	None
10. Olancho Peak	Golden Trout Wilderness
11. Onion Valley	None
12. Ritter Range	Ansel Adams Wilderness
13. San Joaquin Ridge	None
14. Sentinel Ridge	Research Natural Area
15. Shingle Mill Bench	Feature not known
16. Aberdeen volcanic field and vicinity	Not on National Forest land
17. Alabama Hills	Not on National Forest land
18. Banner Springs Bunchgrass Area	Feature not known
19. Convict Creek	John Muir Wilderness (upper canyon)
20. Coyote Ridge and Coyote Flat	None
21. Division Creek	None
22. Glass Mountain	None

Most of the potential candidates listed in Table 47 receive recognition under current management; others have been identified for evaluation as potential Special Interest Areas.

TIMBER

Issues, Concerns, and Opportunities

The public has raised a number of issues relative to timber management. The most significant of these issues among local area residents is the availability of fuelwood for public use. Some parties even suggest that the Forest Service provide or encourage the development of woodlots for fuelwood production.

The residents of Mono and Inyo Counties rely heavily on National Forest lands for fuelwood, due to the isolation of the counties and the corresponding unavailability of fuelwood from other sources. The length and severity of winters at higher elevations in the area trigger public concern about the cost of home heating. A cord of public-use fuelwood, which currently costs \$5.00, would heat an average-sized house for two months. Gas or electricity to heat the same house would cost approximately \$500 for two months. This difference in cost is the primary reason the public raises an issue about fuelwood availability.

The Inyo National Forest has the opportunity to meet the demand for public-use fuelwood by making logging residue available to the public, by allowing the public to cut wood in pre-commercial thinning areas, and by allowing the public to collect dead and down material on most Forest lands. If demand greatly exceeded the supply from these sources, the Forest could consider selling individual trees to the general public as well as to commercial fuelwood operators. The Forest Service can provide technical expertise and leadership in the establishment of woodlots on private land, but woodlots are not considered a suitable use of National Forest land.

Most of the remaining issues were raised by individuals and groups from other areas, and were addressed broadly to all National Forests in the Region. The only one of those issues that dealt with problems appropriate to timber management on the Inyo was the need to integrate silvicultural practices with other resource needs. The issues of managing old growth timber and riparian areas for values other than timber production are addressed under the headings of Wildlife and Riparian Areas respectively.

Control of competing vegetation, especially if control entails the application of herbicides, is a national public issue. It is not, however, a major issue on the Inyo National Forest, as the arid climate and soil productivity levels on most timbered parts of the Forest prevent the rapid and abundant growth of brush and grasses that would be expected to compete with tree seedlings for survival and growth.

Region 5 (the Pacific Southwest Region) is preparing an EIS on Vegetation Management for Reforestation, which addresses the full range of alternative methods for control of competing vegetation, including mechanical, biological, and chemical methods and prescribed fire. Selection of any particular method will be made at the project level based on a site-specific analysis of the relative effectiveness, environmental effects, and costs of the feasible alternative methods. Herbicides will be selected only if their use is essential to meet management objectives. Past experience on the Inyo indicates that herbicide application would be minimal (affecting less than

300 acres per year at most) under any timber management scenario. Aerial application of herbicides is extremely unlikely to occur.

The primary management concern on the Forest is the need to establish a timber management program that meets the long-term sustained yield capacity of the Forest and meets the requirement of non-declining even flow.

Many factors influence the ability of the Forest to increase timber outputs and to meet timber policy requirements. The first of these is the type of harvest applied to commercial timber lands. The Inyo has, in the past, emphasized intermediate (partial) harvest on large acreage to meet its timber output goals. The main reason for this practice has been the desire to minimize impacts on other resources, primarily recreation and scenic quality. The result has been large areas of partially cut, mature stands that fall well short of optimum productivity.

The alternative to intermediate harvest is regeneration harvest (using cutting methods that remove most or all of the trees from a given site and thus promote vigorous regeneration of young trees). Unless the Inyo makes effective use of regeneration harvest, as directed by the current Timber Management Plan, the Forest may not be able to maintain current timber output levels while meeting the requirements of long-term sustained yield and non-declining even flow.

There is also a need to decide which lands will be managed for commercial timber production and which forest management system will be used. The Inyo provides many high quality recreation opportunities, has a greater than average density of cultural sites, provides critical habitat for local wildlife, and provides summer rangeland essential to local ranching operations. Timber management aimed at high levels of commercial production is not necessarily compatible with these other resources and activities. The potential yield currently calculated for the Forest assumes that timber management will occur on a given number of acres. However, significant amounts of land within the timber base may be less valuable for timber production than for other uses.

Departure from the non-declining even flow requirement is not a concern or issue on the Inyo. The Inyo is not a significant contributor to Regional timber targets; thus, departure on the Inyo could not significantly affect achievement of these targets. In addition, due to the overall existing condition of timber stands on the Forest, departure would not be expected to significantly reduce or prevent mortality losses nor to greatly improve timber age or size class distribution.

There are two systems of forest management to choose from: even-aged management and uneven-aged management. Factors influencing the decision of which system to use with reference to adequate regeneration are the reliability of the system, based on research results and the results of past practices; and the suitability of the system to the timber types on the Forest.

The Forest has the opportunity to address these factors in the planning process. Regeneration harvest can be emphasized over intermediate harvest, timbered areas where other resources are more valuable than timber production

can be identified, timber management practices on those lands can be modified, and predicted harvest volumes can be adjusted accordingly.

The second management concern is the need to improve the health and vigor of timber stands in areas with a recreation management emphasis. Many timber stands in recreation areas show evidence of stress from several factors, including pests and overstocking. Such stands will be highly susceptible to increased pest-related damage unless brought under management. The Forest has the opportunity to manage timber in recreation areas without reducing aesthetic and recreational values. Silvicultural prescriptions can be written to improve the health and vigor of these stands and to maintain them in good condition for the future.

A third concern is the need to determine the appropriate management of the Forest's extensive pinyon-juniper woodlands. Although the productivity of pinyon-juniper sites is presently being studied, little data is yet available on the subject. These lands are currently managed for wood products only by making dead and down trees available to the public for fuelwood. Pinyon-juniper lands may well have value for resources other than timber. There is an opportunity in Forest planning to analyze opportunities, establish direction, and identify research needs related to pinyon-juniper woodlands.

A final concern is the need to assess the impacts of public wood gathering on other resource values. This concern is addressed under the heading of Wildlife.

Timber Types and Location

Tentatively suitable timber stands are found in two general locations on the Inyo National Forest: on the north half of the Forest (south of Mono Lake and north of Mammoth Lakes) and at the south end of the Forest (near Monache Meadows on the Kern Plateau).

The species presently managed on the Inyo for commercial wood products are Jeffrey pine, lodgepole pine, red fir, and white fir. Subalpine forests, pinyon-juniper woodlands, and hardwood stands in riparian areas are the non-commercial forest types on the Inyo.

The Jeffrey pine forest occurs between 7,000 and 10,000 feet elevation. This forest type may have varying amounts of intermixed lodgepole pine and red and/or white fir. The average timber productivity site in Jeffrey pine is Meyers site index 60. Jeffrey pine stands occupy a total of 71,007 acres, or 63.7 percent of the timber base. Jeffrey pine in the area has been harvested for sawlogs since the early 1880s.

Although the lodgepole pine forest occurs from 7,000 to 12,000 feet in elevation, those stands capable of producing commercial quantities of wood are generally found between 8,000 and 10,000 feet. Lodgepole pine stands may include Jeffrey pine and red and/or white fir. The average timber productivity site of this type is Dahms Site Index 40. The extremely poor growth form of most lodgepole pine on the Forest precludes harvesting for sawlogs; however, the species is harvested and sold for fuelwood. Lodgepole pine stands occupy 19,372 acres, or 17.3 percent of the Forest timber base.

Jeffrey pine and lodgepole pine have a low tolerance for shade, so most stands grow naturally in even-aged groups. Many existing stands on the Forest are mature to over-mature. The average growth rate within these types is significantly below potential, primarily because past timber harvest practices relied on natural regeneration. Natural regeneration was unsuccessful, resulting in understocked stands with low growth per acre. Stands of this type are high priority for regeneration.

The red fir type occurs from 9,000 to 11,000 feet, with most of the commercially productive stands below 10,000 feet. Red fir grows in nearly pure stands with an occasional white fir, Jeffrey pine, or lodgepole pine. The average timber productivity site is Schumaker Site Index 30. Red fir on the Inyo occupies 21,169 acres, or 19.0 percent of the timber base.

Under natural conditions, the red fir type perpetuates itself in even-aged stands. However, the shade-tolerant nature of both red fir and white fir has led to the development of some even-aged stands with two distinct age classes. This condition usually occurs when some trees in the stand begin to die, allowing enough sunlight on the forest floor to sustain new seedlings. Fir stands can be better managed by using regeneration cuts that allow partial sunlight on the forest floor such as shelterwood or strip cutting, than are the pines, which require full sun. A managed red fir forest would have greater age class diversity than a natural forest.

Some red fir has been harvested for sawlogs, in those areas where natural reproduction was seen as adequate. However, most pure red fir stands on the Forest have not yet been entered for timber harvest. Red fir has not been in high demand on the wood products market, and there was some question about the ability of silviculturists to regenerate that species under conditions found on this Forest. However, in 1979, the Inyo National Forest began experimenting with small clearcuts (less than ten acres) in red fir in order to determine the ability of the Inyo to regenerate that timber type successfully. Good survival and growth of planted seedlings have been achieved. It appears that the regeneration of red fir using small clearcuts in combination with planting is a viable silvicultural option on the Forest.

The subalpine forest occurs above 12,000 feet and contains lodgepole pine, mountain hemlock, western white pine, whitebark pine, limber pine, and foxtail pine. The subalpine type is the least productive on the Forest, with a timber productivity rating of Dunning Class V. Subalpine stands do not meet the minimum suitability criterion of producing twenty cubic feet per acre of new wood per year.

The pinyon-juniper type occurs from 5,000 to 8,000 feet in elevation. Stands vary from pure pinyon pine, through pinyon pine-juniper associations, to pure juniper. Pinyon-juniper sites do not reliably produce twenty cubic feet of wood per acre per year. Some harvesting for fuelwood, posts, and poles has taken place in the past, and these species are currently an important source of fuelwood for local communities. There are no plans to manage either species for commercial products during the planning period.

Oak, aspen, cottonwood, birch, willow, and alder are not suitable for commercial production on the Inyo.

Logging Systems

Nearly all sawlog harvesting on the Inyo National Forest is accomplished in winter by ground-skidding over-the-snow. Only fuelwood sales and emergency salvage sales may be harvested over bare ground due to their small size and/or urgency. No aerial harvesting in use, nor is it expected to occur in the foreseeable future due to economic considerations and physical feasibility.

Over-the-snow logging is practiced to protect soil, ground vegetation, and water quality. As a result of Memoranda of Agreement with the appropriate state agencies, over-snow logging is also considered adequate protection for certain types of cultural resource sites. These memoranda minimize the amount of land that needs to be taken out of production in order to protect cultural values. Finally, winter logging reduces potential conflicts between timber management and recreation use of the Forest.

Openings

The NFMA regulations and the Regional Guide call for a 40-acre limit on the size of openings created by timber management activities. The current practice on the Inyo is to limit clearcut openings to 20 acres or less. The impact of this size on timber yields is negligible.

Capability, Availability, and Suitability

Not all forested land is biologically capable of, or physically suitable for, producing regular crops of industrial wood. In addition, some of the lands which are both capable of timber production and suitable for it are not statutorily available.

Land is considered incapable of producing timber if it is not physically and biologically able to produce industrial quality wood at a rate of 20 cubic feet per acre per year. Land is unavailable if it has been administratively or congressionally withdrawn from timber production, such as in Research Natural Areas or Wilderness. Land is considered unsuitable if there is not reasonable assurance that the land can be restocked to acceptable standards within five years after final harvest or if technology is not available to produce and/or harvest timber without irreversibly damaging soil productivity or watershed conditions.

Individual timber stands are combined, for planning purposes, into groups with similar characteristics in terms of species, tree size, and stand density. These groupings are referred to as timber types or strata. The nine recognizable strata on the Forest are listed below.

L3P - Lodgepole pine; crown diameter 12-14 feet; 20-39% crown closure.

P2G - Jeffrey pine; crown diameter <12 feet; 70-100% crown closure.

P2P - Jeffrey pine; crown diameter <12 feet; 20-39% crown closure.

P2S - Jeffrey pine; crown diameter <12 feet; 10-19% crown closure.

P4P - Jeffrey pine; crown diameter 24-40 feet; 20-39% crown closure.

P4S - Jeffrey pine; crown diameter 24-40 feet; 10-19% crown closure.

P6G - Jeffrey pine; two distinct size classes: overstory with crown diameter 24-40 feet and understory crown diameter <12 feet; both 70-100% crown closure.

R4X - Red fir; crown diameter 24-40 feet; variable crown closure.

R6G - Red fir; two distinct size classes as Jeffrey Pine (P6G).

Forest Management Systems

Congress has directed the National Forests to determine the long-term sustained-yield capacity of the Forest to produce timber under different levels of management intensity and to develop a base harvest schedule that will lead to a regulated forest (a fully regulated Forest is one in which age and size classes are represented in such proportions and growing at such rates that approximately equal annual or periodic yields of products of desired size and quality may be obtained). These tasks involve the adoption of a forest management system.

Two management systems are commonly considered: uneven-aged management (trees of all ages growing intermingled on each acre of land) and even-aged management (all trees within a stand the same age). The Inyo National Forest has favored even-aged timber management because that system is well supported by scientific research and years of practice throughout the western United States. In addition, even-aged management is the system that best approximates natural regeneration patterns in timber types on the Inyo. The system of uneven-aged management, on the other hand, is not well tested or substantiated by scientific study in the relatively dry environment of the Eastern Sierra Nevada. However, the uneven-aged system needs to be tested for possible future application.

For a more detailed discussion of silvicultural systems, see Appendix D.

The following tables summarize the capability, availability, and suitability, by stratum, of lands on the Inyo National Forest.

Table 48
Lands Tentatively Capable, Suitable, and Available
for Commercial Timber Management

Stratum	Total Capable and Suitable Timber Lands (acres)	Unavailable Timber Lands (Wilderness and RNAs) (acres)	Net Suitable and Available Timber Lands (acres)
L3P	27,869	8,644	19,225
P2G	11,646	287	11,359
P2P	31,538	3,424	28,114
P2S	12,095	3,167	8,928
P4P	11,103	5,336	5,767
P4S	6,603	2,312	4,291
P6G	13,409	1,400	12,009
R4X	23,424	13,801	9,623
R6G	35,520	24,135	11,385
TOTAL	173,207	62,506	110,701

Table 49
Forested Lands Not Capable of or Suitable
for Commercial Timber Production

Stratum	Incapable (Less than 20 Cubic Ft/Yr) (acres)	Unsuitable (Regeneration Not Assured) (acres)	Total (acres)
L3P	188,025	1,491	189,516
P2P	6,445	3,468	9,913
P2S	10,442	17,592	28,034
P4P	1,346	900	2,246
P4S	3,465	1,444	4,909
P6G	2,521	384	2,905
R4X	3,538	3,419	6,957
R6G	7,251	1,202	8,453
Other (pinyon-juniper, sub-alpine)	260,067	0	260,067
TOTAL	483,100	29,900	513,000

Current Management

The current Inyo National Forest Timber Management Plan (1967) projects an average annual potential timber yield on the north half of the Forest of 11.5 MMBF. Actual timber sold in recent years has averaged 10.5 MMBF per year. There is no current timber management plan for the south end of the Forest. However, the potential yield in that area is estimated to be 1.5 MMBF.

The 1967 Timber Management Plan is based on a commercial timber base of 91,500 acres (not including the Monache Meadows area on the Kern Plateau). These acres are divided into three categories: standard component, special component, and marginal component. Although lands in the first two categories are certain to meet the NFMA capability criteria listed above, lands in the marginal component may not meet those criteria.

The current timber plan favors even-aged management. Practices that are applied under this management system include: regeneration harvest (clearcutting and shelterwood cutting), intermediate harvest, site preparation, planting, release, precommercial thinning, and fuel treatment. These practices are defined in the Glossary, Chapter VIII.

Supply and Demand

The Inyo National Forest has been supplying lumber and fuelwood to the local area since the 1800s. However, the Forest's overall contribution to the lumber industry is relatively small. There are no local sawmills; however, sawmills in Gardnerville, Nevada and Loyalton, California depend upon logs from the Inyo National Forest, particularly since the Inyo conducts winter logging, providing timber at a time when other sources to the mills are not available. The current annual harvest is 10.5 MMBF.

In contrast, the local fuelwood industry and the public are almost entirely dependent upon the Inyo for their local fuelwood supply. The Inyo currently sells approximately 4,000 cords of fuelwood per year to commercial operators and 6,000 cords per year to the public.

The demand for sawtimber from the Forest cannot be predicted from historical sales trends. Since all timber offered for sale during the last decade has been sold, we can only conclude that supply has not exceeded demand. In addition, the Inyo has relatively little uncut volume under contract (less than two years' sell volume) and has had no sales turned back. All these indicators lead to the conclusion that sawtimber from the Inyo is in high demand relative the other National Forests in California.

The demand for fuelwood varies somewhat with the severity of the winter, but seasonal variation is less significant than a general correlation of demand with population. The demand for fuelwood is expected to continue growing in direct proportion to population growth.

Current evidence indicates that the demand for both sawlogs and fuelwood will increase into the foreseeable future.

Below-cost Sales

Over the period 1979-1984, timber sale revenues exceeded timber costs by more than \$1 million for the period as a whole. However, in three of the six years, revenues were less than costs. This occurred when markets were weaker than normal, which caused both harvest volumes and prices received to decline. Timber market and sale program fluctuations often distort comparisons between revenues and costs for individual years because costs are incurred for projects that may not yield revenues until later years.

VISUAL RESOURCES

Issues, Concerns, and Opportunities

The major public issues and management concerns are that the visual quality values on the Forest be identified and evaluated and mitigation measures be developed to ensure the continuation of a high quality visual resource.

The Forest needs to respond to these issues and concerns in the Forest planning process. The Forest has the opportunity to maintain a very high level of visual quality, as only about six percent of the land base has received major impacts.

Background

The visual resource, as a key attraction for recreation visitors to the Eastern Sierra, is a primary value on the Inyo National Forest. Both visitors who spend time here and those who pass through on their way to other places are attracted to this area by the magnificent scenery. The predominance of recreation as a source of income in the Eastern Sierra is based, at least partly, on the unique natural scenery of the area.

The scenic quality of the landscape is composed of 10,000-foot escarpments; deep, dramatic canyons; mountain lakes, streams, and meadows; and extremely high visibility due to the steepness of the terrain and the lack of screening vegetation.

Visual quality in the Eastern Sierra has declined somewhat over the past 100 years, as human activities have encroached on the natural appearance of the landscape. Structures and associated ground disturbance have had the most significant visual impacts on the Inyo (unlike many National Forests, where logging has had the greatest impact). Sources of visual impacts include mineral developments, recreation facilities, hydroelectric developments, highway construction, and community development. The primary visual impacts of the past ten years have been ski area development and related community growth.

Major potential future visual impacts include additional ski areas, community growth, and energy development. Both Mammoth Mountain and June Mountain Ski Areas have room for growth within the existing permit areas. As many as five additional ski areas could also develop in the same general area. The communities of Mammoth Lakes and June Lake are expected to grow in response to additional skier capacity.

If all potential energy projects are developed as proposed, they will generate more visual disturbance than all earlier human impacts on the Forest. Proposed energy projects include geothermal, hydroelectric, and wind power generating developments. Such projects could be large and numerous, and each project would include many structures (e.g., buildings, pipes, powerlines). Vegetative and topographic screening in the affected areas would not be adequate to meet current Visual Quality Objectives if projects are fully developed.

The only significant potential visual impact related to timber management would be the harvesting of red fir in heavily used recreation areas.

Supply - Variety Class

The quality of scenic resources can best be expressed by the concept of Variety Class. Landscapes in Variety Class A include such features as mountain peaks, streams, lakes, meadows, rocky outcrops, riparian vegetation, fellfields, unusually steep terrain, and unique land forms. Variety Class B scenery typically includes forested lands on rolling terrain with a few vegetative or topographic variations. Variety Class C lands are generally expansive and brush-covered with little variation. The Inyo is part of the Sierra Nevada and the Desert-Desert Mountain landscape provinces. Although much of the latter province contains vast expanses of Class C scenery, very little land in this category is found on the Inyo. The following table summarizes the scenic variety of Inyo National Forest lands.

Table 50
Inyo National Forest Lands
by Variety Class

Variety Class	Description	Acres	Percent of Forest
A	Distinctive	832,000	44
B	Common	906,500	48
C	Minimal variety	146,200	8

Supply - Sensitivity Level

Sensitivity is a measure of the human concern for scenic quality as seen from a given observation point. The sensitivity of an area depends upon its use (how many people use it and for what purpose) and upon its visual qualities (what is seen and how closely it is viewed). Most Inyo National Forest lands are visually sensitive, due primarily to the visibility of the landscape and the large amount of wilderness. An indication of this sensitivity is the fact that most state and federal highways in or adjacent to the Inyo National Forest are existing or potential state-designated scenic highways. The following table summarizes the visual sensitivity of Inyo National Forest lands.

Table 51
Inyo National Forest Lands
by Sensitivity Level

Level	Relative Sensitivity	Acres	Percent
Level 1 & wilderness	Most sensitive	1,426,700	76
Level 2	Moderately sensitive	170,000	9
Level 3 & unseen lands	Least sensitive	288,000	15

Supply - Visual Quality Objectives

A Visual Quality Objective (VQO) describes the acceptable level of landscape alteration for a specific land area, based on the variety class and sensitivity level of that area. VQOs are used in Forest planning to identify the level of visual quality that would be met under each planning alternative. The following table summarizes VQOs as currently inventoried for Inyo National Forest lands.

Table 52
Inyo National Forest Lands by Inventoried
Visual Quality Objective

Objective	Constraints on Management Activities	Acres	Percent
Preservation	-Prohibited (Wilderness & RNAs).	580,000	31
Retention	-Must not be visually evident - retain natural appearance.	329,700	17
Partial Retention	-Must be visually subordinate to natural character of landscape.	646,200	34
Modification	-May be visually dominant, but must conform to natural character of landscape.	264,800	14
Maximum Modification	-May be visually dominant but not the primary focal point.	64,000	3

Supply - Existing Visual Condition

The Existing Visual Condition (EVC) of all lands on the Forest, including wilderness, has been inventoried. This data describes the degree to which the natural appearance of landscape has been altered. EVC Types I-V relate generally to the VQOs listed above. Alterations described in Type VI do not meet any of these VQOs; they would be considered unacceptable modifications. The EVC types listed below are used in Forest planning as a basis for measuring the effects of alternatives on visual quality. The following table summarizes the existing visual condition of Inyo National Forest lands.

Table 53
Inyo National Forest Lands by
Existing Visual Condition

EVC Type	Description	Acres	Percent
Type I	Untouched	1,430,600	76
Type II	Changes unnoticed	169,100	9
Type III	Minor disturbances	187,800	10
Type IV	Moderate Disturbances	70,900	4
Type V	Major disturbances	19,400	1
Type VI	Drastic disturbances	7,100	0

Supply - Visual Absorption Capability:

The Inyo is moderately capable of screening (visually absorbing) land-disturbing activities. However, these activities are most likely to occur in areas where absorption would be most difficult such as along roads or in heavily used recreational areas. The following table summarizes the absorption capability of all Inyo National Forest lands outside of wilderness (approximately 30 percent of the Forest is wilderness).

Table 54
Inyo National Forest Lands by
Visual Absorption Capability

Absorption Capability	Acres	Percent of Total Forest Lands
High	307,700	16
Moderate	736,400	39
Low	275,600	15

Supply - Visual Quality Index:

A Visual Quality Index (VQI) can be developed to numerically display the difference between the Existing Visual Condition (EVC) and the visual condition that would exist if a given set of Visual Quality Objectives (VQOs) were implemented. The current Inyo National Forest Visual Quality index is 142.07, indicating a very high level of scenic value.

Supply and Demand

The Inyo National Forest considers the visual resource a primary value because the landscape is inherently high in quality (variety class) and is extremely visible and seen by millions of people each year (sensitivity level). Due primarily to the low levels of land-disturbing resource activities on the Forest, 94 percent of the land has retained a natural appearance.

The demand for scenic beauty is most readily characterized by demands for recreational activities. Growth rates for all forms of recreation on the Forest except camping have increased significantly in the last 20 years. The amount of camping has declined with declining developed site capacity. See the Recreation section in this chapter for more detail.

Many recreational activities are directly oriented toward the scenic resource. Major increases in the overnight accommodation capacity of local communities as well as increases in dispersed activities such as hiking, driving for pleasure, nordic skiing, and general forest recreation are based on the visual enjoyment of the Forest. Expanding attractions off-Forest (including local events and celebrations), better access and more leisure time, affluence, and education create a demand for continued high visual quality on the Inyo National Forest.

WATERSHED: SOILS

Issues, Concerns, and Opportunities

Issues, concerns, and opportunities regarding the soil resource on the Forest focus on soil conservation, rehabilitation, improvement, and enhancement. Issues, concerns, and opportunities in this category include declining soil productivity, rehabilitation of damaged or deteriorated watersheds, and management practices in silviculture, grazing, recreation, and other Forest activities that protect or enhance watersheds.

Present and projected demands on the Forest for increased production of commodity goods, expansion of recreational facilities, and expansion of mineral and energy production could expose increasing expanses of soil to erosion. The methods used to pursue these activities can alter the soil beyond the point of recovery.

The Forest currently manages the soil resource primarily by mitigating activities to minimize impacts. Where soil impacts are severe, watershed restoration projects may also be undertaken. The Forest Watershed Improvement Needs (WIN) Plan has identified 23,560 acres, primarily in wet

meadows, that are in need of improvement. Of this acreage, approximately 5,000 acres are currently damaged, and 18,560 acres are threatened with damage if preventive measures are not taken. The WIN plan was developed primarily in response to water quality concerns; soils concerns were secondary. Additional soils concerns need to be addressed by additional WIN studies.

There is an opportunity to establish soil resource management direction in the Forest Plan that goes beyond current management by tailoring direction to specific management areas.

Background

Soil is a basic and essential Forest resource that supports or directly influences most, if not all, other resources. Soil is considered productive when it can grow vegetation for domestic livestock forage, wood products, wildlife habitat, and scenic quality. Each soil type has a unique set of characteristics that determine its suitability for such activities as timber harvest, road construction, grazing, and recreation site construction.

More than 120 distinct soil types have been identified on the Forest. An Order 4 Soil Resource Inventory (SRI) has been completed for the east side of the Forest (the White and Inyo Mountains and the Pizona area). A combination Order 3-Order 4 SRI of the west (Sierra Nevada) side of the Forest is 80 percent complete. The latter inventory excludes wilderness except on the Kern Plateau. About 200,000 acres remain to be surveyed.

Order 4 SRIs are broad reconnaissance investigations that are adequate for Forest-wide planning purposes. Order 3 SRIs provide more information than Order 4; they are conducted for, and are adequate for Forest planning purposes on lands subject to heavy recreation use or timber management. More specific on-site investigations, are needed for project-level work.

The soils on the Inyo National Forest are variable in terms of parent material, physiographic position, susceptibility to erosion, and capacity to support vegetative growth. Fifty-one percent of the soils on the Forest are derived from granitic parent material. Sedimentary parent materials represent 20 percent, pumice parent material represents 9 percent, and limestone parent material represents 6 percent of the total. About 78 percent of the soils on the Forest are sandy or coarse-textured. Three-quarters of these soils contain more than 35 percent rock fragments (stones, cobbles, or gravel) throughout their profiles. About 15 percent of the soils on the Forest are ashy in texture. One-fifth of these soils contain more than 35 percent rock fragments throughout their profiles. The remaining 7 percent are fine-textured soils. Physiographic position ranges from flat tableland to gently sloping alluvial fans, to extremely steep mountainsides.

Many soils on the Forest lie on steep slopes. Sixty percent lie on slopes of greater than 30 percent. Of these, one-third are on slopes greater than 60 percent. Soils on slopes exceeding 60 percent are considered sensitive watershed areas and are generally managed with a primary emphasis on protecting and/or maintaining soil resource values.

Soil productivity is defined as the capacity of the soil, in a specific environment, to produce biomass (vegetation). The factors that influence productivity are soil depth, percentage of rock fragments, texture, available water-holding capacity, nutrient status, maintenance of the duff layer, mineral toxicity, and pH. Precipitation, slope, and elevation also affect productivity. Soil productivity on the Forest ranges from extremely low to highly productive.

The greatest threat to soil productivity is erosion. Some soils are more likely to erode than others, but all are affected by disturbances caused by natural catastrophes or management activities. Highly productive soils can be rendered unproductive by erosion. The soils on the Forest with the highest erosion potential are the Beveridge, Brad, Finley, Midas, and Oosen families. These soils together make up about 6 percent of the Forest.

Most of the soils on the Forest show little evidence of erosion. However, certain areas have lost most of their topsoil because of accelerated erosion. Accelerated erosion has resulted from management activities and/or from natural catastrophes. The most severely affected areas are meadows grazed by livestock (most effects have come from past grazing mismanagement) and alpine ski areas.

Soils on Rangelands

The following soil productivity data is based on range measurements. Rangeland soils are associated with five general vegetation types on the Inyo: high desert/alpine, pinyon-juniper/big sagebrush, bitterbrush/big sagebrush, dry meadows, and wet meadows.

Table 55
Soil Productivity on Rangelands

Vegetation Type	Pounds/acre/yr. Forage	Acres on Forest*	Representative Soil Families or Subgroups
High desert; alpine	75-300	152,574	Pergellic Cryoborolls; Spanel
Pinyon-juniper/ big sagebrush	300-600	661,282	Basket; Trocken
Bitterbrush/big sagebrush	600-1,000	248,307	Supervisor; Toeja
Dry meadow	1,000-1,500	13,831	Cumulic Haploxerolls Aquic Crymbrepts
Wet meadow	1,500-2,000	14,506	Dobrow; Typic Haplaquolls

Table 56
Soil Characteristics on Rangelands

Soil family or Subgroup	Percent of the Forest	Associated Landforms	Elevations (feet)	Average Annual Precip. (Inches)
Pergelic Cryoborolls	10%	mountainsides	9,000 to 14,250	11 to 18
Basket	42%	mountainsides, alluvial fans, dunes, and bottomlands	4,700 to 11,400	8 to 12
Supervisor	16%	mountainsides dunes	5,900 to 12,600	9 to 17
Aridic Haploxerolls	1%	dry meadows & riparian areas	6,000 to 10,000	10 to 30
Dobrow	1%	wet meadows	7,000 to 11,000	10 to 30

*Mostly non-wilderness; only wet and dry meadow figures include wilderness.

Meadows, which are scattered throughout the Forest, have the most productive range soils on the Inyo. These soils have developed from alluvium derived from mixed parent material. The soils are generally deep and well developed, often with alternating mineral and organic-rich mineral layers throughout the profiles. Textures are coarse to medium; water-holding capacities are low to moderate (2.5 to 7.5 inches for the soil as a whole). Either surface water or water from a high water table keeps many of these soils moist throughout the year. The natural erosion rate for these soils is low to moderate, but accelerated erosion is a common problem on meadows where too much grazing has occurred in the past.

The history of intensive grazing on what is now Forest land goes back a hundred years. Severe gully erosion on the rangelands, especially in meadows and riparian areas, has resulted from decades of overuse and poor grazing practices. The rangelands on the Kern Plateau at the south end of the Forest have sustained the worst of this damage. Grazing levels have been reduced, and watershed restoration projects are under way to stop and eventually reverse the course of accelerated erosion in damaged areas.

Meadow soils on the Forest are presently being restored at an average rate of forty acres per year. Meadow restoration projects are under way in the Buttermilk area, the Kern Plateau, the White Mountains, the Casa Diablo area, the Glass Mountains, Little Antelope Valley, Little Hot Creek, Mammoth Meadows, Swall Meadows, the Coyote Plateau, and Baker Creek.

Soils on Timber Lands

The following data on soils associated with the three major commercial timber types on the Forest is based on timber measurements.

Table 57
Soil Productivity on Commercial Timberlands

Timber Type	Acreage on Forest*	Average Site Class/Index	Incremental Growth (cu ft/acre/year)	Representative Soil Family or Subgroup
Red fir	19,732	2/30	104	Kwed; Olancha; Siretta
Jeffrey pine	71,007	4/60	46	Oosen; Wapal; Chaix
Lodgepole pine	21,169	6/40	25	Dystric Xerothents, cindery; Thow; Glean

* Non-wilderness only

Table 58
Soil Characteristics of Commercial Timberlands

Representative Soil Family or Subgroup	Percent of the Forest*	Associated Landforms	Elevations (feet)	Average Annual Precip. (Inches)
Kwed	1%	mountainsides, mountain flats,	7,200 to 12,000	15 to 40
Oosen	5%	moraines mountainsides, mountain flats, hillslopes, alluvial fans, & uplands	6,000 to 9,500	10 to 30
Thow	1%	mountainsides, mountain flats, plateaus, hillslopes, uplands, moraines, stream terraces, and floodplains	7,800 to 10,600	14 to 30

* Non-wilderness only

Commercial timber on the northwest part of the Forest grows on deep, young, poorly developed pumice, granitic, and andesitic soils such as the Kwed, Oosen, and Thow families. The soils represented by the Kwed family are the most productive timber-growing soils on that part of the Forest. Soils in the Oosen family are moderately productive, and those in the Thow family are the least productive. All of the soils in the area have low to moderate water-holding capacities (2.5 to 7.5 inches for the upper sixty inches of the soil). The soils are sandy and coarse-textured and often contain many rock

fragments throughout their profiles. These soils are highly susceptible to erosion, especially on slopes of more than 30 percent.

Timber lands on the southwest part of the Forest in the Monache Mountain-Kingfisher Ridge area of the Kern Plateau lie on shallow to deep, poorly developed, granitic and andesitic soils that fall into the Siretta, Chaix, and Glean families. Soils in the Glean family are the most productive of the three; soils in the Chaix family are moderately productive, and soils in the Siretta family are the least productive. All of the soils in the area have low to moderate water-holding capacities. They are sandy or coarse-textured, and many contain many rock fragments through their profiles. Although the natural erosion rates for these soils are low to moderate, the potential for accelerated erosion is moderate to high, depending on the slope and the amount of disturbance.

Soils on Other Lands

Soils on the 23 percent of the Forest outside of rangelands and commercial timber lands tend to be low to moderate in productivity and water-holding capacity. As a result, they support sparse vegetative growth and are correspondingly subject to erosion, especially on steep slopes where the vegetation has been removed. As management activities and human uses of these lands tend to be minimal, erosion is not a major problem over large areas. Mining and OHV use, however, create localized impacts that can be severe.

Alpine ski area development has adversely affected the soil resource. Soils on the two existing ski areas are similar in productivity, water-holding capacity, and erosion potential to the soils on timber land at the northeast end of the Forest. The parent material at Mammoth is mostly pumice (some is granitic) whereas at June Mountain it is all granitic.

The ski runs on these areas have been built on steep slopes, and all or most of the vegetation has been removed. Wind and water erosion have been severe, resulting in the loss of the top soil layer (the most productive part of these soils). Soils carried from the slopes have reached streams, degrading water quality. Erosion prevention plans for each ski area have been partially implemented, but soils are still eroding, and water quality does not yet meet State of California Water Quality goals in some instances.

Other recreational activities on the Inyo have also affected soil stability. Fishing and camping, especially along Bishop Creek, have resulted in trampling of vegetation and erosion of streambanks. Off-highway vehicles in the Monache Meadows area have also destroyed vegetation and led to erosion in the meadows.

Other Forest activities that could affect soil stability are geothermal energy development, roads, and trails. Each of these activities disturbs or removes native vegetation, exposing the soil to accelerated erosion. These activities also often disturb and/or remove some of the soil.

The demand for optimum soil condition is related primarily to the demands for vegetative growth (for timber, range, wildlife, or scenic values) and water

quality. Stable and productive soils are needed to meet the demand for most of the other resources produced on the Inyo National Forest.

The Forest currently manages soil resources by the development and implementation of site-specific soil resource protection techniques. Best Management Practices (BMPs) for water quality protection are used as guidelines, as many of the practices that protect water quality do so by protecting soil stability. BMPs are a collection of management requirements and considerations that need to be addressed prior to and during the implementation of land management activities.

WATERSHED: WATER QUALITY

Issues, Concerns, and Opportunities

Management is concerned with the need to maintain and improve water quality. Water quality is also a public issue. The primary threat to water quality on the Inyo is sedimentation. The most significant sources of sediment are ski areas and rangelands damaged by past mismanagement of grazing.

The major opportunities of the Forest has to respond to water quality issues and concerns are: continued application of Best Management Practices (BMPs), continued implementation of ski area Erosion Prevention Plans (EPPs), and restoration of damaged watersheds.

BMPs have been certified by the State and approved by the Environmental Protection Agency for controlling non-point sources of surface water pollution. Methods and techniques for applying the appropriate BMP are identified during the on-site investigation of Forest projects that have potential to degrade surface water quality.

Background

The vast majority of runoff from Inyo National Forest land is used for domestic or municipal supplies or for irrigation. Although small and localized bacterial, nutrient, and chemical problems exist, established basin water quality objectives are met by 97 percent of the total water flowing off Forest lands, or approximately 1,047,000 acre-feet per year. The only significant impact on water quality is sediment from ski areas and eroding wet meadows.

The vegetatively barren or sparsely vegetated slopes of the Forest's two alpine ski areas can contribute heavy sediment loads to streams during the spring runoff season. Ski runs are developed to provide maximum skier capacity on minimal snow cover. This principle requires that any vegetation on the run be of minimal height and that vegetation be removed straight up and down the fall line. The pumice and granitic soils characteristic of ski areas on the Inyo are easily disturbed, and once disturbed they are easily eroded. Approximately 1,500 acres are currently disturbed. Although Erosion Prevention Plans have been developed for both ski areas, approximately 800 acres of disturbed land have yet to be stabilized.

The other major sources of sediment on the Inyo are wet meadows that have been severely eroded over the past century. The 1981 Forest Watershed Improvement Needs (WIN) inventory surveyed 26,000 acres of meadow, 23,560 acres of which needed improvement to either maintain or restore water quality. Meadow erosion is most severe on the Kern Plateau, Coyote Flat, and the east sides of the White Mountains and Glass Mountains.

Mismanaged grazing in the past has triggered accelerated erosion and greatly reduced the productivity of many mountain meadows. Continued grazing has inhibited the natural recovery of some sites. About 15 to 20 percent of the current cattle grazing and nearly 15 percent of the sheep grazing on the Forest occurs in these meadows.

Much of the sediment production occurs during spring runoff, with an occasional high-intensity summer storm contributing large amounts in a localized area. Grazing has a tendency to compact soils, to concentrate water on livestock trails, to trample streambanks, and to denude small localized areas such as water trough sites, salting sites, and sheep bedding areas. In addition, livestock spend a disproportionate amount of the time in riparian areas, especially in wet meadows, thus inhibiting recovery. The above combination of factors can result in increased runoff and sediment production on sensitive rangelands.

Stream reach inventory and channel stability evaluation procedures have been applied to rangelands on the Kern Plateau. Areas with good bank protection scores (considerable stream bank rock armoring and streamside vegetation) have shown fair to good resistance to the impacts of livestock grazing. Sensitive stream reaches with poor bank protection scores have shown dramatic impacts in response to livestock grazing. Nearly all sensitive stream reaches in grazing allotments have gone through a cycle of erosion, including headcut migration and gully widening and deepening. The trampling of streambanks on such stream reaches has increased sediment production by as much as 500 percent above estimated natural levels. These reaches may, however, represent less than 5 percent of the total stream miles on the Kern Plateau. The bank protection rating system will be used to monitor grazing impacts and recovery potential along these reaches in the future.

Some small, isolated riparian areas in other parts of the Forest show evidence of much disturbance due to frequent visitation by livestock for water and shade. Water quality in these areas deteriorates only during infrequent thundershowers, but the riparian areas are degraded nonetheless.

Watershed restoration projects are currently being implemented on the most severely damaged wet meadows at a rate of approximately 40 acres per year. A goal of 200 to 300 acres per year is desirable and attainable.

Other activities that currently or potentially impact water quality are mining, geothermal energy development, and roads and trails. Each of these activities disturbs native vegetation and compacts the soil, resulting in increased runoff, channelization of water, and sediment production. Those parts of the Forest with the highest precipitation and the steepest slopes are the most sensitive to the water quality impacts of land-disturbing activities.

Timber management has historically conflicted very little with water quality on the Inyo, and conflicts are not expected to increase unless harvest occurs on different soil types or steeper slopes than those harvested at present. Most timber harvest occurs over-the-snow, so soils are not usually affected directly by logging activities. In addition, the timbered area of the Forest lies mostly on pumice soils. Pumice is so porous that there is little, if any, surface runoff to carry soil into streams. If steeper slopes or different soil types are harvested in the future, water quality could become more of a concern than it is at present.

Municipal Watersheds:

The Forest includes ten watersheds that serve municipal water systems; these watersheds are listed below.

Table 59
Municipal Watersheds
on the Inyo National Forest

Municipal Watershed	Average Annual On-site Water Use (acre-feet)
Lee Vining Creek	365
Rock Creek	64
Bishop Creek	25
Big Pine Creek	10
Independence Creek	7
Lone Pine Creek	17
Glass Creek	16
Pine Creek	300
Reversed Creek	325
Mammoth Lakes Basin	3,750

The first six of these watersheds include large wilderness acreage and heavy recreation use areas. Local domestic water uses include campgrounds, resorts, and summer homes. The only concerns with water quality in these six watersheds are recreational use of the campgrounds and backcountry areas, fuel spills from vehicle accidents or resort facilities, or faulty septic and leach line facilities at resorts or summer homes. The latter concerns are minimized by posting roads to control speeds and inspecting facilities every few years to guard against undetected leaks. Backcountry use problems are minimized by educating the public about wilderness sanitation and imposing wilderness use quotas to protect resources. There is no foreseeable need for additional measures to be taken for municipal water standards to be met.

The Glass Creek watershed includes only National Forest land. The only domestic water uses include a campground and a small summer home tract. The watershed is stable and water quality is good; a minor sedimentation problem in the meadows is targeted for improvement in the near future. Although the stream below the recreational facilities typically shows bacterial contamination in late summer and throughout the fall, the water meets water

quality standards for downstream uses. New ski area development or timber harvest are potential impacts on the watershed.

The Pine Creek watershed provides water for the small mining community of Rovana. The headwaters of Pine Creek are in wilderness; the Pine Creek Mine is located just outside the wilderness boundary. Water emerges from wilderness with excellent quality but deteriorates as it flows through the mine and mill sites. The major threats to the water quality of Pine Creek are wilderness use, mining and milling operations, and fuel or toxic chemical spills from vehicles traveling the road. There are no reservoirs or developed recreation sites in the watershed. Wastewater discharges from the mine and mill are regulated by the State Water Quality Control Board, and EMPs are applied to mining operations on National Forest land. The majority of mine and mill facilities are on private land and, hence, outside of Forest Service control. Toxic chemical spills have occurred in the past, and there is a contingency plan for warning the community in case their water supply is contaminated.

Reversed Creek and its tributaries provide water for communities in the June Lake Loop. Existing and potential adverse impacts on water quality are ski area development, community development, and vehicle traffic. The existing ski area produces considerable sediment during peak runoff periods, causing a shutdown of water treatment systems for thirty days or more each year. Implementation of the EPP for the ski area has reduced these impacts over the past few years, and discharge will soon meet State requirements. Any expansion of the ski area must be carefully planned and tightly controlled. Community growth should involve close cooperation between the Forest Service and the county. The water supply for June Lake Loop communities should be sufficient to meet projected population growth, though conflicts with downstream users could arise. A discussion of the potential to increase water quantity in this area is included under the heading of Water Yield, below. For more detailed information, see "June Lake Loop: A Review of Current Water Uses and Future Needs" (1982).

The community of Mammoth Lakes uses nearly a third of the water flowing from the Mammoth Lakes Basin. Most of the watershed is on National Forest land, of which 80 percent is wilderness. The Lakes Basin is managed primarily for recreation and watershed values. There is no timber harvest or other commodity production in the watershed, due both to a lack of opportunities and a primary emphasis on recreation in that area. The five reservoirs in the Basin are used for water storage (600 acre-feet) and regulation of instream flow. Fishing and boating are allowed on the reservoirs. Swimming is permitted only in Horseshoe Lake, which does not drain directly into the watershed. Water from Horseshoe Lake apparently percolates through the soil into the water table.

The quality of Mammoth Lakes Basin water is good where it emerges from the wilderness, but declines somewhat as it passes through recreation developments and heavy use areas. Water quality has improved in recent years since new sewer systems have been installed and wilderness use has been regulated; State standards for domestic water supplies are met consistently.

The supply of water in the Lakes Basin does not meet present and projected demands for the growing Mammoth community. A discussion of the potential to increase this quantity is included under the heading of Water Yield, below.

In April 1977, a Water Management Plan, Final Environmental Report, was prepared by the Mammoth County Water District in response to water rights filings in the Mammoth Lakes Basin. The Forest responded to the final report by conducting an environmental analysis and preparing an Environmental Assessment (EA). This assessment limits drawdowns on the reservoirs and stipulates instream flows for affected stream reaches. These stipulations have been incorporated into the license conditions for the water rights. No constraints are placed on Forest Service activities within this operating agreement. Future direction addresses increased storage potential within the Basin, subject to the stipulations of the existing EA and future EAs.

Cumulative Watershed Effects (Water Quality)

Of the twenty-two National Forest System watersheds on the Forest, less than 20 percent of any individual watershed land base is privately owned. Intermingled private lands are managed predominantly for recreational values (housing, fishing and hunting). The Pine Creek watershed is occupied by a tungsten mine; the Lake Crowley and Mammoth Creek-Hot Creek watersheds have grazing and major community development. Due to the low level of projected impacts from recreation development and management (except alpine skiing), the lack of a substantial private land base, and the low level of management intensity, use, and development on most watersheds, only two areas on the Forest are vulnerable to cumulative watershed impacts relating to water quality. Those areas are the Monache Meadows area on the Kern Plateau and the Mammoth Creek-Hot Creek watershed downstream from Mammoth Lakes.

Increased grazing on sensitive stream reaches and meadows and continued illegal OHV use in the Monache area could have significant impacts on water quality. The soils in that area are derived from decomposed granite resulting in a predominance of loamy sand with little cohesion among particles. The lack of understory vegetation in timber, and the lack of rocky or vegetative armoring on streambanks make this watershed very sensitive to changes in the hydrologic regime.

Increased runoff from past grazing and OHV trails has adversely affected water quality in the Monache area and will probably continue to do so. Watershed damage from these activities has reduced the ability of disturbed sites, especially wet meadows and riparian areas, to absorb and offset the effects of high runoff periods. Continued or increased use of the area with additional land-disturbing activities would have to be closely monitored due to the high potential for further adverse impacts on water quality.

Studies have indicated that grazing can increase sediment production by 25 to 1000 percent or more (Mechan et al, 1977; Hartment et al, 1960; G. Lusby, 1970). Grazing also increases the total water yield and the duration of runoff in a watershed (Hanson et al, 1970). Increased and prolonged runoff increases erosion and reduces the water available for vegetative growth.

Stream reach inventory and channel stability evaluation procedures have been applied in the Monache area. Areas with good bank protection scores

(considerable streambank rock armoring and streamside vegetation) have shown fair to good resistance to the impacts of livestock grazing. Areas with poor bank protection scores have shown dramatic impacts in response to grazing. The bank rock content and streambank vegetation are used as indicators of the resistance of a stream to impacts and will be used as a means of assessing grazing impacts on water quality.

Existing and proposed ski area development, urban growth, and livestock grazing have already adversely impacted water quality in the Mammoth Creek-Hot Creek watershed. A tenfold increase in suspended sediment during the spring runoff-summer period occurs in Mammoth Creek between the outlet of Twin Lakes and U.S. 395. The predominant sources of this sediment are urban development and associated ski area development. Much of the future proposed development would represent ground-disturbing activities, some of those on steep slopes, resulting in increased runoff and sedimentation.

The State Water Resources Control Board has recently adopted a motion to place a high priority on establishing stringent guidelines for urban development in the Mammoth-Hot Creek watershed in an attempt to minimize adverse water quality impacts.

WATERSHED: WATER RIGHTS

Issues, Concerns, and Opportunities

Management is concerned with the lack of legal mechanisms in state law for obtaining water rights for nonconsumptive water-dependent resources. The management of those resources, such as fish and wildlife habitat, riparian vegetation, scenic and recreational values, are central to the mission of the Forest Service, but could be threatened by other water uses on Forest land. This concern on the Inyo focuses on such consumptive uses as hydroelectric projects, domestic and municipal water needs, and irrigation.

The Forest resolves conflicts related to water rights and uses by interdisciplinary review, by setting forth stipulations in appropriate special use permits, and by responding to energy license applications received by the Federal Energy Regulating Commission (FERC) for hydroelectric projects.

Background

The Inyo National Forest holds 340 water rights to meet its existing consumptive use of 7,400 acre-feet of water per year. This water use represents 0.007 percent of the total water yield from Inyo National Forest lands. More than 95 percent of Forest and non-Forest water rights have been inventoried and are currently accurate. It is estimated that the Forest's own consumptive water needs would grow no more than 10 percent over the next fifty years under any management scenario. Most of that demand could be met by using appropriate State laws and procedures.

Many streams, riparian areas, and riparian area-dependent resources on and near the Forest have been adversely altered to a significant degree. Approximately fifty miles of stream on the Forest have been totally dewatered

for municipal, hydroelectric, and irrigation purposes. Approximately 30 percent of that total may be partially rewatered in the future if new licenses for existing hydroelectric projects include stipulations to that effect. Congressional action or litigation would be needed to reinstate instream values on the remaining 70 percent.

WATERSHED: WATER YIELD

Issues, Concerns, and Opportunities

Management concerns focus on the public demand for more water, both locally and in Southern California, and the competition between consumptive water uses (such as hydropower, irrigation, and municipal supplies) and nonconsumptive (instream) values.

Essentially all of the water from the Forest flowing into the Mono and Owens Basins is either used in local communities or exported for municipal consumption. The small amount of water that is not consumed serves wildlife needs in the desert environments of the valley floors.

Background

The current mean annual water yield from Inyo National Forest lands is approximately 1,093,000 acre-feet. Table 60 displays water yield by National Forest System (NFS) watershed.

Approximately 60 percent of water from the Forest drains into the Owens and Mono Basins. Nearly 50 percent of the 190,000 acre-feet flowing into the Mono Basin and 75 percent of the 502,000 acre-feet flowing into the Owens Basin is exported via the Los Angeles Aqueduct to supply 80 percent of the total water used by the City of Los Angeles. Another 30 percent of the Forest water yield flows west from the Sierra Crest, via the Kern and San Joaquin Rivers, into the Central Valley where it is used for irrigation, hydroelectric power, and municipal supplies. Water from the White Mountains, representing approximately 6 percent of the Forest total, is used for ranching, irrigation, and domestic needs within ten miles of the Forest boundary.

The potential to increase water yield on the Forest by vegetation management is limited by several key factors: the low levels of precipitation over much of the Forest; the large acreage in designated wilderness; the domination of most major drainages by recreation developments and heavy recreation use, and the relatively small amount of acreage suitable for intensive timber management (the best opportunity to increase water yield).

The entire Forest includes only 700,000 acres of land that receive sufficient precipitation to warrant an analysis of the potential to increase water yield. Approximately 580,000 of those acres are in designated wilderness. Of the remainder, only 80,000 acres are in suitable timber. Due to these limiting factors, maximum water yield off the Forest would represent an increase of only 20,000 acre-feet per year over current levels. That increase would result from timber harvest and/or vegetation removal for ski area development in the San Joaquin Ridge area between Mammoth and June Lake.

Table 60
Average Annual Water Yield by Watershed

NFS Watershed	Watershed Name	Water Yield (acre-feet)
1606001001	Huntoon Creek	0
01	Northeast White Mountains	51,230
1080400601	Fish Creek (Inyo Portion)	73,125
03	Middle Fork San Joaquin River	138,120
1809010101	Mono Lake	190,000
02	Adobe Valley	30,575
1809010201	Lake Crowley	116,000
02	Hot Creek (formerly Mammoth Creek)	41,000
03	North Owens River	59,475
04	Rock Creek	53,865
05	Horton Creek	13,955
06	Bishop Creek	71,360
07	Big Pine Creek	34,705
1809010301	South Owens River	65,095
02	Independence Creek	8,970
03	Lone Pine Creek	11,000
04	Owens Lake	27,085
1809020101	Southeast White Mountains	10,430
1809020501	Desert - China Lake	1,000
1803000201	Upper South Fork Kern River (Inyo Portion)	40,330
02	Middle South Fork Kern River (Inyo Portion)	11,440
1803000101	Upper Kern River (Inyo Portion)	45,575
	TOTAL	1,094,335

The communities of Mammoth Lakes and June Lake, both included within the Forest boundary, are quickly outgrowing their water supplies. The ultimate limits of expansion for both communities may well be set by the water supply.

In years with average or below-average precipitation, the water supply for Mammoth Lakes falls approximately 10 percent short of existing demand. The current community plan calls for a near-doubling of the population, with corresponding increases in demand for water. Although increased water storage capacity has been proposed for the Mammoth Lakes Basin, and although various options are being studied, wilderness designation and recreational considerations limit that opportunity. Wilderness and recreation also preclude the management of vegetation to increase water yield in the Lakes Basin. The community is exploring groundwater sources, but the volcanic geology of the area does not lend itself to highly productive wells. Other alternatives are very costly. There are several agreements and master operating plans for management of the Mammoth Lakes Basin water supply; these agreements and plans are updated every five years.

The population of the June Lake Loop is projected to increase 100 percent over the next twenty years. There are more opportunities for increasing

water supplies for June Lake than for Mammoth, but those opportunities are hindered by current litigation over Mono Lake, the distance between water sources and the community, and potential conflicts with existing downstream users.

Table 61
Miles of Stream Dewatered
Mono and Owens Basin Watersheds

Mean Diverted Amount as Percent of Undiverted Flow	Miles Impacted	Percent of Total Miles Impacted
0	63.4	12.0
0.1-10	141.5	26.7
10-20	67.9	12.8
20-30	27.2	5.1
30-40	10.5	2.0
40-50	21.7	4.1
50-60	5.3	1.0
60-70	12.3	2.3
70-80	26.0	4.9
80-90	23.1	4.4
90-99.9	24.2	4.6
100	105.9	20.0
TOTAL	529.0	99.9

Cumulative Effects (Water Yield)

Cumulative watershed effects associated with the Inyo National Forest are concerned far less with water quality than with quantity and/or availability. These cumulative effects center on the water needs of growing populations in water-deficient areas (both locally in the Eastern Sierra and in the City of Los Angeles). The major conflict has arisen between consumptive water uses and instream values.

Beginning in the 1880s, water diversion and channelization within, and export from the Mono and Owens Basins has had significant adverse impacts on water-dependent resources. As the above table illustrates, 105 miles of stream or 20 percent of the total in these watersheds have been completely dewatered. In addition, the dewatered streams are those that once had the heaviest flows, the most productive fisheries, and the most extensive riparian habitats.

One of the most significant measurable impacts of water removal has been the declining quantity and quality of waterfowl habitat. According to the Department of Fish and Game, in 1983 (a very wet year in which much of the local runoff was used to recharge the water table) more than 3,000 birds were raised in the Lower Owens Valley. In 1984 (an average water year) fewer than 300 birds were raised in the Valley.

Owens Lake is essentially dry, and Mono Lake is projected to stabilize at 45 percent of its original volume (before water diversions began in 1941). Mono Lake is considered a prime annual resting and feeding site for nearly two million migratory birds and a nesting site for approximately 20 percent of the world population of California gulls. If water diversions continue at current rates, the salinity of the lake could increase to the point of significant adverse impacts on native brine shrimp. These shrimp are the foundation of the food chain that supports both migratory and resident birds.

Within the present Forest boundary, nearly fifty miles of stream are dewatered, primarily for purposes of irrigation, municipal/domestic supplies, and hydroelectric power generation. There is an opportunity through the hydroelectric licensing process to partially rewater certain reaches of stream and to recover approximately 10 percent of the water-dependent resources that have been lost. Any additional rewatering could only be obtained by litigation.

The demand both for consumptive uses of water and for water-related recreation (the backbone of the local economy) are expected to increase over time, so the conflict and competition between consumptive and nonconsumptive needs will continue and intensify for the foreseeable future.

WILD AND SCENIC RIVERS

Issues, Concerns, and Opportunities

Public issues regarding wild and scenic rivers include the concerns that free flowing rivers be preserved, some rivers be maintained unspoiled in their natural state, rivers be considered for wild and scenic rivers status, and potential additions to the wild and scenic rivers system not be threatened.

Management concerns on the subject address the need to assess candidate rivers for possible inclusion in the National Wild and Scenic Rivers System.

Background

Congress established the National Wild and Scenic Rivers Program in 1968. In 1982, the Department of Interior completed the California Component of the nationwide inventory of rivers with potential for wild and scenic status. That inventory included three rivers on the Inyo National Forest: the North and South Forks of the Kern River and the Middle Fork of the San Joaquin River. No additional rivers on the Forest were identified as potential wild and scenic river candidates. The North and South Forks of the Kern River have subsequently been designated by Congress as Wild and Scenic Rivers.

The Inyo National Forest coordinated with the Sequoia National Forest (the lead unit for the Kern River), and the Sierra National Forest (the lead unit for the San Joaquin River system) in making recommendations for the South Fork of the Kern and the Middle Fork of the San Joaquin Rivers respectively.

The North Fork of the Kern River originates within Sequoia National Park and flows south through the Kern River Canyon until it empties into Lake Isabella. At the Kern River Ranger Station in the Park near Golden Trout

Creek, the North Fork of the Kern becomes the common boundary between the Inyo and Sequoia National Forests. The river is free-flowing dropping through rocky gorges with precipitous sidewalls. After the river leaves the Park, it flows through the Golden Trout Wilderness to just south of the Forks of the Kern, where it leaves the wilderness.

The North Fork of the Kern River borders the Inyo National Forest from its confluence with Golden Trout Creek to its confluence with Nine Mile Creek, all within the Golden Trout Wilderness. The Inyo National Forest side of this common boundary is trailless, except for a short section of trail going northwest from the junction of Nine Mile Creek. White water rafting is popular, with trips starting from the Sequoia National Forest side of the river.

The South Fork of the Kern arises on the Inyo National Forest at an elevation of 10,200 feet within the Golden Trout Wilderness. The river flows in a southerly direction for twenty miles through the wilderness, then for eight miles through Monache Meadows, and sixteen miles through the South Sierra Wilderness where it forms the boundary between the Inyo and Sequoia National Forests. The segment of the river that passes through the Inyo National Forest is approximately forty-four miles long. The river is free-flowing, descending through deep gorges with large granite outcroppings and domes interspersed with open meadows. The gorges have numerous waterfalls and rapids. Most of the surrounding lands lie in wilderness. The river supports dramatic and diverse riparian vegetation. The segment of the river on the Inyo is readily accessible by trail. An eight-mile stretch through Monache Meadows is accessible by four-wheel drive vehicle.

The South Fork of the Kern lies mostly on the Sequoia National Forest. The Sequoia, therefore, took the lead role in assessing the river. The Inyo has played a cooperating role in supplying information to the Sequoia. The Inyo will follow the Sequoia's lead in producing the management plan for the river.

The Middle Fork of the San Joaquin starts from Thousand Island Lake at an elevation of 9,800 feet within the Ansel Adams Wilderness on the Inyo National Forest. The river flows in a southerly direction for sixteen miles through the wilderness and Devils Postpile National Monument, then in a westerly direction for two miles until it enters the Sierra National Forest. The river segments on the Inyo total approximately fifteen miles.

The Middle Fork flows through a deep canyon with steep, rocky sides, sheer granite walls, and impressive domes. The river has numerous rapids and falls that are impassable by raft. The segment of the river on the Inyo is accessible by trail and the Reds Meadow Road.

The Middle Fork of the San Joaquin is included with the rest of the San Joaquin River in the Nationwide Rivers Inventory. The major part of this river, including some of the Middle Fork, lies on the Sierra National Forest. The Sierra has, therefore, taken the lead in conducting the assessment and will make recommendations for management of the river to the Regional Forester.

Wild and scenic river recommendation is a preliminary administrative recommendation that will receive further review and possible modification by the Chief of the Forest Service, Secretary of Agriculture, and the President of the United States. Congress has the authority to designate rivers to the National Wild and Scenic Rivers System.

WILDERNESS

Issues, Concerns, and Opportunities

Most public issues about existing wilderness involve administrative decisions that are made in wilderness management plans, not in the Plan.

The major planning issue raised by the public concerning wilderness is the amount and location of new wilderness areas. That issue is handled under the heading of Further Planning Areas.

Four of the five existing wildernesses on the Forest are managed under approved management plans. A plan for the South Sierra Wilderness has yet to be developed. Management is concerned that existing plans be examined for consistency and responsiveness to current conditions, that they be amended to include recent wilderness additions, and that a plan be developed for the South Sierra Wilderness. Specific concerns to be handled in management plans include limitation and dispersal of use, party size, camping and campfire restrictions, recreational livestock use, outfitter-guide operations, trails, ecologically sensitive areas, and wildfire management.

Background

The Inyo National Forest includes 565,142 acres within the Hoover, Ansel Adams (formerly Minarets), John Muir, Golden Trout, and South Sierra Wildernesses, and manages 25,201 acres of Sierra National Forest land within the John Muir. The Inyo shares management of all five Wildernesses with other Forests.

The Inyo manages about 9,500 acres of the Hoover Wilderness (out of 47,937 total acres). The prime attraction on the Inyo portion of the Hoover is the Twenty Lakes Basin, an extremely scenic area with gentle to rolling high-elevation terrain which receives extremely heavy day use. The services of a boat taxi from the trailhead to the north shore of Saddlebag Lake, and the proximity of campgrounds in the Saddlebag Lake and Tioga Pass Road areas contribute to the heavy use. The Hall Natural area, a Further Planning Area being considered for wilderness designation in the Planning process, is adjacent to the Hoover.

The Ansel Adams Wilderness (formerly the Minarets) is administered by the Inyo and Sierra National Forests. New additions to this wilderness were designated by the California Wilderness Act of 1984. Additions on the Inyo side are located above Grant Lake in the June Lake Loop and in the Reds Meadow-Devils Postpile area along the Middle Fork of the San Joaquin River. The Ansel Adams is mostly steep and rugged, and contains many scenic lakes and mountain peaks. Visitor use, including day use, is heavy. Trailhead quotas are needed during the summer season to manage overnight use within

established capacity limits. The many neighboring campgrounds in the Mammoth and June Lake recreation areas provide a user base for day hikes into the wilderness. Easy trail access facilitates wilderness travel. The Middle Fork of the San Joaquin River, which has its headwaters in the wilderness, is under consideration for wild and scenic river status.

The John Muir Wilderness encompasses an area known informally as the "High Sierra", characterized by hundreds of lakes, glaciated peaks, and a favorable climate during the summer. All these factors combine to attract more users in the summer than the area can accommodate. Consequently, most trailheads have use quotas on overnight travel during the summer months. The Forest has a substantial number of developed campgrounds near wilderness trailheads. People using these campgrounds are the principal source of day use in wilderness. Most major trailheads are serviced by commercial pack stations, which offer overnight and day trips into the wilderness. There are some conflicts between backpackers and stock users. Outfitter-guide use in the category of guided backpacking and mountaineering is increasing. The wilderness is easily accessed by trailheads, and sufficient trail mileage exists to provide needed access.

The Golden Trout Wilderness encompasses more than 197,600 acres on the Inyo National Forest on the Kern Plateau in the far southern Sierra Nevada. The Golden Trout is characterized by large, open meadows separated by rolling, timber-covered ridges. There is abundant feed for recreation stock to graze. Ongoing watershed and golden trout habitat restoration projects are restoring degraded meadows and fish habitat, enhancing the wilderness experience of visitors. Cattle grazing is also an important resource in this wilderness.

This wilderness provides excellent opportunities for stock-based trips and for less strenuous backpacking than is found in most of the other Inyo National Forest wildernesses. Use levels have not yet reached capacity, although campsites around the few lakes show signs of heavy use. The wilderness is adequately served by the existing trail system. The major trailhead providing access into the Inyo National Forest portion of the Golden Trout Wilderness is at Horseshoe Meadow, southwest of Lone Pine. Overnight camping at Horseshoe Meadows is restricted to short stays. There are no other developed overnight facilities near trailheads, so day-use crowding is not a problem. New or improved trailheads south and east of the wilderness would help encourage and increase use. If a paved road were constructed into the Monache Meadows area, use would also increase and stock-based opportunities (including outfitter-guide opportunities) would improve due to better access for horse trailers.

The portion of the South Sierra Wilderness on the Inyo National Forest is approximately 38,350 acres in size and is similar in geography and attractions to the Golden Trout Wilderness, which adjoins the South Sierra to the north. Cattle grazing is also important in the South Sierra. Some streams contain reproducing populations of golden trout. Portions of old four-wheel drive roads cross the wilderness, serving as access routes for foot and stock travel. The Pacific Crest Trail runs north and south through the wilderness. There are several trailheads, the most important of which is Sage Flat (for the Olancho Pass Trail), which is also the entry point for a

stock driveway for about 2,000 head of cattle each spring and fall. The existing trail system is adequate for user access.

Wilderness recreation amounted to 540,000 RVDs in 1982. Existing wildernesses are served by 705 miles of trail and twenty-nine trailheads with a capacity of 2,212 PAOTs (Persons-At-One-Time).

The demand for wilderness use exceeds capacity in the Ansel Adams and John Muir Wildernesses. As a result, trailhead quotas are imposed during the summer season. Any additional increases in use can occur only during the spring and fall months and during the midweek days in summer when quotas are not reached. Day use in the Twenty Lakes Basin part of the Hoover approaches capacity during the summer season. Use levels in the Golden Trout and South Sierra Wildernesses have not yet reached capacity. This situation may change as access improves and people become more familiar with the attractions of the areas.

The demand for wilderness use is somewhat dependent on the overall recreational appeal of an area. Scenic attractions, ease of access, lakes, campsites, destination points, and sources of drinkable water are all important. The amount of non-wilderness roadless land on the Inyo with those characteristics is limited; it is unlikely, therefore, that wilderness supply can ever meet demand on this Forest, unless the demand itself declines.

All wildfire in wilderness is presently controlled. It would be reasonable, based on the resource values and fire risk factors in wilderness on the Forest, to consider the confinement and containment suppression strategies unless life, property, or other emphasized values were threatened. Prescribed fire for enhancement of wilderness values is not needed at this time.

WILDLIFE

Issues, Concerns, and Opportunities

Public issues and management concerns have been raised regarding the following general topics: the diversity, amount, and distribution of wildlife habitat; the relative emphasis that should be given to habitat management for various species; the balancing of wildlife needs with the needs of competing resources; and the contribution management can make to meeting the growing demand for wildlife-related recreation. Issues and concerns specific to individual wildlife species or groups of species are discussed under the species subheadings below. Fish are discussed under the separate heading of Fish.

Most issues and concerns center on habitat protection and maintenance. Protection and maintenance are threatened by dramatic changes in habitat due to vegetation management; decreasing habitat diversity; and, in some cases, human intrusion.

The Forest Service is responsible for managing wildlife habitat, but not the animals themselves. Wildlife populations are the responsibility of the U.S. Fish and Wildlife Service (threatened and endangered species) or the

California Department of Fish and Game (all other species). The Forest has the opportunity to influence wildlife through its management of habitat in close cooperation with the CDFG and through the coordination of wildlife habitat needs with the management of other resources.

Background

The Inyo National Forest provides habitat for approximately 400 terrestrial vertebrate species of wildlife.

The overall supply of most habitat types is expected to change little during the next ten to fifteen years. However, the increasing demand to produce energy, timber, forage, and recreational opportunities could cause a reduction in some habitat types. In addition, wildfire prevention and suppression may allow more habitat to reach mature, less productive seral stages by reducing the amount of rejuvenation that would occur under natural conditions. Although the number of species on the Forest should not change, the populations of species dependent on snags, early seral stages of brush, late seral stage of timber, and riparian habitats could decline.

The demand for wildlife-related recreation should increase with increasing population in the state of California. Likewise, the aesthetic value of wildlife that is not related specifically to wildlife recreation (i.e., "just knowing they are there") should increase with increasing urbanization and the need to protect remnants of the national wildland heritage. Public issues related to selected species should increase as the public becomes aware of species-specific problems.

Management Indicator Species

Management Indicator Species (MIS) include key harvest species, threatened and endangered (T&E) species, key sensitive species, and species that represent the wildlife habitat types most likely to be affected by Forest Management activities.

Management Indicator Species are intended to represent all wildlife on the Forest. As such, they are used to determine the wildlife population capability of different habitats on the Forest and to evaluate management opportunities to enhance habitat. T & E, sensitive, special interest, and harvest species can also be used to represent key habitat types.

Determining the quantity and quality of habitat needed to maintain viable populations of MIS is one way to meet the requirement that the Forest Service maintain viable populations of all vertebrate species on the Forest.

The Forest presently manages wildlife with an emphasis on harvest species, threatened and endangered (T&E), and sensitive species; and special interest species. Harvest species are managed primarily to enhance recreational hunting opportunities. T&E species habitats are managed with an emphasis on recovery, or restoring the species to viable levels. Habitat for sensitive species is managed with the intent of preventing the species from becoming threatened or endangered as a result of management activities. Special interest species have values for scientific study or recreational

appreciation; their habitat is managed with the goal of maintaining or increasing populations on the Forest.

The Management Indicator Species selected for the Inyo National Forest are:

Harvest	- Mule deer, Blue grouse, Sage grouse.
Threatened and endangered	- Bald eagle, Peregrine falcon.
Sensitive	- Fisher, Sierra Nevada red fox, Goshawk, Pine marten, Great gray owl, Spotted owl, Sierra Nevada mountain sheep, Wolverine.
Special interest	- Golden eagle, Tule elk, Prairie falcon, Nelson mountain sheep.
Riparian areas	- Yellow warbler.
Snags	- Hairy woodpecker, Williamson sapsucker.
Early-middle seral stages of brush	- Sage grouse.
Older seral stages of coniferous forest	- Goshawk.

Carnivores: Four carnivores exist or potentially exist on the Inyo that are listed by the Forest Service or the California Department of Fish and Game. These are: fisher, Sierra Nevada red fox, pine marten and wolverine. The potential development of downhill skiing and associated activities could adversely affect these species. For the most part these species ranges are outside of areas under timber management.

Fishers are listed as sensitive by the Forest Service. Two recent records and a few unsubstantiated reports exist for this species in the Inyo. Dense forested habitat comprised of large trees are considered optimum habitat. West-side forests probably contain more suitable habitats than east-side counterparts.

The Sierra Nevada red fox is listed as sensitive by the Forest Service and threatened by the state. A few substantiated sightings have been reported in the June Lake area. This species is found in open forest, alpine shrub and riparian habitats at higher elevations. Rock crevices and logs are required for denning.

Pine marten are listed as sensitive by the Forest Service. Martens are a relatively common carnivore in dense stands of red fir and lodgepole pine at higher elevations.

The wolverine is listed as threatened by the state of California. Two recent reports and several unsubstantiated and old reports are documented for this species in the White Mountains and Sierra Nevada. Suspected habitats include subalpine forests for breeding and cover habitat and alpine shrub-herbaceous for foraging habitat.

Mule deer: A major public issue is the perceptible decline in deer numbers over the past twenty to thirty years. Management is also concerned with declining deer populations, especially in light of the RPA goal of increasing mule deer populations 20 percent. If the problems behind declining deer numbers are on Forest land, the Forest Service has the opportunity to correct

them. If, however, a given herd or a significant portion of a herd spends time on lands administered by others, the Inyo National Forest has less control of the situation.

Deer are found throughout the Forest. Eight herds spend at least part of the year on Forest land. The density of resident populations (those that live on the Forest year-round) is low. Six deer per square mile is an estimated average density on high-quality summer range.

Most of the deer on the Forest are migratory. They winter primarily in the Owens Valley, Pizosa Hills, or Walker River drainage on Bureau of Land Management lands and spend the summers at higher elevations, both on the Inyo and west of the Sierra crest. Deer densities on the winter range are considerably higher (up to 120 deer per square mile) than on the summer range. The Inyo has 112,119 acres of key winter range, most of it on the east slope of the Sierra Nevada between 4,500 and 6,000 feet elevation. There is also winter range on land administered by the Bureau of Land Management, adjacent to National Forest land.

The current population of mule deer on the Forest and adjacent (primarily Bureau of Land Management) lands is estimated at 20,200. The current population of those deer that summer and/or winter on National Forest land is 12,000. The maximum potential habitat capability of Forest lands is roughly estimated at 16,000 animals. Any increases in habitat capability would result directly from habitat improvement or indirectly from the management of timber, recreation, and livestock grazing so that deer habitat quality is enhanced.

The reasons for declining deer numbers are not known, but the CDFG is studying the situation in cooperation with other agencies, including the Forest Service. Poor-quality fawning habitat, human disturbance of key deer habitat, and changes in vegetative diversity are possible contributing factors related to management activities. Predation may also be a factor, and there is some concern that bucks in some areas are over-hunted. Direct and social competition with domestic livestock have also been proposed as contributing factors. The factors that limit deer populations must be identified, and a coordinated effort made to correct problems, if deer numbers are to be maintained or increased.

Deer hunting amounted to 25,200 WFUDs in 1982; the demand for hunting has remained fairly stable from year to year, and is expected to follow that pattern if deer numbers remain constant. If, however, the deer population were to grow and hunter success were to increase, demand would be expected to increase accordingly. On the other hand, if the deer population were to decline, the demand for hunting would be expected to follow suit.

The California Department of Fish and Game has prepared deer herd management plans for each of the eight herds that use Inyo National Forest lands. Those plans and the goals they envision are as follows:

Buttermilk Herd: This herd also is almost entirely migratory. Winter range is located in the southern Round Valley and a majority of the deer cross the Sierra Nevada crest and summer on the west side. Approximately

35 percent of the combined Sherwin-Buttermilk deer cross the Sierra over Bishop and Paiute Passes.

Maintain the population near current levels (3,000 deer) to maximize recreational hunting opportunities by maintaining the current quality and quantity of habitat and preventing deleterious impacts from future land uses to winter, migration and staging habitats.

Casa Diablo Herd: The Casa Diablo herd winters in the Benton, Hammil and Chalfant Valley areas. The majority of this herd migrates around the south end of the Glass Mountains and moves north to a staging area in the upper Owens River. They then migrate to summer habitats on the east side of the Sierra between Deadman Creek and Lee Vining Canyon. Important fawning and summer habitats have been identified in the Parker-Walker, Lee Vining Creek, and Glass Creek drainages. A small portion of this herd summers west of the Sierra Nevada crest, in the Glass Mountains and White Mountains.

The current population is estimated at 1,500 deer; the goal is to increase that population to 2,245 deer by applying flexible harvest levels; and by improving habitat and reducing competition and disturbance on key summer, intermediate, and winter range habitats.

East Walker Herd: The 1984 pre-season population was approximately 3,040 deer; the goal for this herd would be approximately 5,050 deer. Most increases would be achieved through range enhancement and reduced competition for forage on lands outside the Inyo National Forest.

Goodale Herd: The Goodale herd winters along the Sierra Nevada front country and summers west of the Sierra Nevada, mostly in Sequoia-Kings Canyon National Park.

The current population is estimated at 2,600 deer; goals are expressed as buck, doe, and fawn ratios for the northern and southern subunits. The northern subunit will be maintained to maximize recreational hunting opportunities. The southern subunit will be managed with emphasis on older age-class bucks for viewing and late-season quota hunting. Habitat goals are to maintain the current quality and quantity of habitat and to prevent deleterious impacts of future land uses.

Inyo-White Mountains Herd: Maintain current landownership status, improve habitat conditions where possible, and prevent deleterious impacts from future land uses (there is insufficient census information for population goals).

Monache Herd: The Monache deer herd summers on the Inyo and Sequoia National Forests and the Sequoia-Kings Canyon National Park. One winter range is located on the Eastern Escarpment of the Sierra Nevada. Another is located in Long Valley adjacent to the Sequoia National Forest. The Monache Meadows area is considered an important staging area and summer area. In addition several migration routes pass through this area.

The primary management goal is to develop and maintain a spring population of 8,000 to 9,000 animals (an increase of approximately 2,000 deer over

current levels). This population could be achieved through habitat improvement and land-use priorities that favor deer.

Mono Lake Herd: Research on this herd is being initiated. The current fall population is estimated at 3,000 deer; the goal is to increase that number to 4,000 animals by improving key habitats, reducing competition with livestock and wild horses for forage, and improving sex and age ratios through flexible harvest levels.

Sherwin Grade Herd: The Sherwin Grade herd is almost entirely migratory. Winter range is located in Round Valley and summer range is predominantly west of the Sierra Nevada Crest. Important migration corridors extend north between Round Valley and the Sherwin staging area, Solitude Canyon, Mammoth Pass and Deadman Pass. A major staging area exists southwest of U.S. 395 between Sherwin Creek and Convict Creek. Approximately 65 percent of the combined Sherwin-Buttermilk herd migrate to the north and over various passes crossing the crest.

Maintain the current population (2,300 to 2,400 deer) by restoring the quality of winter range, acquiring key winter range now in private ownership, improving the sex and age ratios and maintaining the quality and quantity of winter, staging and migration habitats.

Bald eagle: The bald eagle is federally and state-listed as an endangered species in California. The Forest Service is concerned with managing its habitat so that the species can recover from endangered status. Opportunities focus on coordinating on-Forest activities, especially winter recreation, with the needs of this species. Management direction for the protection of bald eagle habitat in the Plan is required.

The Inyo and adjacent lands have a small amount of bald eagle wintering habitat. Approximately twenty to thirty birds winter on or near Inyo National Forest land. Winter bird counts are so variable that it is difficult to know whether the number is increasing or decreasing over the long term. Eagles use lakes prior to their freezing in the fall and after thaws in the spring. The heaviest used wintering areas are Crowley Lake, the Owens River and June Lake Loop. One roost site is suspected in the June Lake Loop that supports up to ten eagles. An additional roost site is suspected in the Owens River Gorge that is not on lands administered by the Forest. There is potential for conflict between bald eagle habitat needs and recreation development in wintering areas.

Peregrine falcon: The peregrine falcon is federally and state-listed as an endangered species; the Forest Service is concerned with managing its habitat so that the species can be recovered from endangered status. The Forest has completed a recovery plan for this species. Management direction for peregrine falcon protection in the Plan is required.

Although peregrine falcons have historically nested on the Forest, the nearest occupied nest sites are found in Yosemite Valley and Hetch Hetchy Canyon. Eight fledglings were reintroduced (by hacking) to the Forest in 1983 and 1984. A third hacking attempt failed in 1985. Birds that were hacked have been observed sporadically since this endeavor. Historic nest sites existed in the upper Owens River, June Lake Loop and Negit Island.

Excellent nesting habitat also exists in Lee Vining and Lundy Canyons. An additional hacking is scheduled to begin at Crowley Lake in 1988.

The maximum habitat capacity for peregrine falcons on the Forest is estimated at four nest sites. There are no apparent conflicts between peregrine falcon habitat needs and the management of other resources.

Goshawk: The goshawk is listed as a sensitive species in Region 5. The major management concerns are to determine the number of goshawk nest sites needed to maintain population viability, and the number of these sites that should be maintained in stands of suitable timber.

The number of sites maintained in suitable timber is a concern on the Forest because fifty acres of timber must be left standing around each protected nest site to meet management requirements. Inyo National Forest lands are located at the southeastern limit of goshawk range. Recreation use and consequent human disturbance are high, forests are sparse, and telemetric studies indicate that goshawks on the Forest require at least a 125-acre territory surrounding their nests. It would be more desirable, therefore, to provide 125 acres around each nest site. Each nest site can represent a significant cost in terms of timber unavailable for harvest. On the other hand, each nest site lost brings the population of goshawks on the Forest closer to the minimum management level. In some areas goshawks use open stands as nesting habitats. This is especially true in the White Mountains and portions of the Glass Mountains.

Goshawks are found in mature and old growth stands of forest. Surveys have located approximately 25 active nest sites on the Forest (15 in suitable timber, 10 elsewhere). These surveys have concentrated on suitable timber stands, as those are the areas in which conflicts are most likely to occur. Another 25 undiscovered sites are estimated to exist on lands in wilderness or noncommercial timber. Available data is insufficient to determine whether the goshawk population on the Forest is changing.

Factors limiting the amount and quality of goshawk habitat are lack of mature timber, human disturbance (an indirect result of improved access), and insufficient vegetative diversity in the forest surrounding the nest site.

The Forest has the opportunity to address the need for goshawk habitat management in the Plan.

Blue grouse: The primary concern is habitat protection for this species. Blue grouse on the Inyo are typically found in forest and shrub habitats associated with riparian areas at high elevations in the Sierra Nevada and White Mountains. Direction for the protection and maintenance of habitat may eventually be needed, but it is not of urgent concern.

Little is known about population numbers and trends. There is some demand on the Forest for this species as a game bird.

Sage grouse: The major issue and concern is that sage grouse populations are declining. The Forest has the opportunity in the Plan to identify research needs and to establish direction for the management of sage grouse habitat.

Sage grouse are found in the extensive sagebrush habitats on the Forest. Low sagebrush is interspersed with big sagebrush and wet meadows, both of which types appear to be important aspects of sage grouse habitat. Big sagebrush serves as a winter cover and food source; meadows provide summer feed and strutting grounds for courtship activities.

The population of birds on or near the Forest is estimated at 1,500, located primarily in the Lake Crowley basin and the White Mountains. The maximum current habitat capacity for sage grouse on the Forest is estimated at 2,000 birds.

The reasons for population decline are not completely understood. It is suspected that certain livestock grazing practices and wildfire suppression have contributed to the increasing density of sagebrush and a declining amount of herbaceous understory which are, in turn, reducing sage grouse habitat capability. Studies are currently being conducted to determine sage grouse habitat requirements. Hunting also appears to be a factor in sage grouse declines on the Inyo and adjacent lands. Between 1982 and 1986 the sage grouse population at Crowley Lake doubled in the absence of hunting from 500 to 1000 birds.

There is a demand for this species as a game bird, and that demand is expected to continue. However, with the decline of grouse populations, the CDFG closed the hunting season from 1983 through 1986. The hunt was opened under permit in 1987.

Spotted owl and great gray owl: There is little data about the occurrence of these species on the Forest. The Forest has the opportunity to identify inventory and research needs regarding these species and to establish in the Plan the need for habitat protection.

Spotted owls are considered sensitive in Region 5 of the Forest Service. Intensive spotted owl surveys were done in the Mammoth Lakes area during the summer of 1987. No responses were elicited. Potential spotted owl habitat does exist in the Monache area. Nest sites have been located on the Sequoia National Forest adjacent to the Inyo.

Two spotted owl sightings on the Mammoth Ranger District have been documented. The demand for spotted owl habitat is high, as its habitat is decreasing throughout the timbered areas of California and the Pacific Northwest. Spotted owls require large tracts of old growth timber, and old growth is also a prime potential source of wood products. There is considerable concern that, without special management, spotted owls could become threatened or endangered within the next 50 years. Red fir stands have the highest potential for spotted owl nesting habitat on the Inyo.

Great gray owls are listed as sensitive by the Forest Service in California and endangered by the state of California. Nesting records exist for lower elevation sites in Yosemite National Park. The southernmost breeding occurrence on the east side of the Sierra is documented on the Toiyabe National Forest.

Great gray owl sightings on the Forest have not been verified. There are few potential conflicts between the habitat needs of that species and the

management of other resources because most of the suitable habitats are in wilderness. Livestock grazing in mountain meadows may have an effect on the great gray owl prey base.

Nelson (desert) mountain sheep: The same parties that are interested in Sierra Nevada mountain sheep are also interested in the Nelson mountain sheep. There is also significant public interest in Nelson mountain sheep as a game species. In other states, permits to shoot a ram have been auctioned for bid prices exceeding \$60,000. This interest is expected to continue.

The Forest has the opportunity in the planning process to address the habitat needs of Nelson mountain sheep and the possible trade-offs between these needs and other resource opportunities.

Nelson mountain sheep are located in the White and Inyo Mountains. The White Mountain herd has approximately 100 sheep and appears to be growing. Little is known about the Inyo herd, but the population is roughly estimated at thirty animals.

Nelson mountain sheep numbers could be affected by human disturbance and disease transmission from domestic livestock. Mountain sheep seek the security of rough, steep terrain. In the White Mountains, however, they leave that kind of terrain to feed on the meadows and benches. If recreation use in the White Mountains were to increase, mountain sheep might confine themselves to the rough, steep slopes. That behavior would, in effect, reduce the amount of foraging habitat available. Increasing recreation use could also bring recreation stock into contact with sheep, involving the possibility of disease transmission.

A potentially significant source of human disturbance in the White Mountains is hang gliding. Mountain sheep have been observed to run for cover when a hang glider comes too close. The most likely stimulus for increased recreation use other than hang gliding would be wilderness designation for all or part of that range.

Nelson mountain sheep have been emphasized in recent years throughout their range in the western United States. Overall numbers are increasing as sheep are reintroduced into historical range and as human disturbance and livestock interactions are controlled. The demand for Nelson mountain sheep is reflected in the public issues cited above. As with Sierra Nevada mountain sheep, the establishment of several separate populations would help ensure protection from epizootic diseases. Total potential population is between 300 and 400 sheep.

Sierra Nevada (California) mountain sheep: This species is listed as sensitive by the Forest Service and threatened by the state of California. The public is interested primarily in the reintroduction of Sierra Nevada mountain sheep into historical range; that interest is expected to increase. Two sheep societies (The Society for the Conservation of Bighorn Sheep and the Desert Bighorn Sheep Council) and the CDFG emphasize sheep management. Articles appear regularly in the press concerning transplants and related topics. Forest Service management is also concerned with mountain sheep management and has participated extensively both in studies of sheep populations on the Inyo and in reintroduction efforts.

Current management emphasizes restrictions on recreation use in mountain habitat. An interagency recovery and conservation plan that identifies management opportunities for Sierra Nevada mountain sheep has also been written. The Forest has the opportunities to establish additional direction in the Plan addressing mountain habitat needs and to cooperate with the California Department of Fish and Game in recovery efforts.

Virtually all the Sierra Nevada mountain in California are found on the Inyo National Forest. The sheep winter on the Forest along the Eastern Escarpment of the Sierra Nevada; they summer at higher elevations of the Forest and inside Sequoia and Kings Canyon National Parks.

There are five herds on the Forest; two of these are naturally distributed, and the other three have been distributed by reintroduction. The total population of Sierra mountain sheep in these herds is estimated at 300 and is growing. If all existing and identified potential habitat were filled to capacity, there would be about 700 and 1,000 sheep on the Forest. These sheep would ideally be found in many separate populations to ensure protection from epizootic diseases.

There is potential for mountain sheep habitat needs to conflict with recreation and domestic livestock grazing. Human disturbance can affect the sheep by displacing them from important habitats. Domestic livestock represent the threat of disease transmission, as mountain are susceptible to certain diseases transmissible by domestic sheep. Additional study may show that cattle, horses, mules, and llamas can also transmit diseases to wild sheep. Other factors that may limit Sierra mountain sheep range are the reduced productivity of overmature forage, the obstruction of access routes by human developments, and a limited amount of suitable habitat for reintroduction.

The demand for Sierra mountain sheep is implicit in the issues and concerns listed above.

Other special interest species: Although the species in this category require a variety of habitats, the primary concern associated with each species is the protection of that habitat to ensure population viability.

There is an opportunity to establish direction for the protection and maintenance of habitat for these species in the Plan.

Population figures are known only for tule elk: there are approximately 600 elk in the Owens Valley, most of which spend at least part of the year on Forest land. Elk numbers are increasing, and animals are removed every few years for transplant to other areas.

Riparian area-dependent species (yellow warbler): The management of riparian habitat to assure the viability of dependent wildlife is both a public issue and a management concern.

Riparian vegetation (including wet meadows) covers less than two percent of the Inyo National Forest. The population and trend of riparian area-dependent wildlife species has been declining over the years due to the deterioration and exploitation of these habitats. The amount and condition

of riparian habitat declines where riparian vegetation is affected by ground disturbance, vegetation manipulation, or streamflow reduction. Approximately 20 percent of the original stream habitat in the Mono Basin and Owens Valley has been eliminated due to water diversions for hydroelectric generation, irrigation, and domestic use.

Snag-dependent species (Williamson sapsucker and hairy woodpecker): The primary concern about this group of species is with maintaining enough standing dead trees (snags), down logs, and habitat diversity to ensure population viability. The Forest has the opportunity to establish direction for snag management in the Plan.

Fuelwood gathering is the major threat to snag-dependent species. In areas where vehicle access is easy, many snags have already been removed illegally for fuelwood. The Forest Service can create snags, protect them, and educate the public about their importance, but some people will resist these efforts and continue to cut them. This problem is especially serious because natural snag recruitment on the Inyo is slow, and snags in many areas are in such short supply that the viability of snag-dependent wildlife populations may already be threatened.

In addition to standing dead trees, cavity-nesting wildlife rely on down and dead woody material for foraging and other needs. Although the Forest Service prohibits the cutting of snags, down and dead material is a legal source of public fuelwood. Increasing energy costs and the recreational value of wood gathering have resulted in the virtual elimination of dead and down wood in accessible areas.

The demand for snags on the Forest is high relative to supply. The availability of snags and down, dead wood could be a major factor limiting wildlife habitat capability of forested environments on the Inyo.

Maintaining the quality of riparian habitat is a critical wildlife habitat concern on the Forest. Since nearly all species are dependent on those areas at some time in their life cycle, the development or alteration of these resources probably has significant potential to adversely affect wildlife species.

The Forest Service is concerned with managing riparian areas not only for wildlife habitat, however. Riparian habitat receives attention in the Planning process as a resource in itself because riparian area-dependent resources are so important and diverse. A more detailed discussion is found under the separate heading of Riparian Areas.

Species dependent on early-middle seral stages of brush: (See sage grouse.)

Species dependent on older seral stages of coniferous forest: (See Goshawk.)