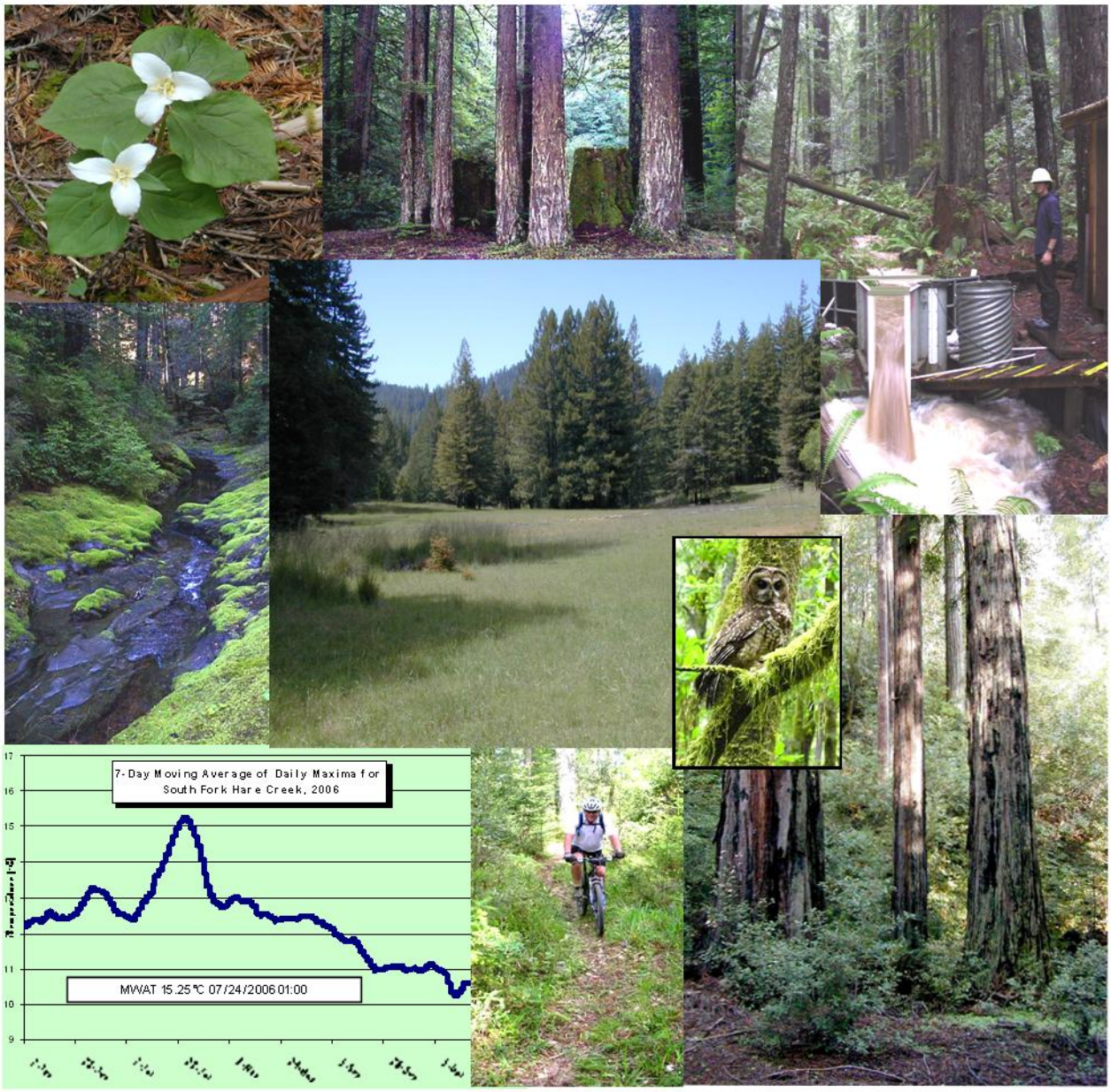
Jackson Demonstration State Forest Management Plan

January 2008

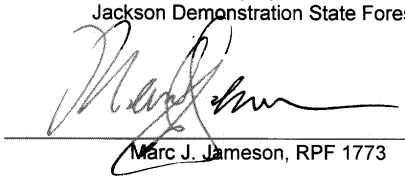


California Department of Forestry and Fire Protection
The Resources Agency
State of California

CERTIFICATION by REGISTERED PROFESSIONAL FORESTER

pursuant to
California Code of Regulations
Title 14, §1602.1

Marc J. Jameson, am responsible for the preparation of this Forest Management Plan for Jackson Demonstration State Forest.



Marc J. Jameson, RPF 1773

JANUARY 9, 2008
Date

APPROVAL of FOREST MANAGEMENT PLAN
for
JACKSON DEMONSTRATION STATE FOREST

Approved by vote of the Board of Forestry and Fire Protection

George Gentry, Executive Officer

January 9, 2008
Date

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Executive Summary

The Forest, Its Purpose and Direction

Forests provide immense and diverse values to the citizens of California. They supply many outputs that we use and enjoy, including clean water, fish and wildlife, and forest products. They are also increasing in importance as a destination for recreational activity.

Public and private working landscapes are both key elements in strategies to protect and restore what are now rare components of the ecosystems and to support sustainable forest, grazing, and agricultural operations. The majority of public wildlands in the North Coast region of California are set aside as reserves and parks to preserve rare ecosystems and wild areas. Demonstration State Forests, by contrast, are public lands that by legislative mandate have a unique and distinctly different purpose from parks and wilderness areas. Demonstration State Forests are mandated to conduct research, demonstration, and education on sustainable forestry practices using active forest management, including periodic timber harvests. Management of the Demonstration State forests is required to address values relating to recreation, watershed, wildlife, range and forage, fisheries, and aesthetic enjoyment.

While still the number three timber-producing state in the nation, California is also home to a very large population with strong interests in environmental protection. Given the often controversial role of logging and timber production in California, the Demonstration State Forests fill a unique niche to advance research, demonstration, and education on sustainable forestry practices. The State Forests fill an important role in helping maintain California's leading role as an innovator in solutions to difficult resource management challenges.

The California Department of Forestry and Fire Protection (Department or CAL FIRE) manages approximately 71,000 acres of Demonstration State Forests, on behalf of the public. Jackson Demonstration State Forest (JDSF), a 48,652-acre redwood/Douglas-fir forest located in Mendocino County between Fort Bragg and Willits, is the largest (Map Figure 1).

JDSF is a unique forest research site on the West Coast. It is able to accommodate multiple demonstration objectives including sustainable forestry, maintaining multiple long-term research installations, conducting large scale studies with a landscape level focus, as well as studies on smaller scales, providing large areas for threatened and endangered species protection, and maintaining a broad diversity of different forest successional stages in order to remain relevant as a research site. Research forests are often limited in the kind of experiments they can undertake by virtue of their modest size. New priorities in forestry research, exemplified by climate change and carbon sequestration, increasingly focus on a landscape level, where the breadth and complexity of ecosystem functions can be more fully understood. Accommodating large scale studies, which sometimes require several treatments and control units, can require thousands of acres. JDSF is the only public forest property in the State with the size and legislative mandate to meet all of these objectives. Large-scale or landscape-level studies do not necessarily treat large areas, but are always concerned with studying how treating a given area will affect the larger landscape (such as a watershed) or ecosystem processes within which the treatment is embedded..

JDSF's management direction derives directly from statutes, regulations, and policies set by the State Board of Forestry and Fire Protection (see Appendix I for details). Board policy describes Jackson and three of the other Demonstration State Forests as "commercial timberland areas managed by professional foresters who conduct programs in timber management, recreation, demonstration, and investigation in conformance with detailed management plans," (Board Policy 0351.1). More specifically, Board policy states that the primary purpose of JDSF is to conduct innovative demonstrations, experiments, and education in forest management; that timber production will be the primary land use on JDSF, and that recreation is recognized as a secondary but compatible land use on JDSF (Board Policy 0351.2). Further noteworthy policy directions that guide JDSF management include:

- Research and demonstration projects shall include silviculture, mensuration, logging methods, economics, hydrology, protection, and recreation. Research and demonstration projects shall be directed to the needs of the general public, small forest landowners, timber operators, and the timber industry.

- Conduct periodic field tours to exhibit State forest activities and accomplishments to forest industry, small forest landowners, relevant public agencies and the general public,, and disseminate information to these audiences.

- Consult with and solicit the cooperation of the State universities and colleges, the USDA Forest Service, and other public and private agencies in conducting studies requiring special knowledge.

- Cooperate with the Department of Parks and Recreation in establishing on JDSF, adjacent to the Mendocino Woodlands Outdoor Center, forest management demonstration areas that are compatible with recreation for educational purposes.

In 1947, JDSF was established predicated upon declining volumes of old-growth timber and the fact that a large acreage of potentially productive timberland in California was not producing a satisfactory growth of young timber. At that time, there was no requirement to restock the land after removing the timber. Early management within JDSF was conducted with the intent of demonstrating forest management methods that would achieve satisfactory regeneration, demonstrate a high level of productivity, and be financially viable for landowners with differing levels of skilled labor and investment capital. JDSF was purchased from the Caspar Lumber Company in 1947, after nearly 90 years of management for timber production. At the time of purchase by the State, the Forest contained both young and old trees and stands. The Forest has continued to build inventory over the past decades, and forest growth continues to exceed planned harvest by a considerable margin.

In the decades that have followed the establishment of JDSF, many changes have taken place that have increased the complexity of forest management and have threatened to substantially reduce the land base available for active forest management in California. In addition, concerns over the habitat needs of fish and wildlife have increased dramatically as development pressures and habitat impacts have caused the populations of many species to decline substantially. Pressures to devote forest land to other, potentially more financially attractive options, such as subdivision and development, continue to build. The CAL FIRE Fire and Resource Assessment Program estimates that 20,000 acres of forest per year in California make a transition from un-fragmented forests to areas with enough interspersed homes to alter wildlife habitats and natural hydrologic regimes, and to introduce new fire risks. Recent bonds passed by California voters as well as endangered habitat driven mitigation fees may begin to offer new opportunities for long term forestland owners to financially benefit from the ecosystem services that their lands can provide in addition to a sustainable supply of timber.

California now imports over 70 percent of its forest products from other states and regions of the world, where environmental protection levels on forest lands are often below those of the State. Demonstrating economically and environmentally sustainable forestry in California fosters the social benefits of employment and business opportunities associated with timber management in California. Maintaining relatively high wage natural resource and manufacturing jobs in areas far removed from the major metropolitan areas can make important contributions to local economic prosperity.

Given these current circumstances, there is a need to demonstrate forest management approaches that support economically and environmentally viable and sustainable forests and sustain the important benefits of maintaining forest land in terms of watersheds, habitat values, and forest products. Thus, JDSF has potential to serve an important role in research and demonstration of the practice and viability of sustainable forest management for California's timberland owners.

The Mendocino County economy has been, and will continue to be, heavily influenced by the logging and forest products industries. As the level of local logging has steadily decreased in Mendocino County, the relative economic contribution potential of JDSF has increased, in terms of both direct and indirect employment, tax revenues, and other related economic effects. The 2005 DEIR estimates that each 10

million board foot increment in harvest from JDSF would generate 160 jobs, $4.3 million in local wages, and $184,000 in local tax revenue.

Significant gaps remain in our knowledge of forest ecosystem functions as well as the interactions between management activities and ecosystem functions. JDSF can provide important opportunities for pure and applied research in these and other areas. Important applied research areas include testing potential regulatory measures for protecting forest ecosystem functions, or testing potential restoration approaches. These projects will be conducted on a multi-agency basis (e.g., Department of Fish and Game, North Coast Regional Water Quality Control Board, National Marine Fisheries Service, USDA Forest Service Pacific-Southwest Experiment Station). Multi-agency grant funding will be sought for these projects.

There is great potential to create a living forest laboratory, available for research and demonstration, by developing and maintaining a broad range of conditions within the Forest. Under this management plan, designated parts of the State Forest will be managed to produce a high level of forest growth and timber production while maintaining and restoring natural ecological processes, providing opportunities to conduct research and demonstration on the relationship of these goals. The scientific community recognizes that landscape-level patterns are extremely important. Thus, it is critical for the Forest to represent a broad spectrum of conditions, including older forest structure, healthy connected stream systems and associated riparian zones, and a range of habitat and structure conditions in order to meet research and demonstration needs and maintain ecosystem health.

As one means of demonstrating resource sustainability practices, JDSF will seek certification of its forest management under the programs of the Forest Stewardship Council and the Sustainable Forestry Initiative.

The Management Plan and its Implementation

This Management Plan accomplishes the goals of synthesizing the knowledge of current resource conditions on JDSF [1], articulating the desired future structure of the Forest, defining a path to that future condition, and establishing abundant opportunities for future research and demonstration activities. It will guide forest management in a number of key areas, including research and demonstration, sustainable forestry operations, monitoring and research, road management, recreational opportunities, and protection and restoration of wildlife habitat. Chapter 3 provides the details on desired future conditions and planned management for JDSF. Chapter 4 focuses specifically on the research and demonstration program. Chapter 5 addresses monitoring and adaptive management.

Recognizing ongoing concerns regarding timber management on JDSF, the Management Plan provides for an initial implementation period during which provides the Board and the Department with an opportunity to obtain detailed input on the plan, and allows for consensus recommendations on potentially controversial management issues. Thus, during the initial implementation period, standards will be in place to limit harvest intensity by setting targets for basal area retention and average stem size. Post-harvest conifer stocking (basal area) levels will be approximately 70 percent or more of pre-harvest levels, and average tree size as determined by quadratic mean stem diameter will be approximately equal to or greater than pre-harvest levels. This equates to a relatively light stand thinning or selection harvest. Also, efforts will be made to limit the extent of harvest in areas that have had little or no harvest entry since 1925 (or that currently have at least 10 trees/acre greater than 30" in diameter (see Map Figure 8), particularly where those areas have not already had work done to prepare timber harvesting plans.

During the initial implementation period, JDSF advisory bodies will review and potentially recommend changes to certain elements of this Plan, including the forest structure conditions, usage of silvicultural systems, and spatial allocations of the Forest to various forest structure goals.

[1] See also the Draft Environmental Impact Report for the Draft Jackson Demonstration State Forest Management Plan (California State Board of Forestry and Fire Protection, December 2005) and the Recirculated Draft Environmental Impact Report for Alternative G (California State Board of Forestry and Fire Protection, May 2005).

Chapters 3 and 4 provide details on how harvesting operations will proceed during this initial implementation period and on advisory body processes. The initial implementation period will sunset within three years, during which time the advisory process is expected to complete a review of the described Plan elements and the Department completes and the Board approves any Plan revisions made in response to the advisory process recommendations. Advisory processes will involve the re-establishment of the Board of Forestry and Fire Protection's Committee on Forest Research, the establishment of a new JDSF-specific advisory body, and the Department's existing Demonstration State Forest Advisory Group.

Research and Demonstration

The Department intends to manage JDSF, as well as the rest of the Demonstration State Forest system, as a demonstration of sustainable forest management, as directed by statute and Board policy, which includes production of forest products and protection of values related to recreation, watershed, wildlife, range and forage, fisheries, and aesthetic values. This approach will create and maintain a diverse forest laboratory available for research and demonstration on a vast array of subjects. Informational needs associated with forest management are very large and changing. Clients for research results and demonstration efforts are expanding beyond the traditional clientele group of small and industrial forestland owners to include nonprofit and governmental entities interested in restoration of a wide range of forest resources. Research on JDSF should include applied research on a variety of topics (see discussion below), as well as basic research in such areas ecological and biological forest processes.

A number of special management needs exist for a research and demonstration forest such as JDSF. These needs, which are particularly important for implementing a long-term research plan, include:

- Increasing quantification of the forest (e.g., a wide range of biological information).
- Paying close attention to experimental design and the detailed documentation and quantification of changes due to treatments.
- Development and strengthening of cooperative relationships with university, governmental, and nongovernmental research institutions.
- Pursuing opportunities to secure research funding from a wide range of grant and other sources.
- Creation of a varied landscape, consistent with approved management plans, to support a broad range of research and demonstration.
- Utilization of the Internet to make large quantities of data and research results available to the research community, forest landowners, and other interested parties.
- Continued and increasing monitoring of various aspects of the forest environment to enable assessment of trends and conditions. Efforts will be made to move away from qualitative assessments to scientifically defensible quantitative tests of individual practice effectiveness. This adaptive management feedback loop will provide a mechanism to alter existing and proposed management practices where necessary.

Increasing resource allocation to each of these activities over time will be key to the ultimate effectiveness of the state forest system. CAL FIRE's intent is to accomplish this through internal funding, grants, and cooperative arrangements with various partners.

Forest staff has identified a number of research and demonstration priorities for the planning period that will be considered together with priorities identified by other sources, including advisory bodies. These priorities include:

- Quantitative assessment of the effectiveness of the delineated upland and riparian corridors in providing habitat and expanding the forest occupancy for identified species of concern.

- Carbon sequestration as a management option, including the economic and social benefits in mitigating the greenhouse effect.
- Research on forest ecology, forest biological processes, and measurement of ecological health.
- Social science research on the structures, functions, processes, success, and failures of advisory entities associated with the management of JDSF.
- Develop partnerships and fund research giving priority to information gaps such as below-ground carbon cycles, fog drip utilization by tree and understory plants, methods to hasten development of older forest structure, and climatic tolerances of species and genotypes.
- Research on the short-term and long-term costs and effectiveness of various forest resource protection measures.
- Fisheries studies that include channel habitat, population dynamics, and off site conditions.
- Young stand management that includes stocking level and precommercial thinning studies.
- Riparian zone wildlife habitat relationship studies that include topics such as stream buffer enhancement and maintenance, and relationships between forest cover, wildlife connectivity corridors, and wildlife population trends.
- Watershed management that includes sediment yield, stream discharge, sediment sources, road abandonment, watershed rehabilitation, and harvest reentry studies.
- Upland zone wildlife and plant relationships that include habitat relationships, forest fragmentation, edge effects, connectivity, and forest corridors.
- Investigation of optimal amount and spatial configurations of structural elements retained during timber harvesting activities.
- Approaches to speeding up development of older forest or late seral forest characteristics in second-growth stands.
- Public education on forest resources, technologies, and issues.
- Forest growth model development that includes gathering data and improving existing models (CRYPTOS).
- Forest data systems development for creating, improving and maintaining a data bank on existing and new data that include both database and GIS data layers.

With potentially conflicting demands for research and demonstration existing, an ongoing process for identification of needs, prioritization, and allocation of funding is necessary. For advice on these matters, the Department will look to the Board of Forestry and Fire Protection's Committee on Forest Research, the Demonstration State Forest Advisory Group, and the new JDSF advisory body. See further discussion of advisory structures and processes, below.

Key Planned Management Areas

Desired Future Conditions

The JDSF Management Plan establishes Desired Future Conditions or targets for management. The central goal is not a particular level of timber harvest or a preferred method of harvesting but a set of forest structures that represent the breadth of forest conditions appropriate to direction from statue, Board policy, and Management Plan goals and direction.

Given the current low level of older forest in the redwood region, a significant portion of the structural goals are oriented towards accelerating the development of older forest structures. The plan specifies healthy, functional ecosystems, emulation of natural processes, and broad diversity of forest structures and habitats, while recognizing that humans are an integral part of the ecosystem. Utilizing a diverse set of silvicultural systems (including reserves with little or no management) is just one of the management tools that may be used to help achieve these Desired Future Conditions. The Plan emphasizes that restoration and maintenance of functioning systems is of high priority. A range of watershed management measures is required to reduce negative inputs to streams (such as fine sediment) and improve positive inputs (such as large woody debris). The Plan includes an aggressive road management plan and includes provisions to develop substantial areas of older forest structure and to recruit large woody debris, snags, and other characteristics of healthy, natural forest ecosystems.

This Management Plan presents a workable approach to create and maintain multiple seral stages, along with important structural habitat elements. It preserves all existing old-growth groves, augmenting most of them to provide large, contiguous areas of older forest habitat. It provides for recruitment of late seral habitat in the Mendocino Woodlands Special Treatment Area, upper Russian Gulch, and lower Big River, as well as along all Class I and II streams. It also provides for a broad corridor of forest with the structural characteristics of older forest that extends from the west to the east and the north to the south. The Plan protects individual large old-growth trees and smaller residual old-growth trees with unique habitat attributes. And it sets goals for increased retention of structural habitat elements such as snags, downed logs, and large green trees and their associated biodiversity values.

Planned harvest actions are set to achieve desired forest structural conditions, not simply to cut current growth or generate revenues. Careful application of silvicultural systems over space and time will achieve these conditions while also ensuring high growth rates and accumulation of high volumes of timber. Under this Plan, standing timber volumes (or “inventory”) will continue to build over time, while providing a significant contribution to the local economy through the harvest and processing of timber. The average annual harvest levels during the next decade are estimated to be about 20-25 million board feet per year, and shall not exceed 35 MMBF per year. This level of harvest represents less than half the total annual growth increment, or about one percent of inventory on an annual basis.

The Plan sets realistic monitoring goals and establishes an adaptive management framework (see Chapter 5). “Adaptive management” refers to a strategy where management outcomes are monitored and compared to established management goals. Where outcomes are found to not meet the goals, management actions will be changed to better achieve the goals.

The analysis used to develop the Management Plan was driven by simultaneous consideration of the multiple goals and objectives identified for JDSF (see Chapter 3). Areas of special concern that contain unique resource values were first identified (Appendix II) and protective management regimes were tailored to the resource values of each (Chapter 3). Special concern areas contain unique resource values, including rare habitats (such as pygmy forest), habitat for species of concern (such as Marbled Murrelet), riparian areas, older forest structure zone, late seral development areas, recreational areas, areas near residences and State Parks, research areas, water supplies, and sensitive slopes (see Map Figure 5).

With the special concern areas identified, a plan was formulated to maintain or enhance ecological functions in all areas, to create diverse forest types, to produce high levels of sustainable timber growth, and to create the diverse range of forest structures, from early to late successional, required to realize a high quality research and demonstration program. The forest was divided into management areas roughly corresponding to watershed boundaries (see Map Figure 5). Each watershed area not covered by special concern areas was designated to receive a range of potential management regimes designed to accomplish the goals identified in the Management Plan. Some watershed areas will be selectively harvested, while others will incorporate a component (in limited cases, a significant component) of even-aged management dispersed in time and space to maintain a variety of forested habitats. Still other watershed areas may be left unmanaged for short or long periods to act as controls for experiments.

Forest Structure Goals

The tables below summarize planned forest structure conditions that the Plan sets out to develop on JDSF over time and the silvicultural systems that will be applied to attain these conditions.

The Management Plan provides long-term goals for the establishment of particular forest structure over time, as presented below in Table 1. The goals for future forest structure conditions shall reflect the multiple management goals of: Research and Demonstration; Forest Restoration; Watershed and Ecological Processes; Timber Management; Recreation and Aesthetic Enjoyment; Information, Planning, and Staffing; Protection; Minor Forest Products; and Property Configuration. One-third of the forest is designated for older or late seral forest conditions. The illustrations below provide an indicator of what the different structure conditions will look like.

Table 1. Desired Future Forest Structure Conditions.

Forest Structure Condition	Acres	Percent of Forest Area
Late seral or old-growth	7,300-12,200	15-25
Older forest structure	4,900-9,800	10-20
Mature and large trees	2,400-7,300	5-15
Mixed age and size	14,600-19,500	30-40
Regeneration and pole-size younger trees	4,900-9,800	10-20
No specific structure assigned	0-4,900	0-10

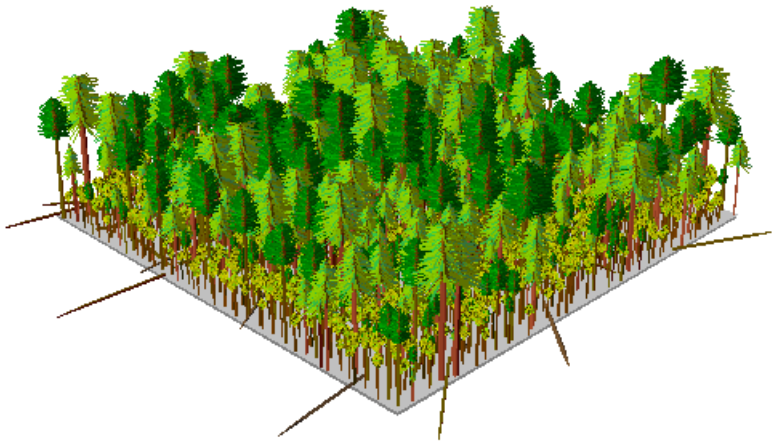
Silvicultural Methods and Restrictions

Table 2 presents the allocation of silvicultural methods to be implemented. These allocations are indicated spatially in Map Figure 5. The silvicultural methods identified in Table 2 will be used, in part, to attain the long-term forest structure goals identified in Table 1. Special restrictions are imposed on the use of even-aged management and clearcutting in particular, as discussed in the next section.

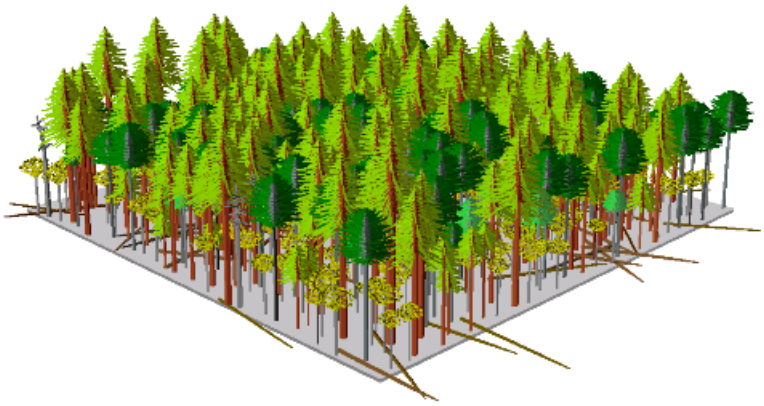
Further restrictions on the rate of cut and area devoted to forms of even-aged management

Even-aged management will be used as necessary to achieve the forest structure conditions needed over space and time to accommodate an adequate range of research investigations (see Table 1). Within this context, even-age management also may be used to address forest health and problematic regeneration conditions, as well as immediate research and demonstration purposes. Of the desired conditions shown in Table 1, mature and large trees (5-15 percent of Forest acres) and regeneration and pole-size younger trees (10-20 percent of Forest acres) typically arise from even aged management.

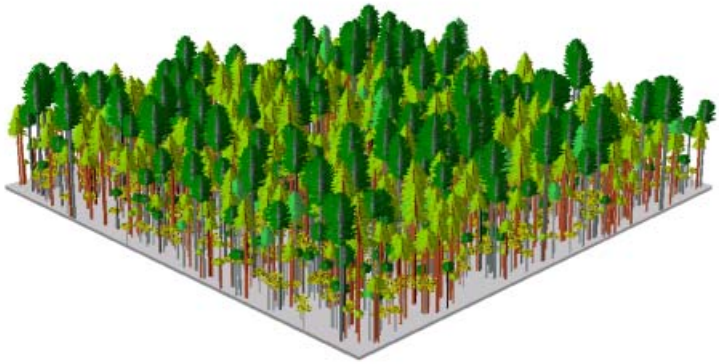
Late seral:



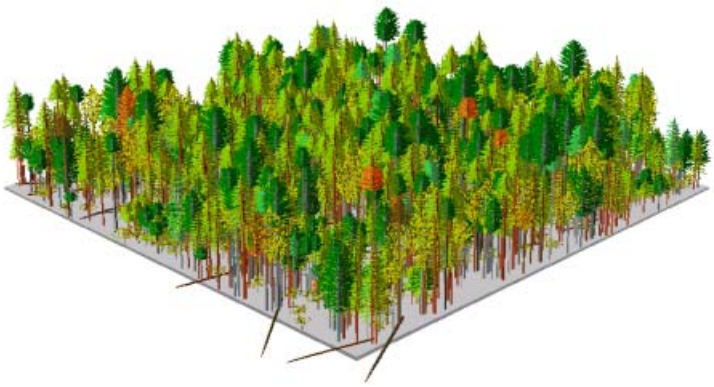
Older Forest Structure Zone:



Mature and Large Trees:



Mixed Age and Size:



Regeneration and Pole-size Younger Trees:

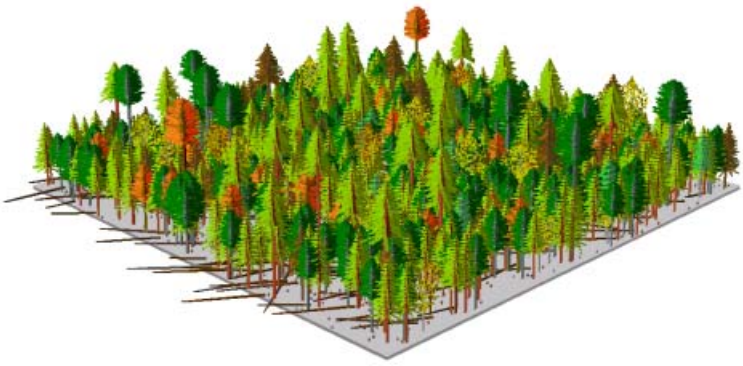


Table 2. Planned Distribution of Silvicultural Methods.

Silvicultural Method	Acres	Percent of Forest Area
No harvest (old-growth groves, pygmy forest, cypress groups, Conservation Camps)	1,350	3
Late seral development and older forest structure prescriptions	15,801	33
Uneven-aged; single tree or cluster selection	8,933	18
Uneven-aged; group selection or single tree/cluster selection	7,325	15
Uneven-aged or even-aged; single tree/cluster selection, group selection, variable retention, two-aged or one-aged	12,788	26
Unclassified [research areas (variable silvicultural treatments) and power line right-of-way]	2,455	5
Total	**48,652**	**100**

Strict limits are in place on the rate at which even-aged management may be utilized. The total area receiving any form of even-aged silvicultural treatments shall not exceed 2,700 acres per decade (or 5.5% of Forest area). Clearcutting is to be conducted only where strictly necessary for purposes of research, demonstration, addressing forest health, or addressing problematic conditions for regeneration. Clearcutting for these four purposes is limited to a cumulative maximum of 100 acres (or 0.2 % of Forest area) per decade. Up to an additional 400 acres (or 0.8 % of Forest area) may be clearcut per decade, but only for specific research purposes that cannot be reasonably met through any other method.

In addition, consistent with the research-driven focus of the Management Plan, the extent of the use of even-aged management, at both the project and Forest-wide level, (a) will be tied to the Forest condition it is intended to produce and (b) will be necessary and appropriate to accommodate research investigations either immediately or at a later time. The foregoing constraints do not apply to even-aged management where necessary to address forest health or problematic regeneration conditions. All proposed even-aged management, with the exception of research-related harvesting in the South Fork of Caspar Creek, will be presented to the appropriate advisory committee(s) for review and recommendation prior to implementation.

In general, use of even-aged management is to be restricted to purposes of research, demonstration, addressing forest health, addressing problematic conditions for regeneration, or achieving the long-term forest structure condition goals identified in Table 1.

The broad range of forest conditions or habitat types discussed above is essential for providing the necessary range of conditions for research and demonstration activities. Within each management regime, there is wide latitude for variation in timing and type of silvicultural practices applied during on-the-ground implementation.

Use of Herbicides

Chapter 3 describes in detail the substantial measures that the Management Plan requires to restrict the use of herbicides. There are four management situations where herbicides have been used in the past at JDSF. The Management Plan explicitly limits two past management uses of herbicides (road maintenance related treatment of native vegetation and reforestation treatments that target native shrubs, (see Chapter 3) and significantly limits use for the remaining two management purposes (control of hardwoods to adjust conifer/hardwood stocking rations and control of invasive weed species as part of an Integrated Weed Management program). A total ban on herbicide use would compromise the research and demonstration value of the Forest and could result in adverse environmental consequences, such as expansion of the area, on and off of the Forest, occupied by invasive species. Herbicides and other vegetation control methods may be used in individual research and demonstrations that are scientifically designed.

In an operational context, herbicides will be used only when no other effective and feasible control methods are found after consideration of the scope of the problem, opportunities to effectively manage the situation, and available alternatives and their potential effectiveness, costs, and risks. JDSF staff will seek opportunities to reduce risk by selecting appropriate herbicide formulations and application techniques, as well as taking additional precautions.

Road System Management

A very important element of the Plan to protect and enhance the resources of the Forest will be the effective management of the road system (Appendix IV), which can be a significant source of sediment for the Forest's watercourses. The road system serves as the main point of public contact with the forest and also serves as the conduit for management activities including the transportation of staff, researchers, equipment, and forest products. Important elements of the road management plan include a road inventory, priority setting for improvements, maintenance provisions, construction standards, and a decommissioning schedule for roads in poor locations that result in ecological damage.

Recreation

Recreational opportunities are recognized as an important and compatible use within the Forest. JDSF has achieved a significant expansion of recreational facilities over the past 15 years, and this Plan (Chapter 3) proposes to maintain a rustic outdoor recreational experience, with expansion of the trail system to create more hiking, mountain biking, and horse-riding opportunities, including a long main trail through the Older Forest Structure Zone. Additional and improved signage will help direct visitors to the campgrounds and day-use facilities while maintaining a rustic outdoor experience. Production and distribution of enhanced Forest road and trail maps and information brochures will increase public awareness of and access to recreational opportunities.

The Plan also proposes the completion of a user-needs study to guide the creation of a recreation plan for future recreational development that is compatible with research activities and the demonstration of forest management. Also, the Plan calls for Forest staff to meet and consult with local recreational users and user groups on a periodic basis to obtain advice and collaboration on the management of recreational resources. It encourages the direct involvement of Forest users in trail design and maintenance.

Forest Learning Center

The research and demonstration program may be augmented by the expansion of the recently-built Forest Learning Center, a place where the public can come to learn more about forest ecology and management. The Learning Center is expected to attract greater numbers of scientists to do important research work on the Forest. In addition to on-site facilities, the Center also will use the internet to allow for remote access to an increasing range of digital and video information. Research priorities will be set through consultation with CAL FIRE staff, the Board of Forestry and Fire Protection, designated advisory entities, various colleges, universities, research institutions, forestry extension specialists; forest landowners; resource professionals; local parties, and the general public.

Monitoring and Adaptive Management

One of the most important elements of the Plan is the provision for a monitoring and adaptive management feedback system (Chapter 5). Knowledge gained will be continually re-evaluated, and management actions will be modified as necessary in response to the results that are observed. This approach will help to keep the Plan implementation in step with new science and management techniques. Elements to be monitored include streams, habitats, botanical resources**,** forest growth, selected fish and wildlife species, recreational uses, timber production, and roads.

Protection and Restoration of the Environment

As described in part above, the Management Plan contains numerous elements to protect and restore environmental conditions on JDSF. Key Plan elements to these ends include:

- Creation of a contiguous 6,803-acre corridor, extending across JDSF from west to east and north to south, composed of an Older Forest Structure Zone, Old-growth Reserves, and Late Seral Development Areas.
- Management of riparian zones on Class I and II streams for the development of late successional habitat and the recruitment and placement of large woody debris.
- Conduct of an Accelerated Road Management Plan to survey road conditions, identify steps needed to improve or decommission, set priorities for improvements and decommissioning, and then implement these changes in priority order.
- Marbled Murrelets and their habitat will be addressed in part through recruitment of late successional habitat along Class I and Class II streams, designation of Upper Russian Gulch (Murrelets have been detected in Lower Russian Gulch on State Park property) as a Late Seral

Development Area, and a proposed multi-agency assessment process to further assess the best approach to recruiting and protecting potential Murrelet habitat on JDSF.

- Restriction of clearcutting to a cumulative maximum of 100 acres (or 0.2 % of Forest area) per decade and only for purposes of research, demonstration, addressing forest health or addressing problematic conditions for regeneration. Up to an additional 400 acres (or 0.8 % of Forest area) may be clearcut per decade, but only for specific research purposes that cannot be reasonably met through any other method.
- Total area receiving even-aged silvicultural treatments may not exceed 2,700 acres per decade (or 5.5% of Forest area). In general, use of even-aged management is to be restricted to purposes of research, demonstration, addressing forest health, addressing problematic conditions for regeneration, or achieving long-term forest structure condition goals identified in Table 1.
- Designation of one-third of the forest for maintenance or development of a range of older forest conditions. All old-growth groves and aggregations will be protected.
- During the first decade of Plan implementation, expected annual harvest levels represent less than half the total annual growth increment, or about one percent of inventory on an annual basis.
- Specific measures for the protection of species of concern, including salmonids, Northern Spotted Owl, Marbled Murrelet, Osprey, Northern Goshawk, and Sonoma red tree vole.
- Measures for the recruitment and protection of snags and down wood to provide wildlife habitat benefits.
- Assessment of slope stability, restrictions on operations on steep and/or unstable slopes, and utilization of a Certified Engineering Geologist.
- Expanding staff to include professionals in disciplines such as wildlife biology, botany, fisheries biology, geology, and hydrology, pending necessary budget authority, which the Department has committed to seeking.
- Planned discussions with neighboring conservation-oriented landowners (The California Department of Parks and Recreation and the Conservation Fund) about how to manage the collectively-owned 70,000-acre landscape for protection and restoration of environmental conditions

Consistent with the California Environmental Quality Act (CEQA). The environmental conditions and functions of the Forest have been described and discussed in detail in the Draft Environmental Impact Report for the Draft Jackson Demonstration State Forest Management Plan (California State Board of Forestry and Fire Protection, December 2005), the Recirculated Draft Environmental Impact Report for the Draft Jackson Demonstration State Forest Management Plan Alternative G (California State Board of Forestry and Fire Protection, May 30, 2007), and the Final Environmental Impact Report for the Jackson Demonstration State Forest Management Plan (California State Board of Forestry and Fire Protection, January, 2008). These programmatic documents also evaluate the potential environmental impacts from implementation of this Plan. Impact mitigations and additional management measures identified in these CEQA documents have been directly included in this Plan or are incorporated by reference. The Final EIR concluded that implementation of this Plan would not result in significant adverse environmental impacts and identified a number of beneficial effects that would result from implementation.

The FEIR cited above is a programmatic EIR, thus, it is important to note that many of the activities conducted under this Plan will be subject to further CEQA evaluation at the project level. The project level CEQA documents typically will “tier” to the Final EIR.

Chapter 1. Introduction

Overview

Professor Emanuel Fritz championed the concept of the State Forest System during the 1940s because of the need to demonstrate responsible and innovative forest management practices for the private timberland owners of California. At almost 50,000 acres in size, Jackson Demonstration State Forest (JDSF) is the largest public ownership dedicated to this purpose in the coast redwood region. This State Forest has demonstrated sustainable management practices for private timberland landowners since 1947, balancing economical timber production with the protection of public trust resources. Due to the long-standing practice of harvesting less than growth, inventories of standing timber on the Forest continue to increase. Some of the densest and highest volume stands of second-growth timber in the redwood region can be observed on JDSF.

Looking to the broader context of forests in California today, the need for forest products as well as associated ecosystem services, and thus the need for effective forest management continues to evolve. Coast redwood forest is among the most productive of temperate forest ecosystems on Earth with respect to growing harvestable wood on appropriate sites. The natural range of this species lies almost entirely within California, and 85 percent of the land base is in private ownership.

Today's conception of forest sustainability includes the sustainability of forest ecosystems, both terrestrial and aquatic. Current issues particularly revolve around the restoration of managed forest ecosystems to maintain biodiversity and system functions. However, a portfolio of goals weighted primarily to biodiversity and system functions is not likely to succeed on private timberlands if it is not financially viable to implement them. Incentives for continued investment are needed to relieve economic pressures to convert to other land uses with a higher and more immediate payoff. While these issues are in some ways beyond the scope of state forest management, they also create an important area of research and demonstration for the Demonstration State Forests, including JDSF: testing a range of timber/ecosystem services outputs for their economic and financial viability, as well as their environmental sustainability.

The JDSF management approach incorporates proposals designed to provide for ecosystem health as well as a financially viable management program. The need to demonstrate this potential is compelling. Demonstration of diverse timber management practices within the context of a working forest will enable this State Forest to facilitate research needed to answer relevant questions concerning the maintenance of biodiversity on private timberlands. Research conducted within this context also will help guide private landowners on how best to allocate funds to those restoration efforts that will have the greatest likelihood of success. In addition, this plan is intended to implement timber management practices on JDSF that are compatible with local and state public interest values so that visitors and neighbors will continue to use and enjoy the State Forest.

An initial implementation period of up to three years will be in effect when this plan is approved. The initial implementation period will sunset within three years, during which time the advisory process is expected to complete a review of the described Plan elements and the Department completes and the Board approves any Plan revisions made in response to the advisory process recommendations. During the initial implementation period, additional harvest restrictions are applied (discussed in detail in Chapter 3).

Content of the Management Plan

This management plan consists of five chapters and ten appendices. Chapter 1, Introdution, details the purpose of and need for the Plan. It discusses the importance of the research and demonstration role that is the primary mission of the Forest. Importantly, it lays out the detailed goals and objectives of the Plan. The chapter also explains how the Plan fits in with other related documents, the planning process that led

to the creation of the Plan, as well as how the plan will be implemented, monitored, and revised. The chapter closes with a presentation of how public input was provided to the planning process and the key public concerns that were identified as a part of that process.

Chapter 2, Current Situation, focuses on the setting for JDSF and the management direction that has been applied under the 1983 Management Plan, and earlier plans, that are being superseded by this new plan. Biophysical as well as economic factors are addressed in this review.

Chapter 3, Desired Future Conditions and Planned Management, constitutes the core of the new Management Plan. It describes the specific management measures that will be applied to achieve the Goals and Objectives presented in Chapter 1. For example, it presents the desired future forest structure conditions and the silvicultural means that will be applied to attain these conditions over time and space. It also discusses likely specific timber management activities to be conducted in the short term, including an in initial plan implementation period of up to three years in length. The chapter describes the specific management measures that will be used to protect and enhance wildlife and aquatic species habitat. It addresses how heritage resources will be surveyed and protected, as well as how invasive species and forest pests will be managed. Chapter 3 also discusses the recreation program, fire protection, law enforcement, and budget and staffing issues.

Chapter 4, Research and Demonstration, details how the research and demonstration program will be carried out on JDSF. Since research and demonstration, per legislative direction and Board policy, is the overarching mission of JDSF, this chapter is a very important one. Chapter 4 reiterates and discusses the Board policy in detail. It identifies research and demonstration opportunities and needs and looks to future research and demonstration activities. The chapter also provides a summary of existing, ongoing research and demonstration projects.

Chapter 5, Monitoring and Adaptive Management, presents key elements that will help to ensure that implementation of the Management Plan actually achieves its desired goals. Monitoring is the process used to evaluate whether these goals are being met. Adaptive management is the strategy that will be used to bring management back on course to achieving Plan goals.

The Management Plan includes ten appendices to provide additional background information (such as legislation, Board policy, and regulations relevant to JDSF) and more detail on certain elements of Plan implementation (such as the Road Management Plan and specific management and mitigation measures).

Purpose of the Management Plan

The Forest Management Plan directs the management of Jackson Demonstration State Forest for the next 10 to 15 years, or until a subsequent plan or major revision is approved. The Plan and the projects undertaken also will be evaluated by the Board of Forestry and Fire Protection every five years (Board Policy 0351.10; see Appendix I). The Plan's purposes are to guide the integrated use and protection of the Forest's resources, to meet requirements of legislation and Board of Forestry and Fire Protection (Board) policy, and to address local, regional, and statewide issues.

The Public Resources Code (PRC) specifically addresses the management of state forests. PRC section 4645 provides that the Department, in accordance with plans approved by the Board of Forestry, shall manage state forests. PRC section 4646 provides that the Director of the Department shall administer all the statutory requirements relating to state forests in accordance with policies adopted by the Board of Forestry. Thus, management of the state forests is a cooperative effort between the department and the Board of Forestry. Management which is inconsistent with policies of the Board of Forestry violates these statutory provisions.

The Legislature's stated purpose in acquiring land for state forest designation is multifaceted: to hold and reforest cutover timber lands, both young and old-growth timber, to demonstrate management of small areas (2000 acres or less) in timber counties where management of small areas needs investigation,

demonstration and education, and for larger areas (up to 40,000 acres) to demonstrate economical forest management (PRC section 4631). PRC section 4631.5 states that it is in the public interest to retain the land base of state forests in timber production for research and demonstration purposes.

The State Forest system was established to demonstrate how to make private timberlands 'fully productive' (PRC 4631). Jackson Demonstration State Forest was acquired for the purpose of demonstration of economical forest management. Management is further defined by the Legislature as "...the handling of forest crop and forest soil so as to achieve maximum sustained production of high quality forest products while giving consideration to values relating to recreation, watershed, wildlife, range and forage, fisheries, and aesthetic enjoyment" (PRC 4639).

Read as a whole, the statutory direction indicates that the management of Jackson Demonstration State Forest is primarily for sustainable timber production with the primary purpose of education and research relating to economical timber management. Specifically, the management plan for JDSF must adhere to these goals. JDSF must demonstrate sustainable timber production, and that timber production must be managed primarily to provide research and educational values. Within that broad statutory mandate, the management plan must adhere to policies and regulations developed by the Board of Forestry.

The State Board of Forestry and Fire Protection sets policy for management of the state forests. This policy builds upon legislation, directing the California Department of Forestry and Fire Protection (CAL FIRE or Department) to prepare detailed management plans and to conduct programs in timber management, recreation, demonstration, and research. Echoing the Legislature, the Board cites a large acreage of potentially productive timberland in California not producing satisfactory growth of young timber. To attain proper management, the Board states that there is a need to investigate, develop, and demonstrate new and improved forest management methods to timberland owners and the public. The State Forests serve this purpose while contributing to the economic stability of local communities by providing high yields of forest products that help sustain local employment and create tax revenues.

The Board of Forestry forest management policies are defined in Chapter 0350 (0350-0351.10); these policies outline and guide management actions (see Appendix I). Board policy 0351.3 establishes the primary purpose of the State Forest program to conduct innovative demonstrations, experiments, and education in forest management. Additionally, this article establishes timber production as the primary land use on Jackson Demonstration State Forest, while recognizing that recreation is a secondary but compatible land use.

Necessity of the Forest Management Plan

The preparation of Forest Management Plans is specified in Public Resources Code Section 4645. The content of the Forest Management Plan conforms to State Board of Forestry and Fire Protection policy Article 8 (Management Plans).

Provisions of the California Environmental Quality Act (CEQA) require analysis of a Forest Management Plan's potential environmental impacts. A Draft Environmental Impact Report (DEIR, 2005) and a Recirculated Draft Environmental Impact Report (RDEIR, 2007) have been prepared that describe the management alternatives considered for the Jackson Demonstration State Forest Management Plan and the potential environmental effects of each alternative. This Forest Management Plan is based on Alternative G, which was analyzed in the 2007 RDEIR. A Final Environmental Impact Report (FEIR) also has been prepared, which incorporates the DEIR and RDEIR by reference. For purposes of consideration of environmental effects, the Forest Management Plan and the FEIR are to be considered as a whole, rather than as separate documents.

Research and Demonstration – Meeting the Needs of Today and Tomorrow

The scientific community conducts research that reflects the advancing state of knowledge, technological advancements, social priorities and economic pressures. Demonstration, research and experimental forests have responded to these realities over time. Experiments early in the twentieth century focused on basic information development, such as appropriate tree species (including the testing of exotics), reforestation, and monitoring forest response to human induced changes. Multiple-use forestry inaugurated an inclusion of a wider range of disciplines. Recreation, watershed, wildlife and fisheries research increased, for example. The creation of the Caspar Creek Watershed study in 1962, in partnership with the USDA Forest Service Redwood Sciences Lab (RSL) is an example on JDSF. The closing of the redwood silviculture lab at the RSL around 1970, the recent closing of the wood sciences lab at the University of California (UC) at Berkeley, and the intensive data collection at the Onion Creek snow lab are some examples of research programs adapting to changing organizational priorities. Other examples include the creation of the Center for Forestry at UC Berkeley, the initiation of watershed studies at Cal Poly's Swanton Pacific forest, and the advanced instrumentation of ecological monitoring occurring at the USDA Forest Service's most recent (2005) experimental forest, Sagehen Experimental Forest, which is operated by UC Berkeley in the Sierra Nevada.

As noted by Irland and Camp (2005), long-term studies are crucial to understanding the effects of forest management actions as well as the effects of broader changes in forest influences, such as global climate change. As a publicly-owned forest dedicated to research and demonstration, JDSF provides an ideal venue for long-term research. Some research projects on JDSF have been periodically monitored for decades. The Caspar Creek Watershed study, mentioned above, is one example of long-term research projects on the Forest.

The current context of forestry in California is one of increased demand for wood products, reduced timber supply from Federal forestlands creating more economic pressures for supply from private forestlands, combined with a high level of regulation and permit compliance costs. Increased fragmentation of wildlands due to development and wildland fire issues related to urban interface and fuel loads are also prominent concerns. All of these forest issues must be viewed in light of societal concerns for sustainability. Floyd (2002) discusses the challenge of addressing forest sustainability, giving it a historic and social context. He points out that sustainability can be considered from an ecological, social and economic viewpoint, or combinations of these. At larger scales, he suggests that a combination of forests that have different management goals is beneficial, including reserves and intensively managed plantations. Approaches to forest management depend, in part, on scale.

The individual tree is the smallest scale and is the smallest element that may be manipulated for management purposes. Silviculture is the art and science of regeneration and density management of trees to achieve the objectives of management. Monoculture tree farms and mixed species stands designed to mimic old-growth gap dynamics both will have specific silvicultural prescriptions. The existing forest landscape contains a myriad of conditions. Overlain on this biophysical variability are the objectives for the desired future conditions by the owners. The challenge for the Forest is to facilitate the creation of knowledge over time to fulfill the many and varied needs of the forestry community.

Having young stands that can be manipulated towards a variety of conditions is informative for researchers interested in ecological restoration and intensive management. Examples from JDSF include thinning studies used by ecologists to thin recently acquired young stands on state parks to accelerate late seral conditions and a spacing study to maximize growing space efficiency and product yield. Forest management that yields high quality ecological and wood products requires the implementation and testing of ideas centered on mimicking ecological processes (Kohm and Franklin 1997). One means of doing this is by the "lifeboating" of ecosystem elements through a consideration of microclimate, species requirements, and spatial and temporal scales. For example, the retention of unique habitat elements such as nesting platforms or basal hollows by keeping trees with these characteristics and protecting them with surrounding trees. This is termed group retention. Groups that are large enough may also provide a source for the reoccupation of the stand of organisms such as epiphytes and mycorrhizae

(refugia and inocula). Dispersed retention, or keeping larger trees scattered throughout a stand, may be beneficial by supplying a source of dead wood through time. The intentional creation of nesting platforms may also be done through the creation of epicormic sprouting (Franklin and Van Pelt 2004) by exposing the bole of a large tree to sunlight.

On a larger scale, one that encompasses many stands over multiple planning watersheds, additional ecological considerations come into play. Population health and viability for organisms like raptors, vascular plants, and aquatic animals are influenced by critical range sizes, connectivity of suitable habitat (Hilty, Lidicker Jr. et al. 2006), and predation. Competition from invasives—such as French broom crowding native plants and, of particular near-term concern, barred owls taking over northern spotted owl habitat—are also considered at a landscape level. The discipline of landscape ecology focuses on scientific study at this scale. By planning at this scale as well as the stand level we can prepare for further inquiry into these issues. The following axiom from (Kohm and Franklin 1997) is appropriate as a guiding principle:

> ***This is a key lesson of 20th-century forestry: Beware of simple formulas applied over broad areas.***

The ecosystems found on JDSF are unique on a global scale. While the redwoods found in California are now technically considered to be in the Cupressaceae family, until the late 1970s they were classified in the separate Taxodiaceae family. Current botanical classification puts the Taxodiceous group as the ancestors of the rest of the family. In previous epochs the group was more widely distributed with pollen and fossil records showing a distribution primarily in the northern hemisphere during warmer and moister climates. The unique fog conditions of the northern California coast are responsible for the persistence of the coast redwood. This situation potentially puts the species at high risk under potential climate change scenarios. The outcome will depend on the complex interactions of global climate response to increasing average temperatures.

JDSF's approach to climate change may be described by three factors: monitoring, mitigation and adaptation. Monitoring will be accomplished through repeated vegetation inventories with growth and mortality analyses along with weather station data capture. Mitigation will be accomplished by increasing our standing inventory and sequestering carbon from the atmosphere. By increasing our understanding of the climatic tolerances of the species represented on the forest we may best plan for adaptation to observed climate changes.

Ecological theory used to focus on seral stages: pioneer through climax conditions. Once reaching a climax condition it was thought that stands of trees would always proceed in a steady-state small scale disturbance regime. This concept is now considered the exception for most ecosystems, with disturbance being the rule rather than the exception (Botkin 2006). Our challenge is to understand the disturbance regimes of the past and future to provide a productive outdoor laboratory for the scientists of today and tomorrow. This Management Plan, with its mix of older and young forest structure goals and utilization of various unevenaged and evenaged silviculture techniques, puts us on a course to do just that.

Climate change, along with geological processes, has been shaping the range and genetic configuration of redwood and associated species for millions of years. Scientists have modeled what may be near term alterations in climate, but there is a large degree of uncertainty. There is no significant environmental climate change impact related to management of JDSF that can be predicted given the current state of scientific knowledge.

Three strategies will be employed on JDSF to address the uncertainty regarding climate change:

- Keep the Forest healthy to maximize resilience to perturbations in moisture, temperature, pests, and storm events.
- Monitor species abundance and health as part of a long-term monitoring strategy.
- Develop partnerships and fund research, giving priority to information gaps such as below-ground carbon cycles, fog drip utilization by tree and understory plants, and climatic tolerances of species.

Research efforts at JDSF could build on the information from the LaTour Demonstration State Forest carbon sequestration demonstration project. In particular, there is a need to integrate coastal growth models with carbon budget models and accounting systems. By providing an example and quantifying the costs and volumes of carbon, this research could facilitate the ability of forest landowners to have a basis for setting prices based on agreed upon measures that would be needed for a financial market for sequestered carbon throughout the redwood region if a cap and trade system should develop.

The JDSF is the premier redwood research forest. The size of the forest, its location near the center of the species range, and its orientation along the ecological gradient of increasing elevation and distance from the coast are its unique features. Soquel Demonstration State Forest in Santa Cruz County, while also a redwood forest, is much smaller (2,700 acres). The USDA Forest Service does not own appreciable acreage of the ecotype. Other government ownerships are parks and therefore lack the ability to extend their research to the private working forests, which are abundant in the redwood region. Nor do the universities have significant acreages. However, there are many scientists at the universities and with government that study this ecosystem. We will not attempt to duplicate their expertise but rather provide a rich experimental palette for their use.

Detailed Goals and Objectives

These Goals and Objectives are based upon legislative statutes, regulations, Board of Forestry and Fire Protection policies, and the direction provide by the Director of the Department of Forestry and Fire Protection and the Board of Forestry and Fire Protection.

Goal #1 - RESEARCH & DEMONSTRATION: Improve the amount and quality of information concerning economic forest and timber management, forest ecosystem processes, watershed processes, performance of forest protection measures, that is available to the general public, forest landowners, resource professionals, timber operators, the timber industry, and researchers.

Objectives:

- Maintain a diverse, dynamic matrix of forest habitats and seral stages to provide a broad range of forest conditions available for research and demonstration.
- Make the State Forest available to educational institutions and other agencies for conducting research and demonstration projects.
- Conduct resource management demonstrations and investigations directed to the needs of the general public, small forest landowners, resource professionals, timber operators, and the timber industry.
- Design a range of demonstrations and comparisons to serve a broad set of clients such as conservation-oriented, restoration-oriented, small landowner, and intensive production approaches to forest management.
- Increase the use of JDSF for research that tests and demonstrates the short-term and long-term costs and effectiveness of various forest resource protection measures.
- Develop demonstration areas incorporating a wide range of forest management approaches within a compact, easily accessible area.
- As a demonstration project, complete certification of JDSF management under the umbrellas of the Forest Stewardship Council and the Sustainable Forestry Initiative.
- Conduct monitoring of resource management activities to gauge their effectiveness in meeting project objectives.
- Demonstrate the compatibilities and conflicts involved in multiple use of forest land, and investigate methods to mitigate conflicts.

Ensure that knowledge gained is also shared by disseminating information obtained through research and demonstration to the general public, forest landowners (especially small owners), resource professionals, and timber operators.

Establish a Forest Education Center at Jackson Demonstration State Forest to support and facilitate forest management research and learning activities.

Accelerate the expansion of knowledge about redwood forests by seeking increased funding to support research and demonstration projects.

Consult and cooperate with universities and colleges, the U. S. Forest Service, other public and private researchers, and private forest conservation organizations in conducting research and demonstration projects. Enter into cooperative agreements for investigations of mutual interest.

Goal #2 - FOREST RESTORATION: Work towards active restoration by managing the Forest to promote and enhance forest health and productivity.

Objectives:

Increase the amount of older forest structure and late seral forest available for terrestrial wildlife, including areas adjacent to aquatic habitats.

Improve habitat connectivity and reduce forest fragmentation, including the concepts of corridors and contiguous habitat.

Use a range of management techniques to compare natural and accelerated forest restoration approaches while maintaining high canopy cover across the whole Older Forest Structure Zone (OFSZ) and other areas designated for development of late seral forest characteristics.

Cooperate with other agencies and private conservation organizations interested in forest restoration on research into approaches to increase the pace at which older forest structure characteristics can be developed through active management.

Focus on restoring more productive river and stream systems from the low gradient floodplains to intermittent streams in the upper reaches to improve the habitat conditions and populations of salmonids, other fish species, amphibians, and other plants and animals dependent on riparian ecosystems.

Work with neighboring landowners, including State Parks and the Conservation Fund, to explore opportunities for multiple-landowner, landscape-level approaches to forest restoration, including the protection and enhancement of watershed and ecological processes.

Restore conifer forests where early successional hardwoods or invasive plants have become established at densities far above those typical of the mature conifer forests dominated by redwoods, Douglas-fir, Grand fir, and hemlock.

Add large woody debris to streams and enhance overall habitat conditions for salmonids.

Increase forest structural elements in stands (snags, large trees, large diameter limbs, cavities and flat tops).

Minimize the influence of invasive exotic plants and animals.

Goal #3 - WATERSHED AND ECOLOGICAL PROCESSES: Promote and maintain the health, sustainability, ecological processes, and biological diversity of the forest and watersheds during the conduct of all land management activities.

Objectives:

Maintain a diverse, dynamic matrix of forest habitats and seral stages suitable for a wide variety of native fish and wildlife populations. Manage designated old-growth reserves for maintenance of late seral habitat values.

Maintain and recruit structural elements necessary for properly functioning habitats. In riparian areas, manage for late seral habitats, while allowing for flexibility to conduct research on riparian protection zones. Create or naturally develop recovery habitat for listed species.

Work with partners to conduct research and demonstration on the effectiveness of measures to protect watershed and ecological processes from potential management impacts.

Determine which native species, in addition to listed species, are most susceptible to adverse impacts from land management activities and which therefore warrant extra concern.

Provide protection to listed species, to species of concern, and to their occupied habitats. Avoid disturbance to uncommon plant communities such as meadows and pygmy forest.

Utilize forestry practices that will maintain stability of hillslope areas and control sedimentation caused by accelerated mass wasting and surface erosion.

Monitor the development and condition of terrestrial and aquatic habitats over time, and apply adaptive management principles to ensure that goals are met.

Implement a comprehensive road management plan to reduce sediment production, including upgrading roads remaining in the permanent transportation network and properly abandoning high risk riparian roads where possible.

Goal #4 - TIMBER MANAGEMENT: Manage the forest on the sustained yield principle, defined as management which will achieve continuous high yields of timber production that contribute to local employment and tax revenue, consistent with environmental constraints related to watershed, wildlife, fisheries, and aesthetic and recreational enjoyment and constraints related to providing a diverse, dynamic matrix of forest habitats and seral stages for researchers.

Objectives:

Manage forest stands to produce sustained yields of high quality timber products and public trust resources. Maintain flexibility in forest management in order to provide a comprehensive demonstration, education, and research program.

Include a sustainable regulated growing stock as a feature of the State Forest's desired future condition. Establish stand-level rotation ages and cutting cycles to meet sustained yield objectives. Based on management goals and constraints, determine a forest-level allowable annual cut that will lead towards achievement of the desired future conditions. Project the short-term, site-specific harvest schedule at least 5 years into the future, and the long-term schedule at least 100 years.

Implement state-of-the-art forest management practices to increase total wood production and improve timber quality, designed and carried out for maximum applicability and demonstration value for private lands.

Contribute to the vitality and stability of the economy of the North Coast of California by conducting regular periodic timber sales.

Goal #5 - RECREATION and AESTHETIC ENJOYMENT: Plan for and provide enhanced levels of low impact recreational opportunities that are compatible with forest management objectives and healthy ecological processes, that are consistent with historic recreational use characteristics, and that allow for engagement of recreation user groups.

Objectives:

Base the development of future recreation programs and facilities on a plan that assesses needs, opportunities, and available resources.

Maintain campgrounds, picnic areas, trails and other recreational facilities in a safe, healthy and attractive condition.

Continue to utilize a style of recreational improvement that is generally low impact and rustic in nature. Develop campground and day use areas so that they are concentrated in identified recreation corridors.

Extend existing trails to create a more extensive trail system, including linkages with neighboring State Parks.

Demonstrate that recreation is compatible with demonstration and timber management land uses, as well as many research activities, through the integration of recreational development and use with these other activities. Utilize this opportunity to explain forest research and management to the recreating public. Include appropriate mitigations in harvest plans that may impact recreation and aesthetic values.

During timber management activities conducted adjacent to residential areas, consider and mitigate the project's effects on the casual and informal recreational uses of the State Forest by the Forest's neighbors.

In cooperation with the California Department of Parks and Recreation, establish forest management demonstration areas compatible with recreation for educational purposes adjacent to the Mendocino Woodlands Outdoor Center and the Pygmy Forest Reserve.

Engage various recreation user groups interested in cooperating in the design, implementation, and stewardship of a more extensive recreational facilities system.

Goal #6 – INFORMATION, PLANNING, & STAFFING: Develop, maintain, and update management plans and other planning documents and processes. Manage and support the information needs and staffing needs of all State Forest programs. Communicate with the public regarding management of the Forest.

Objectives:

Collect, process, interpret, analyze, update, store, index, and make retrievable the array of information and data about the State Forest and its resources needed to support Forest planning and management and to provide baseline information to researchers.

Prepare, monitor, and update State Forest Management Plans and program area plans.

Initiate an adaptive management process for all phases of State Forest planning and plan implementation. Monitor forest operations and make modifications as necessary to achieve management goals.

Utilize State budgetary processes to seek increased funding and staffing to provide the Forest with the resources needed to restart full operations and to achieve Management Plan goals.

Provide regular information to the local community regarding educational and recreational opportunities on the Forest, as well as research, demonstration, and management activities in general.

Provide opportunities for public and other agency input into planning processes, including any advisory groups that CAL FIRE or the Board may establish.

Provide periodic reports to local government entities.

Goal #7 - PROTECTION: Protect the forest from damage and preserve the peace within.

Objectives:

Preserve native plant species and limit the invasion and spread of exotics. Protect native communities from insect, disease, and plant pests using the concept of integrated pest management.

Include fire hazard and risk assessment in forest planning. Manage forest fuels to reduce the incidence and severity of wildfire. Incorporate a fire protection and pre-attack plan into the State Forest management plan.

Maintain a physical presence in the forest to enforce forest and fire laws. Make regular contact with forest users to ensure understanding of and compliance with regulations and use limitations. Use public contact as an opportunity to deliver forest management education messages.

Inventory and protect historic and pre-historic archaeological resources. Identify and prioritize archeological sites that are susceptible to disturbance and schedule data collection prior to planned activities.

Goal #8 - MINOR FOREST PRODUCTS: Maintain a program that provides an opportunity for the public and small businesses to purchase minor forest products.

Objectives:

Continue to make both personal-use and commercial firewood available following timber harvesting operations.

Restrict the utilization of forest products where potential environmental effects are unacceptable, such as cutting of green redwood burls, manufacture of split products from desirable large woody debris, and salvage of windthrow from riparian areas.

Increase opportunities for small-volume sales.

Consider a system for contracting logging and selling delivered logs.

Goal #9 - PROPERTY CONFIGURATION: Improve the boundary layout of the State Forest to facilitate management logistics and increase demonstration and research opportunities.

Objectives:

Consider making boundary line adjustments through cooperation with neighboring timberland owners to configure state forest boundaries to ridgelines and watershed boundaries.

Seek to reduce private in-holdings through purchase or exchange.

Investigate opportunities to purchase additional forest land to add to the State Forest, particularly where it completes ownership of a planning watershed, creates new or adds control over important road access, or provides new opportunities for research and demonstration projects.

Relationship of the Forest Management Plan to Other Documents

This comprehensive, integrated Plan applies to all areas and resources of the Forest. Therefore, it supersedes existing plans.

Upon approval of this Plan by the Director of CAL FIRE (Director) and the Board of Forestry and Fire Protection, all land and resource management activities and all budget proposals will be based on the Plan. As soon as practicable after approval, all permits, contracts, cooperative agreements, and other instruments for use and occupancy of the Forest's lands will be brought into conformance with the Plan, subject to existing rights. Note that previous sale contracts for timber or other commodities not yet harvested may preclude bringing such activities into full conformance with this Plan.

The Planning Process

The last management plan for Jackson Demonstration State Forest was prepared in 1983. As in previous plans, it focused heavily on timber management. However, for the first time it included a comprehensive discussion of the demonstration and education role of the Forest. The 1983 plan recognized the need for more in-depth information about the resource base of the State Forest, and laid out a series of steps to begin gathering that information.

During the 1990s there was increased awareness of the impacts of forest management on wildlife species and their habitats. Northern spotted owls, marbled murrelets, coho salmon, and steelhead trout were listed under the federal Endangered Species Act, and the California Forest Practice Rules were amended to provide increased consideration and protection for these species and for ecosystem processes in general.

This plan builds on the 1983 plan by elevating wildlife, watersheds, and ecosystem processes to a level of importance equivalent to the timber management and the research, demonstration and education programs. The desired future condition of the Forest, discussed in detail in Chapter 3, describes both the development of habitat and biological diversity and the establishment of a forest growing stock that provides for a sustained high yield of timber products.

The planning team was drawn from both State Forest and CAL FIRE headquarters staff and included specialists in forestry, silviculture, harvest scheduling, forest economics, wildlife biology, hydrology, geology, and archeology.

A key part of plan preparation was the development of a set of goals and objectives that provide the framework for describing the desired future conditions of the various resources being managed. The goals and objectives were derived from planning team collaboration, public input, review by Department managers, and Board direction.

Monitoring and adaptive management are key elements of this plan, and they affect all of the individual management programs as well as the management plan as a whole. While the desired future condition described in this plan creates a diverse forest landscape that is flexible and able to respond to many changes, the plan cannot anticipate all of the possible developments in how the State Forest can best serve the needs of California's citizens. As part of the ongoing planning for management of the State Forest, this plan will be reviewed periodically in the context of changing policies and priorities. Since the timing of these potential changes cannot be predicted, it is not appropriate to institute a fixed schedule of plan reviews. This means that the forest staff must remain familiar with the contents of the plan and alert to external influences that may reduce the plan's relevance and trigger a comprehensive review.

At the time this Plan is being completed, the CAL FIRE director and Board are in the process of establishing a charter and membership composition for a Jackson-specific advisory body. The JDSF advisory body will be tasked with review of this plan. This advisory body may make recommendations to the Department and Board as to possible changes in the Plan during the initial three-year review period. The advisory body may also provide recommendations to the Department and Board regarding ongoing implementation issues or policy matters.

Plan Implementation

The Forest Management Plan will be carried out by the Unit Chief, the State Forest Manager, and the Forest and Sacramento staffs. The Plan is based on a set of Goals and Objectives for the Forest and for each area of management. These reflect the capability and suitability of the land to support various activities. The Unit Chief's staff will plan and conduct resource projects that meet this direction. Projects will continue to be planned and evaluated through an interdisciplinary process. The Unit and Forest staffs will conduct environmental analyses and document them in the appropriate environmental documents

(such as Timber Harvesting Plans and Environmental Impact Reports) which will be tiered to the Forest Management Plan Environmental Impact Report.

As noted above, there is an initial Plan implementation period during which the new JDSF advisory body will review and potentially make recommendations for changes to the Plan. As appropriate, CAL FIRE will seek advice on Plan implementation and ongoing Forest management from various bodies, including the JDSF advisory body, the Demonstration State Forest Advisory Group, and the Board's Committee on Forestry Research.

If a proposed project on the State Forest is determined to be inconsistent with the direction of the Plan, the project will be revised or not permitted. Conflicts that recur will result in a review of the relevant management direction of the Plan, according to its monitoring and evaluation process, and may lead to Plan amendment or revision.

By the time the Forest Plan begins implementation in 2007, budget processes for fiscal year 2007/2008 will be largely completed. Thus, budget plans for that fiscal year may or may not meet the budget requirements of the approved Forest Management Plan. Moreover, legislative appropriations and allocations by the Director during any future period may or may not meet the budget requirements of the approved Plan. In these situations, the Unit Chief will modify the proposed Plan implementation schedules to reflect differences between proposed Plan budgets and actual appropriated funds. Resource Management Program managers in Sacramento will notify the Board of Forestry and Fire Protection of these modifications.

Currently, all revenues derived from management activities on the State Forest are deposited into the Forest Resource Improvement Fund (FRIF). The FRIF is designated as the source of money available to budget management activities on the Forest, though the State's General Fund has contributed to Forest operations over the past few years. There is potential for failure to produce revenues sufficient to support the management level specified in the Plan. In this situation, the Unit Chief in consultation with the Forest manager and Demonstration State Forest Program managers will change the proposed Plan implementation schedules to reflect differences between proposed Plan budgets and actual available funds.

Monitoring and Evaluation

The Forest staff will monitor Plan implementation to determine (1) if the Plan is being implemented as designed (implementation monitoring), (2) if implementation is effective in meeting the Plan's objectives (effectiveness monitoring), and (3) if the Plan's initial assumptions are correct (validation monitoring). Specific monitoring and adaptive management requirements are listed in Chapter 5 of this Plan. The Forest staff will collect and evaluate the monitoring results regularly to determine the need for changes in the Plan or Plan implementation.

Revisions and Amendments

The anticipated implementation period for this management plan is ten years. As directed by the Board of Forestry and Fire Protection, the Forest Management Plan is expected to be thoroughly reviewed at least every five years and updated as necessary. It may also be revised whenever the Director determines that conditions or demands have changed sufficiently to affect goals or uses for the entire Forest. Under a schedule approved by the Board, the Director prepares and the Board approves Forest Management Plan revisions. The Forest manager will continually review conditions of the lands covered by the Plan to assess the need for Plan revisions.

Between revisions, the Plan can be amended to reflect changing conditions. The State Forest Manager can prepare and approve an amendment if the change is not significant; such changes can be expected

annually to adjust some of the Plan's details. If the change is significant, the State Forest Manager will prepare the amendment for the Director's consideration and, ultimately, for the Board's approval.

Input from the JDSF advisory body will be sought regarding potential Management Plan revisions and amendments. Public notification requirements and adherence to CEQA procedures apply to any significant Plan amendments.

Public Input into the Planning Process

There has been substantial public input in recent years on the management of JDSF. A number of forums have enabled the public to offer suggestions concerning the management direction of the Forest. In 1997, a Citizens' Advisory Committee was appointed by then CAL FIRE Director Richard Wilson. The committee met periodically over an 18-month period and produced a number of recommendations for management of the Forest. A number of the recommendations of the committee have been incorporated into the Management Plan, as well as providing many of the elements found in Alternative D.

In 2000, CAL FIRE initiated a public input and scoping process for the development of the DFMP and an associated draft EIR. That process included a Technical Session, open to the public, held on March 30, 2000, in Ukiah, where JDSF staff as well as researchers presented information about the management of the forest and received public comments. Subsequently, a total of six CEQA public scoping hearings were held in Ukiah (April 11, 2000), Ft. Bragg (April 12, 2000) and Sacramento (April 13, 2000) where the public was invited to provide testimony. In addition, written comments were received through May 1, 2000. Comments collected from the public were summarized, categorized and utilized in the development of the May 17, 2002 DFMP and in the formulation of alternatives in the May 2002 draft EIR.

In compliance with Board Policy 0351.10 an early draft of the DFMP was made available by CAL FIRE for public review in June of 2001. Comments received were utilized in the development of the May 17, 2002 draft, which was presented to the Board. This draft Plan was the proposed project analyzed in CAL FIRE's May 2002 draft EIR as well as the Board's 2005 DEIR.

Following the Mendocino Superior Court's 2003 finding that the 2002 CEQA process and EIR were flawed, the Board embarked on a new EIR scoping effort in February 2004. Once again public comments were solicited through a Facilitated Scoping session (facilitated by U.C. Cooperative Extension) in Ft. Bragg on February 27, 2004, and a Public Scoping Session held in Sacramento on March 12, 2004. In addition, written comments were accepted through March 18, 2004. Comments received were considered along with those already compiled for the May 2002 draft EIR and Plan prepared by CAL FIRE (see section VI Alternatives in the 2005 DEIR).

As lead agency, the Board was required to approve the administrative draft prior to its distribution for public comment[2]. The Board provided another opportunity for public comment at the time of that consideration. Following the Board's consideration of the administrative draft EIR, the Board released the draft EIR for public comment and agency review in late 2005. There is a minimum 45-day public and agency comment period required on this draft EIR (PRC § 21091). Comments received during the comment period will be responded to in writing by the Board (PRC 21092.5; CCR §15088) and incorporated into the final EIR (CCR §15132). The Board held two public forums on the proposed plan and DEIR (February 2, 2005, in Ukiah, and February 9, 2005, in Sacramento) between the time the DEIR was released and the close of the comment period in the DEIR.

In summer 2006, the Board of Forestry and Fire Protection requested CAL FIRE to prepare a new plan alternative to address many of the issues raised during the public comment period. Specifically, the Board directed the Department to develop a new alternative management plan approach that placed a greater emphasis on research. Further Board direction was that the new alternative should address public

[2] CCR §15084 (e) "Before using a draft prepared by another person, the lead agency shall subject the draft to the agency's own review and analysis. The draft EIR which is sent out for public review must reflect the independent judgment of the lead agency. The lead agency is responsible for the adequacy and objectivity of the draft EIR."

concerns, and take advantage of the experiences on other research and demonstration forests. The new alternative was to be based on Alternative C1 (May 2002 Draft Forest Management Plan), of the 2005 DEIR, but would incorporate changes to that alternative, including the incorporation of certain aspects of other alternatives described in the DEIR.

CAL FIRE presented the basic outline of the new alternative at the September 2006 Board meeting, and the Board discussed the further development of the alternative on an ongoing basis during regular Board meetings during the last half of 2006 and early 2007. These Board discussions were formally noticed as agenda items and opportunity for public comment was provided. During this period, the Board's JDSF Committee also met several times to discuss these changes. In February 2007, the Board directed staff to prepare a CEQA recirculation document for Alternative G (i.e. the RDEIR).

The Recirculated Draft EIR (RDEIR) for Alternative G was released for public review on June 1, 2007, for a 45-day period. During the review period, the Board held two public hearings on the RDEIR, one hearing was held in Ft. Bragg on June 7, 2007, as a part of a regular Board meeting. A special hearing on the RDEIR was held in Ukiah on June 20, 2007. At its October 10, 2007, meeting, the Board provided CAL FIRE with its final specific direction for the preparation of this Management Plan and the final EIR. The Board certified the Final EIR and approved the Management Plan at its January, 2008 meeting.

Public Concerns Regarding the Management of JDSF

A number of forest management issues covering a broad spectrum of topics have been identified through the processes of public scoping, advisory committee meetings, and personal contacts. The issues are listed below, not in order of importance. This list of issues and concerns is not all-inclusive, but represents those issues expressed most frequently or considered most substantive.

Concerns expressed by the public have played an important role in the management of the State Forest. A number of management actions, strategies, and decisions have been implemented in response to these concerns. Briefly outlined below are most of the key public issues, accompanied by a brief discussion of measures being implemented to address these issues.

Forest Management for Various Goals

Fish and Aquatic Habitat

A great number of individuals have expressed concern for the health and protection of native fish and aquatic habitat. Recommendations have been made by the public to expand riparian corridors, to increase the level of road maintenance, and to control impacts that could result from all aspects of forest management, especially from logging activity. The Forest is managed to prevent "take" of listed species, and to allow aquatic habitat recovery to proceed. This management plan outlines an aggressive road management program intended to protect and enhance the riparian area and aquatic habitat over time. Riparian zones are either not harvested or are lightly harvested, primarily by cable skyline systems, and will be managed to develop late seral forest characteristics. Stream channels are protected, and shade canopy is retained at or near preharvest levels. The implementation of this management plan will provide for continued recovery of aquatic habitat throughout the Forest.

Wildlife Habitat

Concern has been expressed for the well being of wildlife species and their populations. To many people, timber management is synonymous with habitat damage. The Forest is managed to produce and maintain a dynamic mosaic of habitat conditions. The Plan provides for retention of old-growth groves and late seral habitats, as well as recruitment of these important habitat types. The plan also provides for the

development of an older forest structure zone that serves as a corridor to connect old-growth groves and late seral development area. There are also provisions to increase the availability of essential habitat elements such as snags and downed logs. Surveys are conducted annually to locate and protect selected listed species such as the northern spotted owl and the marbled murrelet. The variety and quality of habitats is expected to increase through the planning period and beyond.

Late Seral and Other Forest Reserves

The amount of late seral forest is expected to increase over time, due to dedication of additional area to recruitment of late seral conditions and a 8,600-acre older forest structure zone. Over one-third of the forest is assigned to various older forest structure conditions. Much of the area dedicated to the production of late seral or older forest conditions is in large, contiguous patches or stream zones. Large patches of habitat may be beneficial to many forest-dwelling species, due to a lesser amount of forest edge and habitat fragmentation. The Older Forest Structure Zone provides another large unfragmented area where the development of structure closely associated with old forests (large trees, large snags, large downed logs, and a wide diversity of trees in terms of diameter and crown height) will be a dominant goal.

Restoration

Requests have been received to alter management direction so that recovery of natural ecosystems and old-growth forest becomes the primary mandate of the State Forest. Some writers have limited their concern to a request that aquatic habitats and some areas of old-growth be restored. Although the restoration of old-growth or late seral forest has not been adopted as the primary mandate by the Department, existing old-growth forest and other areas of second-growth will be managed to expand the area of late seral forest and older forest structure. Riparian ecosystems will be protected or enhanced to provide for restoration in those areas.

Endangered Species

The protection and recovery of endangered species is of concern to most individuals, and this concern has been expressed to the Department by many people. As part of the planning process, the Department has examined the availability of habitat for endangered species, and has planned to maintain or create habitat to contribute to the viability of regional populations. For example, the Plan specifically designates the area surrounding Russian Gulch for recruitment of habitat suitable for marbled murrelet.

Old-Growth Management

Old-growth management and protection on Jackson Demonstration State Forest is a complex issue that rests largely on the values that different sectors of society associate with older forests. Descriptions of old-growth historically have been based largely on social perceptions of old-growth values rather than legal precepts or biological principles. Implementing a conservation strategy for this remnant forest condition must start with recognition of these different perceptions of old-growth. Many Californians have strong opinions regarding older forests. However, this conservation strategy recognizes that without further categorization the term "old-growth" is too nebulous to support analysis and decision making. For example, tree size in and of itself is not a reliable indicator of tree age due to the influence of site conditions on tree growth rates.

Old-growth stands will be preserved, and additional forest will be managed to develop late seral and older forest characteristics. There will be no reduction in old-growth forest. Large old-growth trees and old trees with specific structural habitat value will be retained within managed stands.

Even-Aged Management

Numerous comments included the request that even-aged management on the Forest be discontinued. To many, even-aged management is perceived as damaging to aquatic resources, slopes, and wildlife. Although even-aged management will be used on the Forest, the area where it can be demonstrated has been restricted to specific management units. In addition, structural elements of value to wildlife will be retained within or adjacent to even-aged harvest units. Clearcutting, the most intensive form of even-aged management, will be limited to research and demonstration, and where needed to address forest health problems or particularly problematic regeneration challenges. The Management Plan also includes specific acreage limits on the amounts of even-aged management, and clearcutting in particular, that may be conducted on the Forest each decade.

Small-Volume Sales

There have been a few requests to make more timber available to local small businesses, such as micro-mill operators and licensed timber operators. Recently, a few small-volume sales were offered, but there is room for expansion and improvement in this aspect of timber sales. The degree to which this program is enhanced will depend upon the availability of staff to administer the program, due to the substantial increase in administrative effort needed per unit of volume sold.

Jobs for Locals

There has been concern expressed that a reduction in available timber supply will result in a loss of local jobs. As planned, the level of harvest will decline from the levels under previous management plans. However, the anticipated level of harvest will still provide a substantial amount of jobs, economic activity, and tax revenues.

Timber Supply

Concern has been expressed that future management will result in a reduction of available timber for harvest. There have been requests to maintain or increase the level of harvest. The level of harvest will be determined by the biological capacity of the Forest, in consideration of all applicable goals and constraints. The Forest will continue to meet the legislative mandate to manage for maximum sustained production of high quality timber products, subject to specified constraints. As planned, the level of annual harvest will slowly increase over the coming decades, as the growth capacity of the forest increases.

Logging in General

A number of comments received during the public scoping process requested changes in the amount or purpose of logging activity. Many requested that logging be curtailed, or restricted only to instances where “forest restoration” was enhanced. A few requests for maintenance or increase in logging activity were also received. Logging is being planned within the Forest to implement the intent of the legislation that created the State Forest, to implement policies established by the Board of Forestry and Fire Protection, and to achieve a number of the goals specified in this plan. Logging and timber production are being planned to maintain JDSF as a research and demonstration forest, where sustainable forest management occurs for the benefit of the public, landowners, and professional land managers and regulators.

Herbicides

The Draft Forest Management Plan noted that there have been requests from the public as well as the Citizens Advisory Committee that the use of herbicides on the forest be curtailed and alternatives to their use be evaluated. It also noted that a few of the people who commented requested the continuation or increase in herbicide use to control invasive weeds on the Forest. The recent comments on the

December 2005 DEIR also contained a range of public concerns about herbicide use. Some individuals and some groups requested a cessation of all herbicide use. A few comments received have requested the continuation or increase in the use of herbicides to control exotic species on the Forest.

In Mendocino County, herbicides are not used for roadside vegetation control on state or county roads. County-wide, forestry use of herbicides has declined from 1.2% of total county pesticide use in 2002 to 0.4% of total pesticide use in 2004. JDSF use has declined as well from the 1990s. A variety of techniques are used on the Forest to control invasive weeds.

A total ban on herbicide use may compromise the broad research and demonstration value of the Forest and could result in environmental and economic consequences. New information on alternatives to herbicides that are relevant to the Forest has become available in the eight years since the Citizen's Advisory Committee's Report. This Management Plan adopts strict limits on the use of herbicides. These limits are detailed in Chapter 3.

Implement a Road Maintenance Program for Restoration and to Serve as a Public Education Tool

Due to widespread recognition that forest roads, especially older roads, can damage hill-slopes and aquatic habitats, there have been many requests for an intensive program of road maintenance on the Forest. To deal with this issue, a comprehensive road management plan has been prepared (Appendix V). In addition, increased funds will be made available from revenues generated on the Forest to manage and maintain the road system. A recent budget change has added a second heavy equipment operator to the Unit /Forest staff in order to increase road maintenance capabilities. The road management program will be integrated with the research and demonstration program and the education program to offer the public and private timberland owners information and first-hand experience with appropriate road management.

Promote Hardwood Development as a Forest and Timber Resource

The Citizen's Advisory Committee appointed by the Director in 1997 recommended that more emphasis be placed upon the value of hardwoods for quality wood products, and as important habitat elements within the forest ecosystem. Retention of hardwoods within timber stands for purposes of habitat maintenance and recruitment is an important element of the wildlife management program on the State Forest. See Chapter 3 for greater detail on habitat management. Over the past decade, the Department has promoted the growth and utilization of hardwoods in the region, but the relative value of hardwoods remains low in the marketplace. In the management of timber stands throughout the Forest, hardwoods are now considered individually, in a similar fashion as conifers Individual hardwoods are retained in most stands in order to recruit hardwoods into larger size classes, and to develop valuable wildlife habitat elements.

In areas of the forest with either an overabundance or a lack of hardwoods, an effort will be made to restore the stands to a pre-management ratio of conifers to hardwoods.

Research and Demonstration

Forest Certification

The Department has made a commitment to pursue independent certification of forest management activities for JDSF.

Demonstration and Research Applicable to Private Landowners

Timberland owners and resource professionals have expressed an interest in maintaining or increasing the research and demonstration of forest management applicable to private timberlands within the region and the state. It is the Board's direction and the Department's intention to increase the amount of

research and demonstration conducted on the Forest, and to improve the dispersal of the information. The Board has emphasized the importance increasing the research and demonstration emphasis of the management of JDSF. This plan is a reflection of that direction.

Public Input into Management Process

A number of people have requested that the public be given a greater voice in the management of JDSF. Most of these concerns have been expressed by local individuals. Public participation in the planning process for the State Forest is provided for during the public comment periods for the Management Plan and for the Environmental Impact Report prepared for the Management Plan, and during subsequent review processes for individual timber harvest plans and other actions requiring environmental review. In addition, the Director has appointed an advisory committee to assist in the planning and management of the entire Demonstration State Forest system. The local staff has made a practice of notifying neighbors when timber harvest projects are in the planning phase to enable them to discuss concerns with Forest staff. This often results in the application of mitigation or limited alteration of plans in response to concerns.

At the time this Plan is being completed, the CAL FIRE director and Board are in the process of establishing a charter and membership composition for a JDSF-specific advisory body. This advisory body will be tasked with review of this management plan. This advisory body may make recommendations to the Department and Board as to Plan changes it believes may be appropriate.

Utilize Revenues Only for Restoration of the Forest

Requests have been received to limit the use of revenues generated by forest management to restoration activities on the Forest. Over the past few years, the amount of revenue spent on habitat restoration and erosion control projects has increased, and an even greater amount has been allocated to the road management program. The revenue generated on the State Forests, per legislative direction, is deposited in the Forest Resource Improvement Fund (FRIF), which provides monies to support all of the Demonstration State Forests. No other programs are currently funded out of the FRIF.

Recreation and Aesthetic Enjoyment

Aesthetics

During the past decade, campgrounds, picnic areas, designated trails, and other high-use recreational areas have been buffered from the visual impacts of even-aged timber management activity. Views of mature forest have been maintained adjacent to most of these features. In addition, the spatial allocation of management systems has been designed to maintain forested views from much of Highway 20 and other popular travel corridors. Even-aged management is generally thought of as not aesthetically pleasing in the short-term, and is located in areas with lesser amounts of recreational activity. Future management will continue to place a priority upon aesthetics near homes, recreational facilities, and main travel corridors.

Recreation

The Plan calls for a recreation survey to provide a better understanding of Forest recreation users' activities and interests. The survey process will be followed by development of a recreation management plan.

Camping

In general, the public has requested that the availability of rustic campsites be increased. In response, the Department has re-opened the Big River Campground and will consider the opening of other historically-used camping areas throughout the Forest.

Hiking

The public has shown an interest in expanding the Forest trail system. A particular interest is the creation of long trials through areas of the Forest with older forest conditions. Concern has also been expressed that logging and the formal abandonment (decommissioning) of riparian roads leads to a loss of riding and hiking opportunities. The State Forest has initiated a process by which major trails within timber harvest areas are examined prior to harvest, and reopened upon completion with the exception of non-sanctioned trails in locations that are damaging to the environment. When riparian roads are formally abandoned, an attempt will be made to incorporate riding and hiking trails into their former locations, or to relocate the trails to nearby areas so that loss of recreational opportunity does not occur.

Horseback Riding Trails

Some equestrian groups have requested expansion of the riding trail system. During the planning period, expansion of the system will be evaluated and implemented to the extent that staffing and funding allow. Top priority will be given to loop trail segments in proximity to campgrounds, watering locations, and other areas with easy access.

Bicycle Riding Trails

Many local mountain bikers and their associations have requested the opportunity to build and maintain trails systems similar to those on other State Forest such as Boggs Mountain and Soquel. Concerns expressed regarding bicycle trails have been similar to those for horseback riding and hiking. In general, an expansion of the system has been requested. An expansion will be considered, and implemented to the extent that staffing, funding, and collaborative efforts with mountain biker groups allows.

Hunting

Hunting groups have requested that Forest roads remain open throughout the year. In response, the road system was examined, and roads with firm native surfaces or rocked surfaces were not subjected to seasonal closure if their use was not considered potentially damaging to water quality or aquatic habitat. Road closures are considered individually on an annual basis.

Off-Road Vehicle Use Opportunities

A number of requests have been made to allow off-road vehicle use on the State Forest. It may be within the authority of CAL FIRE to allow this use, subject to limitations. To date, the Department has declined to allow off-road vehicle use on the State Forest due to anticipation of substantial usage of an uncontrollable nature. It is currently illegal to operate unlicensed motor vehicles on the State Forest, yet substantial usage occurs. Most of this use is perceived as local, since access to the Forest is generally made from rural residential neighborhoods, not from areas utilized by visitors to the area. If this use were legalized, it is anticipated that a substantial increase in activity would occur, originating from both local and regional areas. Resource damage would be very difficult to prevent, given the staffing levels dedicated to law enforcement on the Forest. A number of individuals have also requested that off-road vehicle use not be allowed.

Target Shooting

It has been requested that the Forest establish formal shooting areas or “ranges” for recreational shooters. The Department has declined to establish these areas due to concern regarding potential for impacts to result from concentrated shooting activity. In addition, there are very few areas that are both

easily accessible and well away from permanent residences where noise and safety are major concerns. Other individuals have expressed both safety and noise concerns, requesting that shooting not be allowed in areas of the Forest, or in the Forest as a whole.

Management Adjacent to Mendocino Woodlands

The Mendocino Woodlands camps are utilized by a large number of local and regional residents. There has been long-standing concern that management of timber stands within the legislatively established special treatment area (STA) would reduce the recreational value of the park. Due partially to these concerns, only one timber harvest has occurred within the STA during the past planning period. A large portion of the STA has been designated as an area for demonstration of the development of late seral habitat, where timber management will be tightly constrained to maintain pleasing forest views. Recently, a memorandum of understanding between the Department of Forestry and Fire Protection and the Department of Parks and Recreation was signed. Many of the provisions of the memorandum are intended to protect the use and values associated with the Mendocino Woodlands camp area. Two limited timber harvests are planned to occur in the STA within the planning period. One is the continuation of a selective harvest demonstration for non-industrial timberland owners, and the second is a thinning demonstration in the upper area of Thompson Gulch designed to eventually produce late seral habitat with a large average tree size. The majority of the Thompson Gulch demonstration will be located outside of the STA. The Department will maintain ongoing communication and cooperation with State Parks to ensure that management of JDSF adjacent to Woodlands State Park and the recently established Big River Unit of Mendocino Headlands State Park retains a high level of compatibility with State Park values.

Chapter 2. Current Situation

Setting

This section briefly describes the setting for a number of factors related to JDSF. Substantially more detailed discussion of Setting can be found in the December 2005 DEIR.

Location

Jackson Demonstration State Forest (JDSF) is located a little northward of the geographic center of the redwood region, which stretches 500 miles from Del Norte County through Monterey County. About half the total area of redwood forest is located to the north of JDSF and about half to the south. With 542,000 acres of redwood forest, Mendocino County encompasses more redwood forest area than any other county in California (Fire and Resource Assessment Program 2002).

JDSF includes portions of the Noyo and Big River watersheds, as well as several small watersheds that drain directly to the Pacific Ocean. JDSF covers approximately 48,652 acres in central Mendocino County (see Map Figure 1). It varies from 2½ to 8 miles wide in a north-south direction, and is about 16½ miles long on the east-west axis. Its western boundary is within 1.5 miles of the coast, and the eastern boundary generally lies on the crest of the Mendocino Ridge separating the coastal slopes from the inland valleys, approximately 7 miles west of Willits.

The City of Fort Bragg, where the JDSF headquarters facility is located, is 2 miles north of the western property boundary. The town of Mendocino is located 2 miles west of the southwest corner of JDSF. The town of Willits and the Brooktrails development are located approximately 7 miles to the east. Ukiah, the county seat, is 35 miles southeast of JDSF.

Forest Ownership and Management Trends

The North Coast of California is characterized by extensive areas of private forest land along the western portions of the counties, and a mix of private forests, public forests, and non-forest lands in the eastern portions of the counties. Redwood dominates the cool, fog influenced coastal regions, while Douglas-fir and other tree species are more common farther inland.

The North Coast, Mendocino County, JDSF, and the surrounding area have a long history of timber harvesting, reforestation, and other timber management activity that dates back to the mid 1800s in some areas. Timber management activities have been a primary and substantial source of economic activity for the North Coast region and Mendocino County. Forest management has also resulted in environmental impact and social controversy.

Although the development and land use history of the area is somewhat patchy, this region is known to have been occupied by Native peoples for centuries before European settlers began to settle as early as the 1600s. By 1860, a major redwood milling operation was established near the mouth of Big River, and by 1885, another major redwood milling operation had been established near the mouth of the Noyo River. Logs were brought down the drainages and to the shores of the Pacific Ocean and loaded onto ships for transport to destinations to the south along the coast. Towns and cities developed along the coast, largely associated with the logging and fishing industries. Railroads were eventually extended inland, and operated for many decades, until being replaced by truck roads in the 1940s. Roads and highways were constructed, with some of the major routes linking the coast to inland areas being paved

to accommodate the increasing levels of log transport, and transport of other goods and people between the coastal and interior regions.

Most of the forested areas of Mendocino County have been historically owned and managed as relatively large contiguous entities. The family-owned companies were largely replaced by large corporate entities during the 1960s and 1970s, and these corporate ownerships have mostly been replaced by other forms of ownership over the past 10 to 15 years. More recently, large forested tracts in Mendocino County have been acquired by conservation organizations and are to be managed for restoration and timber production (i.e., the Big River tract acquired by the Conservation Fund and the Usal tract acquired by the Redwood Forest Foundation).

History of Jackson Demonstration State Forest

Caspar Creek and the Caspar Lumber Company were named after Siegfried Caspar, a German immigrant who owned a cattle operation in this area. Initial logging on what is now JDSF began in 1862 when the Kelley and Rundle sawmill, supplied by a surrounding 5,000 acres of virgin redwood land, started operating near the mouth of Caspar Creek (Wurm 1986). In 1863 Jacob Green Jackson, a lumber dealer who owned lumber yards in Stockton and San Francisco, bought out the owners of the Kelley and Rundle operation and founded the Jackson Lumber Company. Lumber from the Caspar Lumber Company was transported to markets, mainly San Francisco, by schooners until the early 1930s.

In February 1946, C. J. Wood, the president of Caspar Lumber Company, offered to sell up to 51,000 acres of the company lands to the State at a reasonable price. A condition of sale was that the company could operate up to 15 years on some reserved old-growth timber. The State finally entered into a contract with the company to buy the lands on January 31, 1947 for one and a half million dollars. The purchased lands were named Jackson State Forest after the original owner of the land, Jacob Green Jackson. For tax reasons, C. J. Wood chose to transfer the properties to the state in five separate transactions, the last of which took place in 1951. Separately from the Caspar Lumber Company transactions, the Mendocino Woodlands Recreation Demonstration Area was added to JDSF at approximately the same time. This 5,425-acre property had been acquired from the Mendocino Lumber Company in 1935 by the U.S. Resettlement Administration, and was being administered by the National Park Service. The property was conveyed by deed to the Division of Forestry on September 11, 1947, and incorporated into JDSF. Map Figure 1 shows the lands covered by the initial purchase as well as the subsequent Mendocino Woodlands transaction.

Prior to the first harvest entries in JDSF beginning in the 1860s, most of the Forest can be assumed to have been virgin old-growth. The coastal watersheds were all very heavily cut up until the 1930s when developing tractor technology and other factors allowed partial harvesting to extend further inland.

The earliest harvests in the original old-growth forest in the area which now constitutes JDSF were done with primitive technology, relying on rivers to float logs to the mill. This limited logging occurred within the Caspar Creek drainage immediately above the Caspar Mill, and along the lower slopes above the larger watercourses such as the South Fork of the Noyo River and the North Fork of Big River. The late 1800s witnessed the introduction of railroads and steam yarders. Most of the stands from the coast inland, up to the Chamberlain Creek drainage, were clear cut with this technology. Forest management was largely non-existent during this period. Emphasis was placed upon extraction of what seemed like a virtually inexhaustible resource of old-growth trees, and upon overcoming the challenges of logging and transporting very large trees with the primitive technology of that era. By 1947 when the State acquired Caspar Lumber Company's holdings, most of the coastal watersheds such as Caspar and Hare Creek, had regenerated to even-aged stands of 15 to 60 year old second-growth timber, though post-logging fires had burned through many of the regenerated stands.

Caspar Lumber Company started partial cutting on the East End of the Forest in the 1930s, in the Chamberlain Creek drainage. Chamberlain Creek defines the boundary between the East End and the West End of the Forest. After acquiring the Forest, the State continued partial cutting in this drainage and the James Creek drainage during the 1950s and 60s. This first round of partial harvest was an individual

marked tree cut that removed about 70 percent of the conifer volume. As a result, most of the large old-growth trees were removed. This initial cut was followed by a diameter limit harvest that removed most remaining conifer trees greater than 22 inches in diameter. This harvest pattern on the east end of the Forest resulted in an irregular uneven-aged stand structure, characterized by a relative abundance of hardwoods, poletimber and small sawtimber-sized young second-growth conifers, and individual scattered residual old-growth conifers.

This kind of irregular stand structure is typical of current stands on the East End of the Forest, and distinguishes the east end from the West End of the Forest. Although the West End of the Forest was subject to partial cutting of the second-growth stands, it has retained a more uniform stand structure due to the early history of large-scale clearcutting within the coastal watersheds.

In the late 1950s, after most of the old-growth areas within JDSF had been entered, managers began to investigate the feasibility of harvesting second-growth stands. Since the oldest second-growth stands were located within the Caspar Creek watershed, the first second-growth harvest on the Forest took place there. Harvest in second-growth stands subsequently occurred in the Caspar, Jughandle, Hare Creek, and South Fork Noyo River watersheds during the 1960s.

Management of JDSF has made use of both even-aged and uneven-aged systems. A range of silvicultural methods has been in use on the Forest, for research and demonstration projects as well as operational forest management (Lindquist 1988). Harvest on JDSF has generally involved longer rotations and less frequent re-entries than on most industrial timberlands within the region.

Surrounding Land Use

Within central Mendocino County, lands to the north and south of JDSF are classified as Forest Lands (FL) in the Mendocino County General Plan (as is JDSF). Lands directly on the eastern boundary of JDSF are classified as FL and Range Land (RL). Further to the east are the large areas of Rural Residential (RR) as well as the thousands of smaller residential lots in the Brooktrails development. The Land Use Classifications for the west side of JDSF are Rural Residential (RR), Remote Residential (RMR), Public Service (PS) and Solid Waste Landfill (SW) (Mendocino County 2003). A potential area of conflict exists where Rural Residential areas are immediately adjacent to areas where timber harvesting or other activities involving heavy equipment are conducted. Examples of possible indirect impacts are changes in aesthetics, alteration of wildlife habitats, and noise impacts.

Other important neighbors of JDSF on the west and southwest include several State Park units (Jughandle State Reserve, Russian Gulch State Park, Mendocino Woodlands State Park, and the Big River Unit of the Mendocino Headlands State Park). Recently, the Conservation Fund acquired approximately 12,000 acres in the Big River watershed, immediately to the south of the central part of JDSF. The Conservation Fund will be managing this area for sustainable forest management, including repair of erosion sources.

Climate

The Pacific Ocean is a moderating influence on the climate of the region. JDSF has a Mediterranean climate, characterized by a pattern of low-intensity rainfall in the winter and cool, dry summers. Fog is a dominant climatic feature, generally occurring frequently during the summer months, and less frequently during the rest of the year. Air temperature is strongly influenced by the extent of the coastal fog belt, which extends inland up to 20 miles or more during summer nights, generally burning off back towards the coast by afternoon.

About 90 percent of the precipitation in this area falls between October and April, with the highest average monthly precipitation in January. Winter storms from the Pacific Ocean bring intense rainfall over several hours or days, particularly warmer storms from lower latitudes. Snow is infrequent and usually does not remain even at higher elevations inland. Mean annual precipitation is 39 inches at Fort Bragg

[California Department of Water Resources (CDWR) 1997], but measures higher in the Caspar Creek watershed, where annual means of 51 inches and 45 inches have been recorded at the North and South Fork gages, respectively (Ziemer 1996). Mean annual precipitation at Willits, just a few miles to the east of the JDSF, is slightly higher at 55 inches (CDWR 1997). The rainfall, runoff, and stream discharges in this region are all considerably lower than the wetter redwood forest areas in Humboldt and Del Norte counties to the north.

Topography and Geology

JDSF and the surrounding area are located on the coastal side of the Mendocino Coast Range. The State Forest lands extend from gently sloping marine terrace surfaces along the Mendocino coastal plain in the west, to increasingly steep, rugged terrain in the eastern part of JDSF that is along the crest of the Mendocino Coast Range. The geomorphology of the coastal mountains of Mendocino County has been strongly influenced by two on-going processes: tectonic uplift and fluctuations in sea level. The landscape is especially affected during low sea level stands, when the coastline moves farther west. During these events, streams down-cut and form deeply incised valleys with steep-sided inner gorges. Once sea level rises (as at present) and the coastline advances, streams aggrade, the deep coastal valleys partially in-fill and estuaries form at the mouths of larger streams.

In general, the landscape is characterized by moderate to high relief. Slopes are less steep in the western watersheds within the Forest, and are steeper to the east in the watersheds nearer the crest of the Mendocino Coast Range. Elevations range from less than 100 feet within stream valleys along the western edge of JDSF, to a maximum of 2,092 feet in the southeast corner. The area drains directly to the Pacific Ocean. The local stream pattern is reminiscent of a “trellis”, where short tributary streams flow into larger streams at roughly right angles. Stream pattern is controlled in part by structural patterns in the bedrock. As is true throughout the Coast Ranges, the predominant structural pattern trends northwesterly. Thus, many of the principal watercourses in the area are oriented in a northwest/southeast direction (South Fork Noyo River, Hare Creek, and Caspar Creek).

The California Geological Survey has mapped landslide features and relative landslide potential for the entire Noyo River watershed and for portions of the Big River watershed occupied by JDSF (Manson, Sowma-Bawcom, and Parker 2001; Short and Spittler 2002a; Short and Spittler 2002b). The areas inside and outside of JDSF are generally similar in the percentage of area covered by the various landslide and mass wasting features. Debris slide slopes, followed by rockslides, are the features covering the greatest amount of area. JDSF has a higher percentage of its area in potential inner gorge than does the area outside of the Forest. This situation is of concern because these potentially unstable areas tend to be directly connected to watercourses and have a high likelihood of delivering sediment to watercourses if they release material due to either natural causes or anthropogenic disturbance.

Hydrology

A USGS stream gauging station has been operated on the Noyo River since 1951. Large runoff events have occurred in 1955, 1964, 1974, 1993, and 2006. Streamflow has been measured in the Caspar Creek basin since water year 1963, with large runoff events documented in 1964, 1966, 1974, 1993, 1999, and 2006. The effects of harvesting and road building on changes in stream flows have been well documented through the work that has been conducted as part of the Caspar Creek watershed study (Ziemer 1998) (see also the website, http://www.fs.fed.us/psw/topics/water/caspar/). This project has been carried out jointly by the USFS and CAL FIRE since 1962.

Surface Erosion and Mass Wasting

Surface erosion for the JDSF planning watersheds has been estimated from field survey, results from the Caspar Creek watershed study, and erosion hazard ratings. GIS-produced estimates of erosion hazard rating predict that the eastern planning watersheds have the highest percentage of land in the high or extreme categories. High sediment delivery to stream channels has been estimated to come from heavily used gravel-surfaced roads within 200 feet of streams. The James Creek planning watershed currently has the highest density of riparian roads. Overall, average sediment delivery from surface erosion associated with JDSF riparian roads is 50 percent of the total estimated from all sources. The legacy effects of old streamside roads were found to be substantial.

Mass wasting on JDSF is dominated by: 1) shallow debris slides associated with roads and landings, and 2) slides in inner gorges and steep colluvial filled hollows. Mass wasting has been carefully analyzed in two planning watersheds—James Creek and Caspar.

Fluvial Geomorphology

The most significant impact to stream channels located within JDSF boundaries has been the widespread removal of large woody debris (LWD) from low gradient (0-4 percent) stream channels from the 1950s to the early 1990s. This LWD removal has reduced pool frequency and depths and overall habitat complexity, which has in turn reduced the quality of over-summering and over-wintering habitat for anadromous fishes. Where wood has been removed, stored sediments have flushed, resulting in channel lowering and entrenchment—disconnecting channels from floodplains and reducing backwater habitats—thought to be important refuges for fish during strong winter storms. Additionally, older logging practices that occurred until the mid-1970s resulted in large inputs of sediment into stream channels. Channels in the eastern planning watersheds are particularly degraded due to steeper topography and differences in logging practices; evidence of entrenchment and LWD depletion is most apparent in these channels. Some channels have shown slight recovery from aggradation, but overall most continue to show evidence of high sediment input, increased entrenchment, and reduced LWD.

Vegetation - General Forest Habitats

The forest type dominates the North Coast, Mendocino County, and JDSF. Beyond JDSF to the west there are coastal and aquatic communities. Within JDSF, key forest vegetation types include the Redwood Series, Red Alder Series, Pygmy Cypress Series, and the Bishop Pine Series (Sawyer and Keeler-Wolf 1995, Holland 1986). Other non-forest vegetation communities are limited in area at JDSF and include sphagnum bogs, marshes and grassland.

The Redwood Series is the principal vegetation type found within JDSF, comprising approximately 48,000 acres. Redwood (*Sequoia sempervirens*) and Douglas-fir (*Pseudotsuga menziesii* var. *menziesii*) trees dominate the Forest. Other conifers present in the Forest include grand fir (*Abies grandis*), western hemlock (*Tsuga heterophylla*), and Bishop pine (*Pinus muricata*). Hardwoods comprise substantial secondary components in this type and are represented principally by tanoak (*Lithocarpus densiflorus* var. *densiflorus*) and madrone (*Arbutus menziesii*). The mixture of species shifts with distance from the coast, history of the area, exposure and soils. Redwood becomes less dominant moving inland with Douglas-fir and hardwood increasing. Some of the inland areas would be classified as Douglas-fir series by Sawyer and Keeler-Wolf (1995), and Holland (1986).

Most of the redwood stands found on JDSF are young (from five to 120 years old), but several small stands of un-entered and residual old-growth forest remain, totaling approximately 459 acres. The management history has influenced the species distribution in the eastern part of the forest as well. Though conifers dominate the forest overall, hardwoods play a role at JDSF. Young tanoak and madrone

dominate young fir and redwood in some areas, and exist within most conifer stands at the mid and lower canopy levels. Hardwoods are more prevalent toward the central and eastern portions of the Forest.

The riparian Red Alder Series found in the western portion of the Forest can contain relatively pure stands of alder. Alder, Big leaf maple, and willow are generally restricted to riparian areas. Additional hardwoods found on JDSF are: California bay (*Umbellularia californica*), chinquapin (*Chrysolepis chrysophylla* var. *minor*), and canyon live oak (*Quercus chrysolepis*).

The Mendocino pygmy forest is a unique ecological community that occurs only in coastal Mendocino County. The California Natural Diversity Database (CNDDB) recognizes it as a community that is "rare and worthy of consideration." (2003). The Pygmy Cypress series covers approximately 613 acres of JDSF near the western extent of the Forest. CAL FIRE and California State Parks cooperate to manage some of this area.

Within the Pygmy forest areas there are two Sphagnum bogs. The Pygmy Cypress series often lies adjacent to Bishop Pine series. This type is typically found on soils that lack the fertility to support timber and often have pygmy cypress within them. The Northern Bishop Pine series is listed by CNDDB.

There are ten special status plants and lichen that are known to occur on the Forest and 25 others that have been identified as likely to occur on JDSF though scoping and discussions with DFG. They are listed in Table 3.

Fungi and lichen are examples of smaller, less well known organisms present at JDSF. Fungi function as beneficial mycorrhizae, decomposers aiding nutrient cycling, and as pathogens. Fruiting bodies may include mushrooms that benefit wildlife and human foragers. The area known as Mushroom Corners near the intersection of roads 408 and 409 is utilized by several universities, colleges and scientific societies for educational and scientific purposes.

Invasive Weed Species

Aggressive plants that are not native to the area are referred to as invasive weeds. As on neighboring lands, invasive exotic weeds are present at JDSF. Among the plants of greatest concern within JDSF, the California Invasive Plant Council (Cal-IPC) list of "Invasive Non-Native Plants that Threaten California Wildlands" (2006) rates the following as High: jubata or pampas grass (*Cortaderia jubata*), Scotch broom (*Cytisus scoparius*), French broom (*Genista monspessulana*), yellow star-thistle (*Centaurea solstitialis*), Himalayan blackberry (*Rubus amenicus)* and English Ivy (Hedera helix). Two locally important species on the same list, Gorse (*Ulex europaeus*) and Cape Ivy (*Delairia odorata*) are found on JDSF, but only in limited numbers due to active Integrated Weed Management practices being used. JDSF also contains an area of Tasmanian blue gum (*Eucalyptus globulus*) which is listed by Cal-IPC as Moderate.

The invasive weeds can threaten biodiversity, ecosystem processes and management. Invasive weeds have the potential to displace native vegetation including special status plants. In addition, invasive weeds result in increases in fire hazard and road maintenance, as well as reduced conifer seedling survival and growth. Invasive plants are typically capable of very rapid invasions, in part because of the absence of natural predators or diseases in local ecosystems. Invasive weeds have become established on the State Forest during the past century. The risk of new invasive weed species becoming established on the State Forest over the next 10 to 20 years remains very high.

Many invasive weeds become established in areas where native vegetation has been removed. Roads and open areas along the roadway are often prime infestation zones for weeds. Invasive weeds are often spread along roads by human activities, but wind and wildlife also spread some invasive weed species. Timber operations often create habitat by disturbing the soil surface and creating sunlit openings on the forest floor. Because of prolific seed production, each successive generation can increase the number of seeds in the surface soil (i.e., the seed bank). Successful management of invasive weed species with long-lived stored seeds recognizes that, even if no individual plants can be observed, when conditions are favorable germination of the stored seed will re-infest an area. Many invasive weeds grow rapidly and are

not browsed by wildlife as are many native plants. As a result invasive weeds overtop and suppress the growth of neighboring native plants. They are often efficient at utilizing available soil moisture, and some weed species alter the soil chemistry, which also increases their competitive advantage.

TABLE 3. Plant Species of Special Concern.

Species	Legal Status				Local Distribution			
Common Name, *Scientific Name*	Federal[a]	State[b]	BOF[c]	CNDDB- CNPS[d]	North	South	East	West
Pygmy Manzanita, *Arctostaphylos mendocinoensis*				G1/S1? - 1B.2		X		X
Humboldt Milk-Vetch, *Astragalus agnicidus*		2		G2/S2.1 - 1B.1	X			
Small Ground-Cone, *Boschniakia hookeri*				G5/S1S2 - 2 .3				
Thurber's reed grass, *Calamagrostis crassiglumis*				G3Q/S1.2 - 2 .1				
Swamp Harebell, *Campanula californica*				G3/S3.2 - 1B.2		X		X
Northern Clustered Sedge, *Carex arcta*				G5/S1S2 - 2.2				
California Sedge, *Carex californica*				G5S2? - 2.3				X
Bristly sedge, *Carex comosa*				G5S2? - 2.1				
Livid Sedge, *Carex livida*				G5/SH - 1A				
Deceiving Sedge, *Carex saliniformis*				G2/S2.2 - 1B.2				
Green Sedge ,*Carex viridula* var. *viridula*				G5T5/S1.3 - 2.3				
Oregon Goldthread, *Coptis laciniata*				G4G5/S2.2 - 2.2				X
Pygmy Cypress, *Cupressus goveniana* ssp. *pygmaea*				G2T2/S2.2 - 1B.2		X		X
Supple daisy, *Erigeron supplex*				G1/S1.1 - 1B.2				
Coast Fawn Lily, *Erythronium revolutum*				G4/S2.2 -2.2				
Roderick's Fritillary, *Fritillaria roderickii*		2		G4T1/S1.3 - 1B.3				
Pacific gilia, *Gilia capitata ssp. pacifica*				G5T3T4/S2.2? - 1B.2				
American Manna Grass, *Glyceria granids*				G5/S1.3? - 2.3				
Glandular western flax, *Hesperolinon adenophyllum*				G2/S2.3 -1B.2				
Thin-lobed horkelia, *Horkelia tenuiloba*				G2/S2.2 - 1B.3				
Hair-Leaved Rush, *Juncus supiniformis*				G5/S2.2 - 2.2				
Baker's Goldfields, *Lasthenia macrantha* ssp. *bakeri*				G3TH/SH - 1B.2				
Coast Lily, *Lilium maritimum*				G2/2.1 – 1B.1				X
Running-Pine, *Lycopodium clavatum*				G5/S3S4.2 - 2.3				X
Northern microseris, *Microseris borealis*				G4?/S1.1 - 2.1				
Robust monardella, *Monardella villosa ssp.globosa*				G5T2/S2.2 - 1B.2				
Bolander's Beach Pine, *Pinus contorta* ssp. *bolanderi*				G5T3/S3.2 – 1B.2		X		X
North Coast Semaphore Grass, *Pleuropogon hooverianus*		3		G1/S1.1 - 1B.1				
White Beaked-Rush, *Rhynchospora alba*				G5/S2.3 - 2.2				
Great Burnet, *Sanguisorba officinalis*				G5/S2.2 - 2.2				
Seacoast Ragwort, *Senecio bolanderi* var. *bolanderi*				G4T4/S1.2 - 2.2				
Point Reyes Checkerbloom, *Sidalcea calycosa* ssp. *Rhizomata*				G5T2/S2.2 - 1B.2				
Purple-Stemmed Checkerbloom, *Sidalcea malviflora* ssp. *Purpurea*				G5T2/S2.2- 1B.2				
Long–Beard Lichen, *Usnea longissima*				G4/S4.2 - na	X			X
Oval-leaved viburnum, *Viburnum ellipticum*				G5/S2.3 - 2.3				

[a] No Federal status plant species [b] 2=Endangered , 3= Threatened [c] No BOF status plant species.	CNDDB State Ranks: S1 = Less than 6 Eos OR less than 1,000 individuals OR less than 2,000 acres,S2 = 6-20 Eos OR 1,000-3,000 individuals OR 2,000-10,000 acres,S3 = 21-80 Eos or 3,000-10,000 individuals OR 10,000-50,000 acres,S4 = Apparently secure within California; this rank is clearly lower than S3 but factors exist to cause some concern; i.e. there is some threat, or somewhat narrow habitat, S5 = Demonstrably secure to ineradicable in California. Threat ranks. #.1 = very threatened, #.2 = threatened,#.3 = no current threats known.
[d] CNDDB Element Ranking: G =global rank /S=state rank	CNPS : 1A. Presumed extinct in California,1B. Rare or Endangered in California and elsewhere,2. Rare or Endangered in California, more common elsewhere, 3. Plants for which we need more information - Review list, 4. Plants of limited distribution - Watch list. CNPS threat rank similar to CNDDB

Note: Plant status changes, based on 9/28/07 DFG Special Vascular Plants, Bryophytes, and Lichens List. Sidalcea malachroides and Mitella caulescens were listed in the December 2005 DEIR but now have lower ranking.

Wildlife

Wildlife in the Northern California Ecological Sub-Region, which includes Jackson Demonstration State Forest, is relatively diverse, although few species are endemic (occurring nowhere else) to the region. A query of the California Wildlife Habitat Relationships System (version 8) for the Northern California Coast Eco-region and for predominant forest types (Redwood, Douglas-fir, Montane Hardwood, Montane-Hardwood Conifer, and Montane Riparian) yielded a total of 288 species (170 birds, 21 reptiles, 19 amphibians, and 78 mammals) whose range includes a portion of this eco-region. This represents the maximum number of species that could occur in the area for the forest types queried if other species habitat requirements (e.g., minimum habitat patch size, adjacent habitats, and structural elements) are met, and includes several species that have not been documented on JDSF.

The redwood/Douglas-fir forest provides habitat for a large number of species. However, with the exception of heavily studied species such as the Northern Spotted Owl, there is only limited information on the role of forest composition and forest patch or stand juxtaposition on population dynamics. Maintaining a forested mosaic that helps support the many species in the region is a goal for both forest management and private forest demonstration. Habitat protection and restoration of relatively rare habitat types is also an important element of forest management.

JDSF and the surrounding forested area provide habitat for a number of listed and sensitive fish and wildlife species, including the Northern Spotted Owl, coho salmon, and steelhead. In addition, JDSF currently provides or may provide in the future, habitat for several listed or sensitive species that are not currently known to occur on the forest. These species include the Marbled Murrelet, Pacific fisher, and Humboldt marten. As such, the large block of publicly owned forestland that is JDSF, in conjunction with other parcels of public land in central Mendocino County, represents a valuable resource of potential re-occupancy and sustainability for at-risk wildlife species.

Habitat Elements and Structure

Habitat elements associated with late seral and old-growth forest that are important features for wildlife, such as large snags and downed logs, are widely distributed, but not abundant on JDSF.

Old-growth Forest Groves and Individual Old-growth Trees

Like most of the redwood forests in the region JDSF's stands of old-growth forest are small and fragmented. There are 11 known old-growth groves designated on JDSF, totaling approximately 459 acres. Old-growth residual trees, which were left standing when the forest was first harvested and during subsequent harvests, can be found as isolated individuals or in small aggregations across JDSF. Old-growth forest can also be found near JDSF in state parks. Compared with most large private ownership in the region, JDSF has an abundance of mid-seral stage redwood forest.

A review of the research on wildlife biology and ecology of old-growth forest research has indicated the fact that not all large trees have the same value to wildlife. Nor does age alone determine a tree's value to wildlife. Many slow growing redwood trees retained after logging activity in the 1880s and early 1900s are no longer shaded by neighbors and now grow vigorously, appearing to be (younger) second-growth trees. When the core of these trees is examined, the actual age would date the tree back to pre-European settlement. These trees lack the structure elements, large limbs and cavities that other old trees possess, and they have wildlife value equivalent to second-growth trees.

Because of the favorable climate and soils of the region and history of harvest, some young trees are now larger than trees that are indeed old. In general, as time progresses, tree size will vary more with the resources (sunlight, nutrients, water) available for its growth rather than the number of growth years. Because of redwood's potential to reach great size and age, assessing age only by size is prone to error.

The unique value of the remnant groves on JDSF was recognized since the forest was founded. For the last decade at least, remnant old-growth groves have been protected, along with specific stands of residual old-growth forest and individual large trees with structural characteristics of value to wildlife.

Snag Retention and Recruitment

Snags are important structural components of the forest ecosystem, and the dependency of wildlife species on snags ranges from incidental to absolute. Over 90 vertebrate species that occur in Mendocino County prefer or require snags to fulfill a portion of their life history needs (2 species of amphibians, 54 birds, and 36 mammals) (CDFG 1996).

Snags are defined as dead trees greater than 11 inches in diameter at breast height (DBH) and 12 feet or greater in height. These sizes are based on minimum dimensions that afford potential value to most vertebrate wildlife species (Thomas et al 1979). In general, larger snags provide better habitat than smaller snags because they last longer before they decay and fall, provide better thermal cover, and accommodate a more diverse spectrum of wildlife species.

Because most wildlife find snags with diameters of less than 11 inches to be of limited value, the following summary of snag distribution on JDSF only includes snags with at least 11 inch diameters.

The average density of snags on JDSF is estimated to be 1.9 snags per acre, based on recent forest inventory data. Slightly over half of the snags (57 percent) are conifer, and 43 percent are hardwood. The most common species of snag is tanoak (23 percent), followed by young-growth Douglas-fir and Bishop pine (20 percent each), madrone (15 percent), and young-growth redwood (8 percent). The diameter at breast height (DBH) of the snags averages 17.6 inches, with a maximum of 44 inches, and does not differ appreciably between conifers and hardwoods.

Large Woody Debris

Large woody debris (LWD) includes downed logs, limbs, bark, root wads, and stumps. Lack of LWD on the forest floor can limit habitat use. In managed forests throughout the State, past timber harvesting practices have greatly reduced the amount of large woody debris on the forest floor. Large woody debris is also an important structural component in aquatic and riparian habitats. Retaining LWD on the forest floor helps to maintain or enhance wildlife habitat and soil nutrient levels.

Species of Concern

A total of 25 vertebrate species of concern currently occur or may have a high probability of occurrence on Jackson Demonstration State Forest (Table 4). Other species of concern are present within the vicinity of Jackson Demonstration State Forest (e.g., Peregrine Falcon). Due to the lack of habitat elements used by these species however (e.g., cliffs for nesting falcons), occurrence in anything other than a transitory nature is a low probability. Similarly, a lack of information on habitat requirements, population distribution, and influence of forest management in the literature precludes the development of species specific management guidance in some cases. Additional research and inventory work would be beneficial for these species on JDSF as well as in other parts of the species range. The synergistic effect of conservation strategies for unique habitats, special habitat elements, and other species represents an interim management approach for species where little information exists. The list of species of concern is dynamic in that additional species may be listed in the future, change in species distribution and occurrence status on the forest may occur, or as additional survey and inventory work is completed, habitat relationships will become clearer.

TABLE 4. Animal Species of Concern Occurring or with a High Probability of Occurrence on JDSF.

Species	Legal Status				Known Local Distribution on JDSF			
Common Name *Scientific Name*	Federal[a]	State[b]	BOF[c]		North	South	East	West
Southern Torrent salamander *Rhyacotriton variegates*		1						X
Western Tailed Frog *Ascaphus truei occidentalis*		1			X			X
Northern red-legged frog *Rana aurora aurora*		1			X	X	X	X
Foothill yellow-legged frog *Rana boylii*		1			X	X	X	X
Northwestern pond turtle *Emys marmorata marmorata*		1						X
Marbled murrelet *Brachyramphus marmoratus*	2	3	1					
Osprey *Pandion haliaetus*		1	1		X			X
Great Blue Heron rookery *Ardea Herodias*			1					
Great Egret rookery *Casmerodius albus*			1					
Bald Eagle *Haliaeetus leucocephalus*	2	3	1					
Cooper's hawk *Accipiter cooperi*		1			X			
Northern goshawk *Accipiter gentilis*		1	1					
Sharp-shinned hawk *Accipiter striatus*		1			X			
Northern spotted owl *Strix occidentalis caurina*	2	1	1		X	X	X	X
Vaux's swift *Chaetura vauxi*		1				X		X
Olive-sided flycatcher *Contopus borealis*	1				X	X	X	X
Tricolored Blackbird nesting colony *Agelaius tricolor*	1	1						
Purple martin *Progne subis*		1						X
Yellow-breasted Chat Icteria virens		1					X	
White-tailed kite *Elanus leucurus*		4						
Sonoma tree vole *Arborimus pomo*		1			X	X	X	X
Ring-tailed cat *Bassariscus astutus*		4			X	X	X	X
Coho salmon *Oncorhynchus kisutch*	3	3			X	X	X	X
Steelhead *Oncorhynchus mykiss*	2				X	X	X	X
Chinook salmon *Oncorhynchus tshawytscha*	2							

[a] 1= Bird of Conservation Concern; 2=Threatened, 3=Endangered
[b] 1=CA Species of Special Concern; 2=Threatened , 3= Endangered. 4= DFG Fully Protected
[c] 1=Sensitive

Aquatic Resources

JDSF contains parts of 17 planning watersheds, as delineated and defined by CALWATER version 2.2. The proportion of each planning watershed that is part of JDSF ranges from one to 99 percent. A legacy of extensive land use activities has left its imprint on the watersheds in the region. These activities include timber harvesting, road building, railroads, and both residential and commercial development. Historic

harvesting activities during the period of 1860 to 1940 included the building of a successive series of dams to back up large quantities of water to flush masses of cut logs downstream to sawmills. The Big River watershed is documented as having had as many as 27 dams (for excerpts from W. Francis Jackson's book, "Big River was Dammed," and related historical photos, see http://www.krisweb.com/krisbigriver/krisdb/html/krisweb/history/bigdam.htm).

The current condition of aquatic resources has been evaluated in multiple studies, including identification of sensitive aquatic resources and potential hazards affecting these resources. Much of the focus was on habitat conditions present for coho salmon and steelhead trout.

Historically, coho salmon and steelhead occurred in all of the planning watersheds within the Forest. On JDSF there are about 90 miles of streams with fish habitat, and within the planning watersheds draining JDSF there are about 192 miles. Steelhead are found in all 15 planning watersheds reviewed; coho salmon were found in 12 of the 15 planning watersheds. Coho generally use stream channels with less than 4 percent gradient and were found in 92 miles of the class I watercourses found in the 15 planning watersheds (i.e., about 48 percent of the total Class I stream mileage present).

Current habitat conditions continue to be evaluated for several factors. Work completed in 1993 showed that the percentage of pool space filled with fine sediment, or "v-star", was on average about two times higher when compared to that found for undisturbed channels in the same geologic type (Knopp 1993). This finding indicates high fine sediment supply, but it is within the range of those found for other North Coast watersheds with similar management histories. LWD loading in the Caspar Creek watershed was reported to be two to seven times lower than that found in old-growth redwood systems with similar drainage areas (Napolitano 1996). Other watersheds on the Forest, not dedicated to the study of large-scale even-aged management systems, have higher LWD loadings. Water temperature has been measured throughout JDSF since 1993. Maximum weekly average temperatures (MWATs) have been calculated and compared to acceptable thresholds for coho of 62.2^{o} F. The primary area where MWATs have exceeded this threshold has been in the eastern planning watersheds draining JDSF. The North Fork Big River planning watershed, furthest from the coast, has the highest water temperatures and has exceeded the threshold several times. Shading estimates were made from air photos taken in 1996, and in general, streamside shade was high, particularly in the northern and western planning watersheds. Impacts of past management have reduced the amount of suitable habitat available. An increase in the amount of rearing habitat is expected to provide the greatest increase in salmonid production.

The regional declines in salmonids have resulted in various State and Federal threatened and endangered listings of individual species and or Evolutionarily Significant Unit (ESU) by both State and Federal fisheries agencies. The status and distribution of steelhead, Coho and Chinook are shown in Table 4 (*Animal Species of Concern Occurring or with a High Probability of Occurrence on JDSF*). This table also includes reptile and amphibian species of concern that utilize aquatic habitat.

Aquatic habitat elements important to both salmonid conservation and other aquatic resources are included below and are also discussed in the Fish, Wildlife and Plants Section in Chapter 3 of this plan. Riparian areas, wetlands and large woody debris are important components of aquatic ecosystems.

Wetlands

The wetlands on JDSF are small in extent, but of high public interest and biological value. They include two S*phagnum* bogs, a few scattered ponds, stream margins and several springs and seeps. Sphagnum bogs are found within the Pygmy forest and are recognized as a sensitive community by CNDDB, the California Department of Fish and Game's Natural Diversity Database. A large man-made pond (McGuire's Pond) with associated wetland is located at the headwaters of the South Fork of the Noyo River, within a private in-holding surrounded by JDSF in the Highway 20 corridor. Wetlands support specialized plant communities, which in turn provide foraging and breeding habitat for a diverse array of invertebrates, amphibians, reptiles, birds and mammals.

Wetlands are afforded protection under Section 404 of the Clean Water Act, which is administered by the U.S. Army Corps of Engineers. The definition of wetlands (i.e., wetlands that fall under the regulatory authority of the Corps) is based on three parameters: (1) surface soil saturation or inundation for at least 14 days during the growing season; (2) the presence of hydric soils; and (3) the presence of certain diagnostic plants (known as wetland indicator species) (US Army Corps of Engineers 1987).

Recreation and Other Forest Uses

The coastal area of Mendocino County is a popular destination for recreationalists, most of whom visit the area to be close to the beaches. In addition to public beaches and coastline, there are several forested parks available. JDSF provides important public recreational resources, receiving an estimated 61,000 recreational visitors per year. Although approximately 10 million people live within a 5-hour drive of JDSF[3], most of the recreation activity on the Forest is from Mendocino County residents. There are over 60 individual campsites, many miles of riding and hiking trails, and over 200 miles of forest road utilized by the public. Maintenance of these facilities is an important management component and historically has been funded from timber harvest revenues deposited in the Forest Resource Improvement Fund (FRIF) account. Other common recreational activities conducted on the Forest include picnicking, hunting, swimming, wildlife viewing, and target shooting. The Forest also is a local source of firewood and other minor forest products such as mushrooms and greenery for both personal and commercial use.

JDSF is just one of many public outdoor recreation facilities in the North Coast region. For example, there are over 56 state parks and beaches in this region. These facilities receive an estimated 11 million visitors per year (Department of Parks and Recreation 2003). In Mendocino County alone there are 22 state parks. In the context of public redwood forest recreation opportunities in the state's coastal regions, JDSF represents about 14% of the area and less than 1% of the annual visitation.

JDSF represents the most significant public land available for mushroom collection in this area. State Parks prohibit the practice of mushroom collection. Universities and mushroom societies from the Bay Area travel specifically to JDSF because of CAL FIRE policies allowing the collection of mushrooms, with the issuance of permits.

Domestic Water Supplies

Several municipal and domestic water supplies utilize runoff from JDSF. The City of Fort Bragg draws approximately 60 percent of its water supply from an intake on the Noyo River 2.5 miles downstream of the confluence of the South Fork Noyo River with the main stem. Fort Bragg also draws water by direct surface diversion form Newman Gulch and Waterfall Gulch, two small streams in the Lower Noyo River and Hare Creek planning watersheds, respectively. Parlin Creek Conservation Camp is supplied by water pumped from an infiltration gallery 20 feet below the bed of the South Fork Noyo River, downstream of the confluence of Parlin Creek. The system takes about 8,000 gallons per day, and supplies 115 people. When turbidity is high, water is supplied from storage tanks. The maximum shut down period has been about five days. Chamberlain Creek Conservation Camp obtains most of its water for domestic use from a surface water source on a tributary of Chamberlain Creek. This system supplies water for 130 people. Mendocino Woodlands Camp is supplied by several in-stream collection points and springs located on JDSF property. In addition to these water supplies, there are 27 other listed water rights in or near JDSF, although they are not all actively used. They are mostly for domestic use and irrigation.

[3] Population information from 2003 California Statistical Abstract available on the Internet at http://www.dof.ca.gov/HTML/FS_DATA/STAT-ABS/Sa_home.htm.

Current Forest Management

The discussion in this section reflects management of JDSF under the 1983 and earlier forest management plans. Chapter 3 describes the planned management of JDSF under this new management plan. In practice, management practices on JDSF continue to evolve gradually over time, reflecting changing societal, professional and research priorities.

The legal mandate for management of Jackson Demonstration State Forest is to research and demonstrate financially viable sustainable forestry practices in a broad range of forested habitats and forest structure conditions in the North Coast region of California. The North Coast region contains a large variety of forest stand types, and landowners practice a broad range of harvesting and forest management techniques. The owners of these working forests benefit from the research and demonstration that JDSF and other demonstration forests provide.

In order to be truly sustainable, forest management must maintain the ecological processes and biological diversity of the forest and its watersheds. To this end, JDSF management has maintained and developed a diverse range of forest habitats and stages of forest development. The diversity of forest conditions that have been cultivated on JDSF through 60 years of management offers unique opportunities for research and demonstration. The variety of forest structures found on JDSF, from recently regenerated stands to old-growth, make the Forest an enormously valuable resource as a working forest laboratory for research and demonstration. Forest structure, inventory, and growth are monitored on a regular basis, and the information is used to predict both future structure conditions (including wildlife habitat characteristics and values) and forest growth and yield.

JDSF is managed under sustainable forestry principles. Annual harvest has averaged well below annual growth. As a result, many second-growth stands on the Forest are growing older and becoming increasingly stocked with larger trees. An integral part of management is the regular harvest of a sufficient acreage to maintain an adequate representation of early to mid seral forest structures. These "maintenance" harvests may not have an immediate research function, but they serve the essential purpose of maintaining the range of forest structure conditions necessary to stay relevant as a managed research forest. Every timber sale on JDSF has not had a direct research purpose, but every timber sale has contributed in some way to cultivating the range of forest structure conditions necessary to remain relevant as a working research and demonstration forest.

Watershed protection levels at JDSF have been, and will remain high. This level of protection offers unique research opportunities, including the opportunity to test and monitor the effects of proposed new regulations. Forest restoration is an essential element of forest management, providing opportunities to test and monitor both active and passive approaches associated with management of riparian zones, the forest road system, older forest structures, and habitat development.

The development of high value forest products culminates in the sale of forest products to private entities, which contributes to the local economy. Timber sales, described in greater detail below, may be of varying sizes, with substantial variation in the harvest methods and the volume of timber that is made available. Minor forest products, including firewood, mushrooms, and greenery are also offered to small businesses and the general public.

Forest Structure

Forest structure refers to the unique combination of tree species, tree sizes, tree numbers, and tree spacing, along with other forms of vegetation (e.g., shrubs, forbs, grasses, and fungi) that can become established among and beneath the trees. The structure of a forest is reflective of conditions that promote regeneration and growth of the vegetation. Vegetation responds to opportunities to regenerate, and subsequent growth is influenced by available light, moisture, and nutrients. As a forest develops, the vegetation competes for light and moisture, creating abundant diversity of conditions. The removal of

trees, as individuals or in groups, creates openings in the forest, and opportunities for regeneration and remaining vegetation to occupy these spaces.

Depending upon the amount of light that reaches the forest floor, various species of brush, forbs, and grasses may become established and persist. As forest stands change, due to natural development or stand management activity, the spacing and size of the trees is variable, and the level of undergrowth will change. This dynamic is commonly referred to as vertical and horizontal diversity.

Historic management and natural forest development have combined to produce a mix of conditions within the Forest. Most of the original old forest was harvested by the Caspar Lumber Company between 1860 and 1955. Where this harvesting involved the cutting and burning of entire stands, which was common practice prior to the 1940s, the resulting young forest developed in an even-aged condition, where most of the trees are of nearly the same age and the forest canopy tended to become closed very early. This canopy condition tends to inhibit the growth of brush and forbs near the ground surface. After World War II, the cutting of old forests tended to be conducted in increments, where the larger trees were removed initially, followed by subsequent removal of smaller trees on one or two occasions. These conditions are prevalent in the North Fork of the Big River watershed and its tributaries (Chamberlain and James Creek watersheds). Each time that these areas were harvested, an opportunity was created for young trees to regenerate, so these areas tend to be occupied by stands with trees in two or more distinct age classes, along with scattered residual old trees that were not cut due to size, defect, or logistical circumstances.

Active management of young forest stands began during the 1960s. This management involved multiple forms of partial cutting as well as clearcutting. Clearcutting of young forest occurred primarily during the 1980s and early 1990s. Where this practice occurred, the resulting forest is very young and even-aged, rapidly approaching a closed canopy condition where the high level of shade will impede the development of brush and forbs. Where partial cutting methods have been employed in young stands, conditions are variable, and these stands are commonly characterized by having trees of two or more distinct ages, as well as having some brush and forbs growing under the canopy due to increased levels of light produced by the removal of trees.

The principal conifer species present within JDSF are coast redwood and Douglas-fir. These species commonly occur together within the Forest, with redwood typically more prevalent. Other minor conifers are present, including grand fir, hemlock, and bishop pine.

Most of the forest stands also include a hardwood component, with the predominant hardwood species being tanoak. Other hardwoods that occur include Pacific madrone, red alder, and live oak. Within conifer-dominated stands, the hardwoods are generally incapable of attaining the same height growth as the conifers, and eventually occupy a place below the crowns of the taller conifer trees.

There are a few remnant stands of virgin old-growth within the Forest, in addition to several hundred acres of partially harvested old forest. Structural components characteristic of older or late seral forest stands (e.g. snags, down logs, live trees with cavities and large limbs) exist throughout the forest at levels typical of middle aged and mature second-growth stands in the redwood region.

The property has been conservatively harvested, resulting in a relatively high volume of standing timber. Because growth exceeds harvest, the forest continues to build inventory, and management has fostered the development of a broad range of structure conditions.

Resource Inventories

Estimates of timber volumes and other vegetation characteristics are derived primarily from a system of plots referred to as the JDSF Forest Resources Inventory (FRI). The inventory used as a basis for the Management Plan incorporates several thousand inventory plots. The system of inventory plots is replaced on a periodic basis.

Forest inventory has been monitored since 1959 through the implementation of a Continuous Forest Inventory (CFI) system. A 60 by 60 chain grid of 141 one-half acre permanently monumented rectangular monitoring study plots was installed throughout the Forest. The system was designed to track changing forest conditions and structures within reasonable tolerances for the Forest overall. Period measurements have been completed approximately every 5 years since 1959 using the original plot design. The most recent measurement of the CFI plots occurred in 2005. The JDSF CFI system constitutes one of the longest and most detailed time series of vegetation monitoring data in existence.

Historical harvests on the Forest have averaged 28 million board feet per year over the past 20 years of normal operation.

Timber Sale Program

The State Forest plans and schedules regular timber sales as directed by Board policy and existing management plans.

Forest product sale transactions are broken into two categories based on size, Class I sales and Class III sales(an intermediate Class II category was discontinued in 1976). Class I sales are limited to no more than 100 thousand board feet in volume, and cannot exceed $10,000 in value. These sales tend to consist of salvage operations, power line right-of-way clearance, and other small lots of timber. Class I sales of other forest products typically include firewood, split products, poles, greenery, and mushrooms. The Department of General Services exempts CAL FIRE from the requirements for competitive bidding for Class I sales, although these sales can be bid when it is appropriate. (For example, it may be desirable to use a bidding process to select a purchaser of a small sale when there are many people interested.)

Class III sales cover the major timber sale program, and are awarded through a competitive bidding process. Sale volumes have ranged from 100,000 board feet to more than 15 million board feet. Most sales have been between 5 and 12 million board feet. A Timber Harvesting Plan is prepared for each major timber sale.

Following consultation with the forest manager and forest staff, and after review of the Management Plan a timber harvesting plan and sale contract are prepared. The sale is appraised and advertised. A prospectus for each sale is sent to persons and organizations found on a mailing list that currently has about 100 names of potential purchasers, local logging contractors, and other interested parties. The sale is also listed on the California State Contracts Register website.

An advertising period of four to five weeks is typically provided to allow purchasers and contractors ample time to evaluate the sale and the contract provisions. Sales usually have bid dates in late winter or early spring, which allows the contract to be awarded and approved and operations to begin shortly after the end of the winter period.

Sale contracts are valid for one to two operating seasons, depending on the volume to be logged, the amount of new road to be constructed, the complexity of the operation, and how early in the year the sale is awarded. Normally, the contract for a sale of less than six or seven million board feet will be designed for completion in one season, and a larger sale will run for two seasons.

In most cases, the lead forester during sale preparation will serve as the contract administrator during the operational phase. This provides continuity of site-specific familiarity and ensures immediate feedback on the strengths and weaknesses of the harvest design. Administrative inspections are intended to ensure compliance with the timber sale contract. Inspections of the sale area are made at least weekly, and more often during critical or sensitive phases of operation. Additional administrative duties include monitoring harvesting progress and the request of stumpage payments on a timely basis.

State Forest sale administrators do not double as CAL FIRE Forest Practice inspectors on the sales which they administer. THP review and inspection for the purpose of compliance with the Forest Practice Rules is performed by CAL FIRE inspectors who are not State Forest staff. The contract administrator's responsibilities extend beyond the completion of timber harvesting, to include inspection and arrangement of maintenance of erosion control facilities during the maintenance period, and ensuring that harvest units meet stocking requirements.

Recreation

Recreational opportunities found on Jackson Demonstration State Forest are unique to the coastal region. They are informal, free of charge, unsupervised, and diverse. Primary recreational activities include camping, picnicking, hiking, biking, driving, horse-back riding, and hunting.

The objectives of the previous forest management plan developed in 1983 were to provide facility development sufficient to meet the projected average peak demand while remaining compatible with management of the timber resource, and to use recreation demand as an opportunity to inform the public about JDSF's timber and research activities. In the past 10 years, average peak demand has not been quantified other than by tracking the annual camping days per year. Although the past 10-year period has averaged 16,000 overnight-use days per year, the total number of visitor-use days exceeds this by an estimated factor of three when day-use visitors are included.

Although public use on the Forest has not diminished over time, priorities for implementing a recreation program have fluctuated with political goals and their resultant budgets. The goal of integrating recreation management, forestry education, resource protection and timber harvesting to demonstrate compatible use has been ongoing by default since the State Forest's inception as well as with directed attention.

With the exception of the two Conservation Camps and areas undergoing active timber operations, nearly all of the 48,652-acre forest is open for public access. There are 21 campgrounds within the boundaries of JDSF, and most of these offer opportunities for swimming or wading. In 1999 there were over 12,200 days of use by campers who typically stay for two to four days. Roughly half of the users are from Mendocino County. The road system and easy access from Fort Bragg, Mendocino and Willits allows for extensive day use. It is estimated that day use comprises at least three times as many visitor-days as overnight camping. Unlike the surrounding smaller State Parks, JDSF has more roads available for use and allows a wider range of recreational uses (horse back riding, mountain biking, and hunting). JDSF does not collect any fees for recreational uses but does provide considerable public value to the visitors.

The majority of visitors live in Mendocino County, but an increasing number of visitors are from outside of the county. The rise in non-local visitors may be attributed to increased publicity from travel guides as well as large annual events held on the Forest, and perhaps in the future from the Internet. Campgrounds are always full for the holiday weekends during the summer. The majority of the campsites are only open seasonally.

A recreational use survey was conducted in 1988. The findings of this study showed that 25 percent of the respondents visit JDSF for the purpose of environmental education, but the majority of respondents (50 percent) visit JDSF to observe nature. Approximately 24 percent of the respondents indicated that less logging would make the forest a better place to visit. The survey specifically queried only a few adjacent landowners. The survey confirmed that Mendocino County residents comprise the majority of visitors to the Forest. Visitors value the fact that access and camping is free on the Forest.

Facilities

Maintenance of existing facilities has been the primary recreation management objective for the past several years. As staffing levels and budgets varied over the years, priorities fluctuated. The majority of recreational facility maintenance has been made possible by utilizing crews from the two Conservation

Camps located on the Forest. Refer to Appendix VI for existing facilities and specific opportunities found therein.

Camp Host sites are located on the Forest at the two multiple-site campgrounds: Camp One (west end) and Dunlap Camp (east end). Information and camping permits can be obtained from the Camp Hosts. Currently, the only other locations where information can be obtained are from the JDSF headquarters (Fort Bragg) or the Mendocino Unit headquarters (Willits) during business hours on weekdays. Camp Hosts have been key in reducing the frequency of vandalism to campground and day-use facilities. Their physical presence acts as a deterrent, as does their routine maintenance of campground facilities.

The trail system on the Forest varies from designated self-guided interpretive trails and developed hiking trails to skid trails and logging roads (both old and new). There are four designated non-interpretive hiking trails that are located in JDSF: Camp One Loop, Trestle, Waterfall Grove, and Woods Trail. These trails are primarily limited to foot traffic travel although other non-motorized uses are not restricted. The Sherwood Trail is part of a regional trail designed for equestrian use that is not maintained by JDSF and continues into Fort Bragg across private property. Off-road vehicles also utilize these “trails” illegally.

Special Events

There are several special events that occur each year that require specific contracts for using the Forest: weekly equestrian trail rides, an annual Enduro equestrian race, and an annual Skunk Train bicycle ride.

Camp 20 Highway Stop

A large number of people utilize the Camp 20 facility as a highway rest stop, or to stop and make phone calls from the phone booth. The area has a vault toilet (installed in 2000), pay phone, picnic tables, and ample room for parking of cars and heavy trucks.

Passage Via Highway 20 and Road 408, and Other Forest Roads

Thousands of travelers pass through JDSF annually along Highway 20, County Road 408, Road 500, and Road 700. County Road 408 is often used as an alternative route when Highway 20 is blocked. The route is not well signed from Highway 20 to Mendocino (or Caspar), but this does not appear to discourage use.

Road Management

The road system serves as the main point of public contact with the forest, and also serves as the conduit for management activities, including the transportation of staff, researchers, equipment, and forest products.

Forest roads on JDSF are used for timber harvesting, forest management activities, forest protection, public access, and recreation. The current road network reflects a history of various transportation technologies and forest practices. Beginning in the 1870s, railroads were used to transport logs in some watersheds and railroad grades were located along or adjacent to streambeds. Some JDSF roads use remnants of the old railroad grades in several places.

Most of the roads on JDSF, however, were constructed from the 1950s to the 1970s. Roads constructed during this period generally included an inboard ditch and cross drains. Concentrated runoff from this type of road has been shown to be a major source of fine sediment, because the inboard ditches are often connected directly to stream channels (Wemple et al 1996). Additionally, a considerable amount of sediment originates at or near points where streams are crossed by roads and from large fill failures. Current road density averages approximately 4.9 mi/mi^2, with densities ranging from 6.7 mi/mi^2 in the James Creek planning watershed to 2.6 mi/mi^2 in the Brandon Gulch planning watershed. For all the

JDSF planning watersheds, the average amount of JDSF area covered by roads is 3.6 percent. Improvement of JDSF roads to reduce sediment yield is a priority for this management plan.

Minor Forest Products

The Department currently offers the public and private commercial interests the opportunity to purchase minor forest products, subject to specific rules and constraints. At present, permits can be purchased for collection of products including salvage sawlogs, poles, split products, greenery (e.g., boughs, shrubs, and ferns), mushrooms, and firewood. Class I sale permits are issued for the collection of these minor forest products.

Salvage Sawlogs

Logs may be purchased from the State Forest, subject to permit constraints and applicable state regulations. Payments are generally made on the basis of log volume removed from the State Forest. The purchaser is responsible for paying all applicable yield and sales taxes. The removal of salvage sawlogs requires the purchaser to be in possession of a valid timber operator's license. Prices for logs to be removed are subject to negotiation between the purchaser and the State Forest manager. All timber operations are limited by the Forest Practice Rules and constraints established by the State Forest manager. Typical State Forest constraints include provisions for clearance from watercourses, slope limitations, wet weather restrictions, and pre-location of yarding and hauling facilities. All log locations are pre-specified. No logs and wood products originating from standing snags or old-growth trees may be collected.

Firewood

Firewood permits are available from the Forest. Firewood collection permits can be purchased for personal and commercial purposes after payment of a fee. Commercial producers are responsible for payment of all applicable taxes. Firewood collection is limited to dead and down material, and does not include either old-growth material or potential conifer sawlogs. Firewood collection is limited to pre-designated areas, and is generally subject to constraints such as watercourse clearance, slope limitation, weather conditions, retention of sufficient LWD for forest structure purposes and access road designation.

Greenery

Permits to collect greenery are available to the public. Very little of this activity occurs, but a few permits are issued every year. In recent years, permits have been issued for the collection of Douglas-fir boughs, ferns, salal, and huckleberry brush. Payment varies by product, being either on a volume basis or an item basis.

Mushrooms

Mushroom collection permits may be purchased for both personal use and commercial collection. Collection volume is limited, although areas of collection are not constrained.

Poles and Split Products

Permits may be purchased for collection and manufacture of poles and split products. Old-growth material may not be collected. Payment is made on an item or volume basis, and the purchaser is responsible for payment of all applicable taxes. Typically, poles are derived from thinning of young redwood/Douglas fir stands. Very little split product is manufactured, due primarily to the restriction against collection of old-growth material. Areas near watercourses are restricted in order to retain large woody debris with specific ecological value.

Periodically, the State Forest manager establishes permit prices, volume or numerical limits, and conditions of collection for the various minor forest products collected by the public. For personal use

items, permit prices are nominal and are intended to cover the costs of administration of the permit process. Conditions of collection, collection location and collection limits (volumetric or numeric) are based upon an assessment of potential impacts that could result from the collection process and removal of the resource. Pertinent data are included in Appendix VII.

Invasive Weed Species

Aggressive plants that are not native to the area are referred to as invasive weeds. These invasive weeds can threaten biodiversity and ecosystem processes. Invasive weeds have the potential to displace native vegetation including special status plants. In addition, invasive weeds result in increases in fire hazard and road maintenance, as well as reduced conifer seedling survival and growth. Invasive plants are typically capable of very rapid invasions, in part because of the absence of natural predators or diseases in local ecosystems. Invasive weeds have become established on the State Forest during the past century, with several species becoming particularly problematic in recent decades. Some of the most common invasive plants in central Mendocino coast are jubata (Pampas) grass, broom, gorse and ivy. Several different species of broom and ivy are present on the Forest. The risk of new invasive weed species becoming established on the State Forest over the next 10 to 20 years remains very high.

No single solution currently exists for management of invasive weed species. Multiple methods have been tried both locally and throughout the region. Given the fact that invasive weeds affect most wildlands on the Mendocino Coast; cooperation across ownerships is critical to management. In the last few years a local cooperative weed management area has formed and begun to coordinate managing the invasive weeds on the Mendocino Coast. JDSF is a partner in this effort with State Parks, Mendocino Land Trust, the local California Native Plant Society and other local agencies and organizations. Sharing resources and information is making management more effective on the Mendocino Coast.

Use of Herbicides

Herbicides have been used on JDSF for control of both native and non-native species. Very little herbicide use occurred prior to the late 1980s. After that time, herbicides were periodically utilized within even-aged harvest units to control both native and non-native species that presented a significant level of competition to conifer regeneration. This treatment was generally a hand spray application of herbicide to control native hardwoods, native brush, and invasives such as French broom and Jubata grass.

Herbicides were also utilized to control and clear roadsides of invasive species, including French broom and Jubata grass. This treatment occurred primarily during the early to mid-1990s, and involved hand spraying of herbicides directly on target plants. Some native brush species, such as ceanothus were also controlled during this treatment process.

Over the past five years, usage of herbicides has been minimal. This low level is reflective of the cautious use of herbicides on the Forest, as well as the generally low level of overall management activity on the Forest during this period.

Parlin Fork Management Area

The Parlin Fork Conservation Camp houses inmates of the state correctional system. Security around the camp is needed to ensure that there is no inappropriate interaction between inmates and the public. This situation makes it difficult to conduct normal Forest management operations in proximity to the Camp without bringing Forest staff and contractors into contact with inmates.

In 1992 it was decided to delineate a 312-acre area around the Conservation Camp where the timber resource would be managed by CAL FIRE personnel and harvested with CAL FIRE equipment and crews

rather than by private logging contractors. This was made feasible by a state-operated sawmill at the Camp that operates on timber harvested from the Parlin Fork Management Area. This mill manufactures the local logs into dimensional lumber for use by state government facilities.

A long-term management plan covering silvicultural, harvesting and post-harvest activities in the Management Area was prepared by CAL FIRE staff at Parlin Fork and approved by the Department in 1992 pending its inclusion in the Jackson Demonstration State Forest management plan. The plan for the Parlin Fork Management Area calls for sustained yield management using a group selection method. The management objectives of the plan are similar to those of a non-industrial private timberland owner.

Harvesting in the Parlin Fork Management Area is exempt from the THP requirements of the Forest Practice Act because the products manufactured from the harvested timber are used by state government and are not sold. (See the definition of “timber operations” in the Act, §4527.) However, all harvesting is planned in full consideration of the potential for environmental effects, and supervised by a CAL FIRE forester to ensure that operations meet the standards of the Forest Practice Act and Rules and are consistent with the management plan for the Parlin Fork Management Area.

Heritage Resources

The term *heritage resources* is used in this management plan as a convenient term to include all forms of archaeological, historical, and other cultural resources. At JDSF these commonly occur in the form of both prehistoric and historic archaeological sites, usually containing features and/or artifacts. Many of these sites, both on an individual basis and taken as a whole, are significant under the criteria used to evaluate heritage resources. These sites can be associated with events that made a significant contribution to the broad patterns of our history. They can be associated with the lives of important persons in our past, some embody distinctive characteristics of a type, period, or method of construction, and many have the potential to yield information important to the understanding of prehistory or history (USDI National Park Service 1998). Agencies of the State of California have been directed to preserve and protect the heritage resources under their jurisdiction for the benefit and inspiration of the people of California. JDSF holds the potential to make significant contributions to the study of both the history and prehistory of this region. The importance of the prehistoric sites to living Native Americans is also an important consideration.

History of Research

The North Coast Range region has played a prominent role in the development of archaeological research in California. The rich prehistoric legacy of this area has provided substantial information towards the understanding of California's prehistory. The prehistoric archaeological sites on JDSF hold the potential to make significant contributions towards the reconstruction of the prehistory in this region. JDSF is one of the few significant publicly owned tracts of land that encompasses a large cross-section of the North Coast redwood forest belt. As such, the forest offers a unique opportunity to investigate the prehistoric utilization and lifeways within this environment by examining a variety of site types within a specific physiographic zone. The archaeological study of these resources could provide a more complete understanding of the pattern of prehistoric land use of the North Coast Range and the settlement-subsistence patterns of Native Americans.

JDSF is located within the territory of the Pomo, an ethnographic group that occupied an extensive portion of northwestern California. The Northern Pomo held the territory encompassed by JDSF and were bordered on the north by the Coast Yuki. There is a rich ethnographic record for the Pomo, but very limited material for the Coast Yuki. The major ethnographic sources relevant to JDSF have been reviewed and summarized by Levulett and Bingham (1978) and more recently by Betts (1999).

The historic utilization of the forest is more well-known, with a body of historic records to supplement the archaeological resources. Logging on the Mendocino Coast began in the 1850s with intensive cutting of redwood and tanoak near the coast. As these supplies were depleted, it became necessary to penetrate further into the interior. A system of narrow-gauge railroads was built in the latter part of the nineteenth century in order to transport the massive redwood logs to the coastal shipping points such as Caspar. A

system of main lines and spur tracks, along with trestles, work camps, fueling points, incline railways, steam donkeys, and other ancillary features was constructed over a period of many decades reaching deep into the redwood forest belt. By the 1930s the heyday of railroad logging had run its course, in part due to the increased efficiency of truck hauling. The remains of the early railroad logging system are widely distributed over the forest (Gary and Hines 1993). The history of JDSF has been summarized by Levulett and Bingham (1978). Additional studies covering JDSF history are listed by Foster and Thornton (2000).

Research at JDSF

Archaeological investigation on JDSF began in 1970 with the documentation of Three Chop Village (CA-MEN-790) by Harriette Thomsen. In 1978, a cultural resource overview was prepared for JDSF (Levulett and Bingham 1978).

During the summer of 1984, the Albion Project staff from San Jose State University conducted archaeological excavations at Three Chop Village (CA-MEN-790). Three contact-period house depressions were excavated at this Mitom Pomo site. Three cultural components were identified, the earliest interpreted as pre-Pomo, and the later two as Pomoan occupations.

The historic resources inventory prepared for JDSF by Gary and Hines (1993) documented 172 resource locations. This inventory was initially compiled through a record search at the Northwest Information Center, a review of JDSF files, oral interviews with JDSF personnel, and limited site visits. A set of maps was prepared to plot the suspected resource locations and a preliminary significance assessment was made of the visited locations.

Test excavations were conducted at Misery Whip Camp by Mark Hylkema in 1995. This small historic site contained an abundance of historic artifacts including "penny pipes", and evidence of blacksmithing. The site appears to have been associated with early logging technology utilizing oxen yarding and "splash dam" transportation to the sawmill. This may be one of the earliest logging camps on the forest, predating the railroad logging period. This archaeological study was conducted to evaluate site significance and recover information as mitigation for possible unavoidable impacts from timber operations.

A recent archaeological investigation at JDSF has resulted in the relocation and re-recording of eighteen of the twenty known prehistoric sites located within the forest (Betts 1999). These sites were documented with complete site records prepared in accordance with California Office of Historic Preservation (OHP) guidelines (CDPR 1995), and included Primary Records, Archaeological Site Records, Photographic Records, Artifact Illustrations, Site Maps, and Location Maps plotted on both the JDSF map and the appropriate USGS 7.5' quadrangle. This study included a descriptive inventory, an integrity assessment, and management recommendations for these prehistoric archaeological sites.

The reports on heritage resources that have been prepared for JDSF (Betts 1999; Gary and Hines 1993; Levulett and Bingham 1978) have outlined the major periods of prehistoric and historic occupation of the forest and include specific listings of many of the recorded sites. These studies provide the basic framework necessary for the future interpretation and evaluation of these sites.

Current Practices

CAL FIRE has developed a comprehensive heritage resource management program at JDSF to preserve and protect the resources located within the forest. A system of procedures has been implemented to prevent impacts to archaeological sites during timber harvest operations. Proposed Timber Harvesting Plans (THPs) are evaluated as per the requirements of Forest Practice Regulations for identifying, recording, and protecting heritage resources. Projects other than THPs are reviewed as prescribed by the California Environmental Quality Act (CEQA) which also includes an archaeological investigation and impact analysis. Additional heritage resource management projects that are not project-related, have been designed to meet the specific needs of the individual resource.

Project Planning and Review

Each THP prepared for JDSF includes a Confidential Archaeological Addendum (CAA). This document consists of an archaeological investigation that includes pre-field research, Native American consultation, field survey, documentation of findings, preliminary significance assessments, and site protection measures. This report is prepared either by a CAL FIRE staff archaeologist or JDSF staff forester with the required archaeological training.

Database

CAL FIRE maintains a comprehensive database of the known heritage resources located within JDSF. This information is housed at the CAL FIRE Archaeology Office in Sacramento, the Coast Cascade Regional Office in Santa Rosa, and JDSF Headquarters in Fort Bragg. This database consists of archaeological site records, survey reports, resource location base maps, and artifact collections. All archaeological reports and site records that are prepared for JDSF are submitted to the Northwest Information Center of the California Archaeological Inventory at Sonoma State University. The Information Center is consulted at five year intervals for any updated material that needs to be added to the CAL FIRE database.

A composite base map of all known heritage resource sites within JDSF is kept by the Forest Manager and the CAL FIRE Regional Archaeologist in Santa Rosa. These base maps are periodically updated to reflect new information. Access to these confidential maps is on a need-to-know basis, with site locations only being disclosed when protection measures must be implemented for a specified undertaking.

Survey Strategy

Lands within JDSF are systematically surveyed for heritage resources prior to all timber harvest operations in order to identify any heritage resources that may be impacted by project operations. Archaeological sites that are located as a result of these surveys are recorded and protected during logging operations. Although there has never been a complete survey of the entire forest, a substantial area has been surveyed for heritage resources, mostly during review of individual project undertakings. These surveys are conducted by a CAL FIRE staff archaeologist, JDSF personnel with CAL FIRE archaeological training, or a consulting archaeologist.

Protection Practices

All significant heritage resource sites identified as a result of project planning are protected. Where possible, resources are protected by altering projects to avoid impacts on the resource. Additional site protection practices that are commonly employed during timber harvesting operations include the establishment of equipment exclusion zones, directional felling of trees away from sites, reuse of facilities with no modification, use of rubber tired equipment, and monitoring of operations by personnel with archaeological expertise.

JDSF contains an extensive network of historic-era railroad grades and their associated structural remains such as trestles. These railroad trestles are protected from management activity, but are not maintained. The railroad grades themselves are not protected unless a portion of the grade demonstrates some unusual feature. Many of these railroad grades have been converted to roads in the past.

There are two standing historic buildings on JDSF. The "Little Redwood Schoolhouse" located at Camp 20 is approximately 80 years old and was moved by railroad between logging camps by the Caspar Lumber Company. The "Cat Barn" is a structure located at Camp 20 that was built in 1940 by the Caspar Lumber Company for repair of equipment. This building has sustained considerable deterioration. Based on an evaluation conducted in 1989, it was determined that maintenance or restoration would not be feasible.

Among the remnants of early logging operations at JDSF are two steam donkeys and a locomotive. One of the donkey engines has been partially restored to protect it from further deterioration and is on display at the Camp 20 Recreation Area. The second donkey engine is on loan to the Roots of Motive Power at the Mendocino County Museum grounds in Willits. This engine has been restored to operational condition and is on public display. "Daisy", one of the original steam locomotives used by the Caspar Lumber Company, has been partially restored by the Parlin Conservation Camp, and is on loan to the City of Fort Bragg where it is also on public display.

Research-oriented test excavations have been carried out at two sites on the forest, Three Chop Village (Layton 1990) and Misery Whip Camp (Hylkema 1995).

Data and Information Management

As a research and demonstration forest, JDSF has a large number of different data sets from various research projects. Most of these legacy data are stored separately in flat files. As part of ongoing management of the Forest, there are also several operational data sets, including GIS data layers, continuous forest inventories, intensive forest inventories, and other resources data, including wildlife and stream surveys.

Most data are accessible, but may require custom software for processing. JDSF is currently building a state-of-the-art information system to integrate all survey data on the Forest into a database management system, the State Forest Data Bank. Future resource data will be integrated using a common format. The enhanced access to data will benefit managers, researchers and the public. Access to publications is currently available on www.demoforests.net. This web site is being updated with materials from JDSF and is the first phase of the data bank.

Property Configuration

Jackson Demonstration State Forest is a nearly contiguous ownership. There is only one outholding, an area of about 800 acres located in the southwest portion of the Forest. All but one of the several inholdings are in the western half of the property. These are held by private non-industrial owners and include both agricultural and rural residential uses. Most of the western inholdings are in the southwestern corner, between County Roads 408 and 409. The one inholding at the east end of the Forest is a 160-acre parcel owned by Coastal Ridges LLC.

Staffing and Budget

Staffing:

The level of staffing (as measured in personnel-years, or PY) to manage JDSF has been augmented recently to reflect recognized needs.

General Duties	Classification
State Forest Manager	Deputy Chief
Research, Demonstration & Education Program	Forester II
	Forester I
	Forestry Assistant II
Timber Management Program	Forester II
	Forester I (3 PY)
	Forestry Assistant II
Administration, Recreation Program	Forester II

Wildlife Biologist	Senior Biologist Specialist
Road Program	Forester I
Geology	Engineering Geologist, CGS (1/2 PY)
Clerical	Office Assistant
	Account Clerk (1/2 PY)
Road Maintenance	Heavy Fire Equipment Operator (2 PY)
Geographic Information System	Research Program Specialist II
Law Enforcement and Fire Prevention	Fire Captain Specialist
Seasonal work, misc.	Aide, Annuitant (2.5 PY)

Budget:

Personnel Budget

The annual budget for fiscal year 2008-2009 to support personnel on JDSF is approximately $1.9 million. This figure includes approximately $123,000 to support seasonal employees.

Operating Budget

The State Forest was allocated approximately $300,000 for the current fiscal year (2007/08) to fund basic Forest operations.

Research, Demonstration, and Monitoring Funds

JDSF shares available funds with the other state forests for purposes of financing grants for research and demonstration and to conduct monitoring projects. The available funds for FY 07/08 include $175,000 for purposes of research and demonstration projects and conduct of monitoring activities within the State Forest system.

Regional Economic Role of Jackson Demonstration State Forest

For additional information on the economic role of JDSF, please see section III of the 2005 DEIR.

Introduction

The large forest industry holdings in the redwood region represent much of the unfragmented areas of natural vegetation in a region with limited federal forestlands. The many smaller non-industrial forest land ownerships cover nearly as much area as the industrial holdings and account for most of the forest land that could be relatively easily converted to agricultural or residential uses. Many of the larger lots within rural residential areas and on the outskirts of denser residential and commercial areas also provide considerable tree cover and wildlife habitat, even if the forest habitats are fragmented. All of these forests provide unique open space values and recreational opportunities between the rugged coastline and the drier interior valleys and mixed forests and rangelands.

From an employment perspective, forest management and related employment provide a substantial proportion of the better paying jobs available outside of the cities on the North Coast. The remaining sawmills and wood remanufacturing plants still make up a significant component of the regional manufacturing base. In addition to the direct employment created by these manufacturing jobs, the businesses also generate demand for many locally produced goods and services. Employment related to recreational activities on the state forest are part of the larger and diverse tourism and outdoor

recreational industries that are based on a mix of coastal, inland, and urban-based activities. Compared to the Wine Country, San Francisco Bay Area, and the Tahoe Basin, there are many opportunities on JDSF to increase recreational use by improving recreational infrastructure such as signs, trails, benches, and special use trails that can co-exist with the ongoing forest management.

As the region completes a transition from an area dominated by an old-growth based forest industry to a more diversified economy and a new set of social and economic opportunities, it is worthwhile to identify the larger local and regional framework within which a demonstration state forest operates.

The legislated intent for Jackson Demonstration State Forest showed the importance of managing young-growth forests, long before the harvest of young-growth trees surpassed that of old-growth, during the 1980s. Public Resources Code section 4631 states:

> It is hereby declared to be in the interest of the welfare of the people of this state and their industries and other activities involving the use of wood, lumber, poles, piling, and other forest products, that desirable cutover forest lands, including those having young and old timber growth, be made fully productive and that the holding and reforestation of such lands is a necessary measure predicated on waning supplies of original old-growth timber.

More recently, the California Timberland Productivity Act of 1982 (Public Resources Code § 51102) establishes one of its goals to "discourage premature and unnecessary conversion of timberlands to urban and other uses."

Non-industrial timberland owners manage approximately half of the private forestland in the North Coast region (Table 5). Nearly all of these forests were initially harvested decades ago and have been regenerated. Unlike the industrial timberland owners who have permanent staff to manage the land and may have strong financial interests in related sawmills, remanufacturing plants, and wholesale timber businesses, many of the non-industrial forest land owners are less dependent upon long term forest management, and are not very knowledgeable in the complexities of managing forests. The demonstration mandate of the state forests includes demonstration of the long-term physical and financial viability of managing young forests. If the values of long-term forest management are not demonstrated to owners of small to mid-sized forest tracts, there is greater potential for these lands to be converted to other uses, and the economic, social, and environmental impacts of expanding forest fragmentation could be magnified across the region.

Table 5. Inventory Characteristics of Private Timberlands of the North Coast and JDSF

Variable	Non-Industrial Private Forests (NIPF)	Industrial Timberlands	Total Private Timberlands	Jackson Demonstration State Forest
Timberland Acres	1,336,000	1,402,000	2,738,000	48,652
Total Inventory per acre (thousand cubic feet/acre)	3.45	3.69	3.58	7.22
Conifer Inventory per acre (thousand cubic feet /acre)	1.97	2.68	2.33	6.77
Hardwood Inventory per acre (thousand cubic feet /acre)	1.49	1.01	1.24	0.45
Conifer as Percent of Total	57%	73%	65%	94%
Sources: Timber Resource Statistics for the North Coast, 1994, Waddell and Bassett and JDSF.				

Table 5 provides a detailed description of the industrial and non-industrial private forest (NIPF) owners of the North Coast, in terms of some of the basic characteristics of timberland inventories from the last full evaluation of private timberlands in the region. Non-industrial timberlands have lower total per-acre inventories (3.45 versus 3.69 thousand cubic feet/acre) and overall forest growth rates (2.7% versus 3.6%) than industrial timberlands (Waddell and Bassett 1994). Additionally, a consistent pattern across

the region is that NIPF owners' lands have higher stocking rates of hardwoods (1.49 versus 1.01 thousand cubic feet/acre) and lower stocking rates of softwoods (1.97 versus 2.68 thousand cubic feet/acre). Demonstrations on how to improve the long term productivity of these timberlands, especially where high hardwood inventories exist, is one of the most common requests of private landowners and consulting foresters in the region. In addition to increasing the overall financial profitability of forestlands, an increase in conifer forest components would improve fish and wildlife habitats for many species.

Sustained Yield Timber Production on JDSF

Forest growth has greatly exceeded forest harvest levels during state ownership of JDSF, resulting in today's high stocking levels. Figure 1 shows the harvest levels on JDSF from 1948 to present.

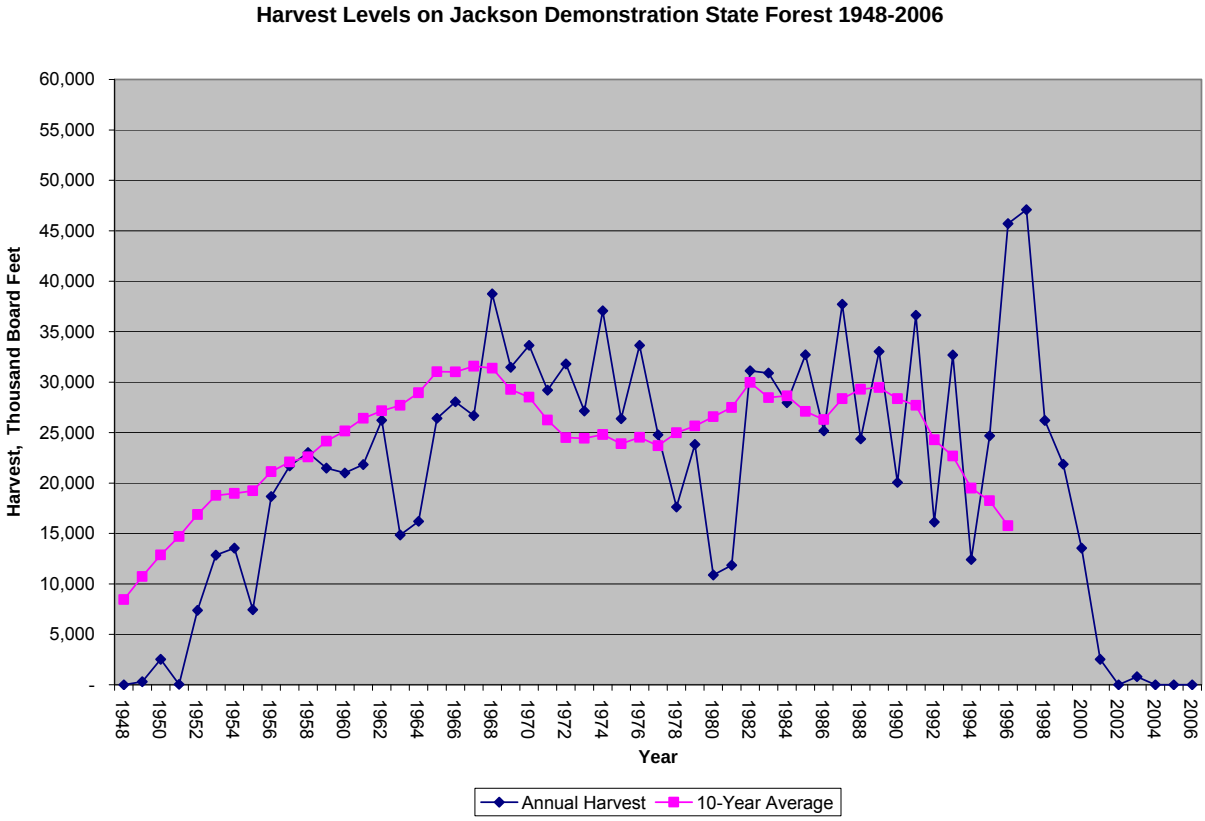


Figure 1. JDSF Timber Harvest since 1948.

The average annual harvest levels during the next decade are expected to be about 20-25 million board feet per year, and shall not exceed 35 MMBF per year. With an estimated current annual growth of around 65 million board feet per year across the Forest, historic and projected harvest levels represent less than half the total annual growth increment, or about one percent of inventory on an annual basis.

Growth and yield projections presented in detail elsewhere demonstrate that much higher levels of sustainable production are possible. Future harvest levels are heavily dependent on research and demonstration goals to be achieved using a wide variety of management techniques. Across roughly one third of the forest, the goals call for maintaining older forest structure for wildlife habitat, recreation, and other purposes–many of which maintain high inventory levels and/or limit harvests.

Timber Related Employment and Taxes

Local economies can grow and prosper when they have strong basic economic sectors that can produce and sell goods and services to outside markets. Timber, agricultural products, manufactured goods, and tourism are all examples of goods and services that bring revenue into the region. When these revenues are expended locally as wages or business purchases, they support a much larger number of local service jobs, both private and governmental. Retirees and other new residents bring investments and retirement funds from outside of the local area which help to support additional local jobs. The challenge of any regional economy is to have a diversified range of basic sectors to balance out cyclical changes.

Local jobs that involve commodities or services that are sold outside of the county or region have added benefits that flow from the fact that workers and the businesses that employ them spend most of their wages and a considerable fraction of business purchases locally. This generates additional local employment. The California Spotted Owl Report (CASPO) report (Ruth and Standiford 1994) estimated that there was one indirect job for every regional timber job in the Sierra Nevada. The FEMAT report, covering the region of the Northern Spotted Owl in California, Oregon, and Washington estimated 1.1 indirect jobs for every direct timber job. Stewart (1993) estimated 0.85 indirect jobs for every direct timber job based on county data before 1992. The huge loss of timber jobs is related to the protection and management of the northern spotted owl and the Federal Government's Northwest Forest Plan (60,000 jobs in Oregon alone). Unfortunately this change provided a massive test of the economic model estimates of the direct to indirect job relationship from a reduction in direct timber employment. The general conclusion was that every job lost in the timber industry would jeopardize approximately one additional job in other industries. (ECONorthwest, The Economic Impacts of the Proposed Siskiyou Wild Rivers National Monument, June 28, 2000. http://www.econw.com/pdf/siskiyouNM.pdf).

As indicated in the 2005 DEIR, each tourism type job pays only about 62% of the annual wages of a timber industry job. Therefore, approximately 1.6 new tourism industry jobs would be required to replace the loss of each timber industry job to maintain a balanced economic impact within the region. While such a shift would balance regional economics in a gross sense, many of the affected individual timber workers would face a reduction in personal income.

For predicting employment changes related to changing levels of harvest output from Jackson Demonstration State Forest, or other timberlands in Mendocino County, a conservative ratio of 8 direct workers per million board feet of harvest was used rather than the much higher jobs/MMBF ratios experienced in Mendocino since 2000, as documented in the DEIR. The total of 8 direct jobs per million board feet of harvest is based on 7 workers per MMBF in sawmills and related wood remanufacturing plants and 1 worker per MMBF working in the logging, log transport, and reforestation sectors.

Table III.13 in the 2005 DEIR (page III-55) presents a range of employment, regional income, and local tax estimates that would correspond to various levels of annual timber harvest. In addition to the benefits to local workers and local government revenue, increased economic output from the state forest supports other local business revenues. It also provides the funds necessary to continue to upgrade the road system to reduce sediment and peak water flow runoff, maintain research programs, fund the extension and outreach program, and improve recreational facilities. In simple terms, every change of 10 million board feet of annual harvest is related to 160 jobs, $4.3 million in local wages, and $184,000 in local taxes.

Along with state parks in the region, JDSF provides areas for visitors and residents to enjoy a range of outdoor activities that are a key piece of the attractions to the coast-based recreation and travel industry. Compared to the numerous state parks in central Mendocino, the larger state forest has fewer developed facilities and scenic landscapes than the nearby state parks, but provides a greater array of opportunities for activities that may not fit well within the smaller state parks such as mountain bike riding, horse riding, hunting, dog walking, and the collection of forest products such as mushrooms and ferns. Since JDSF collects few fees for these activities and most of the activities are rarely the sole reason for visitors it is hard to place an economic value on the estimated 60,000 recreational user days per year. A rough estimate of how much users would pay for similar experiences can be made by using a $5/visit fee estimate that is not uncommon for higher use metropolitan wildland parks. This leads to an estimate of an

annual value of around $300,000 per year that accrues to the recreational visitors. Most economic assessments of wildland recreation conclude that these users, especially when they are from outside of the local area, spend far more than the actual or estimated entrance value on food, lodging, recreational equipment, and rentals.

Current recreational opportunities on Jackson Demonstration State Forest do not appear to be directly tied in a positive or negative manner to harvest levels since the harvest units are scattered across the forest and are only closed for a limited period of time. In the short term, recreational use will move when seasonally limited to permit the safe use of harvesting and reforestation equipment. The ability of JDSF to maintain recreational infrastructure such as roads, trails, and trash removal is reduced when reductions in timber revenue force decreases in personnel working on the Forest. In the longer term, a combination of JDSF staff resources, internally generated funds, external grants, and partnerships with local recreation use organizations will drive the design, development, and economic benefits of new recreational opportunities on the forest.

Research and Demonstration

Research and demonstration are primary elements of the mission for JDSF established by the State Board of Forestry and Fire protection. The research and demonstration projects carried out by CAL FIRE are funded by the net receipts from the timber harvests and represent a significant reinvestment into the Forest. The overall purpose is to demonstrate how forest landowners (especially non-industrial owners who typically under-invest in forest management and lack economies of scale in environmental assessments and harvesting costs) can improve the overall condition of forest management. Effective research and demonstration requires areas with a wide range of effectively monitored practices that are maintained over the life of the projects.

It is important to distinguish between the general management prescriptions for the State Forest and silvicultural prescriptions that are part of specific research studies. For example, the collaborative Caspar Creek watershed study between CAL FIRE and the USDA Forest Service was designed in part to investigate the effect of clearcutting on soil erosion, sediment production and water flow. This study has provided valuable insights into the environmental effects of different patterns of road building and harvest, but it should not be interpreted as representative of operational management on the Forest.

Chapter 3. Desired Future Conditions and Planned Management

Introduction

The desired future conditions for JDSF evolve out of the Goals and Objectives presented in Chapter 1. The Goals and Objectives call for a management focus of research and demonstration (Goal #1), built on a foundation of forest restoration (Goal #2), and promotion of watershed and ecological processes (Goal #3). Timber management (Goal #4) is one of the key means to achieving the first three goals. For example, research and demonstration on timber management is an explicit requirement of the Public Resources Code establishing the Demonstration State Forests (PRC §4631), while at the same time it is an important tool for more quickly achieving the development of desired older forest structure and developing a wide range of forest stand conditions that provide a wide range of research opportunities at the same time as offering a diverse range of wildlife habitat. This chapter also addresses future conditions and planned management measures for recreation and aesthetic enjoyment goal of the Forest (Goal #5), which is very important to a broad range of the public. Also addressed here are desired conditions and the management for information planning and staffing (Goal #6); forest protection (Goal #7); minor forest products (Goal #8); and property configuration (Goal # 9).

This chapter discusses at length the desired forest conditions for JDSF that evolve out of the Goals and Objectives, as well as the body of statues and Board policies that underlay the Goals and Objectives. The chapter presents the specific desired future conditions and the measures that will be applied to achieve them. Some of these are very broad (e.g., ecosystem management approach) others are very specific (e.g., hillslope stability and assessment techniques), while others are in between (e.g., forest structure goals).

Also included in this chapter are the details of an initial implementation period for the Plan. The intent of the initial implementation period standards is to provide the Board and the Department an opportunity to obtain detailed input on the plan, and allow for consensus recommendations on potentially controversial management issues. The initial implementation period will last for a maximum of three years. A set of initial implementation period harvest limitations has been established, and is expected to remain in place for a one- to three-year period, while advisory bodies consider the JDSF management plan and make recommendations to the Department and the Board for possible modifications of the management plan, including forest structure goals and usage of silvicultural systems such as even-aged and uneven-aged management (including forms and amounts). With respect to even-aged management in particular, decisions on stand structure for future unspecified research projects will be developed by JDSF staff in cooperation with researchers, DSFAG, and when functioning, the new Jackson Demonstration State Forest advisory body.

Table 9, below provides the short-term harvest schedule and reflects the initial implementation period harvest limitations. This table identifies the harvests most likely to proceed during the first five to ten years of plan implementation. For various reasons, some of these harvests may be altered (e.g., in size or silviculture) from descriptions, or may not occur. Other harvests not on the list could be developed and implemented.

This chapter provides critical direction for how the Forest will be managed and will be a central source of general and specific guidance. Additional critical management direction is found in Appendix IX, which compiles the mitigations that the 2005 DEIR and 2007 DEIR identified as being needed to address potential significant environmental impacts, as well as the Additional Management Measures that were developed during the EIR process and this plan's development. Chapter 5, Monitoring and Adaptive Management, is an important complement to the current chapter, since it outlines how forest management outcomes are monitored, compared to desired outcomes, and how management will be modified if the desired outcomes are not being achieved.

JDSF's Ecosystem Management Approach

Management of forest resources on JDSF for long-term environmental and economic sustainability is accomplished under an ecosystem management framework. Ecosystem management is driven by explicitly formulated goals and it is made adaptable by incorporating feedback from monitoring and research to improve understanding of the processes and interactions necessary to sustain ecosystem composition, structure, and function (Christensen et al 1996).

The ecosystem management process used to develop the JDSF Management Plan incorporates concepts of both input and output management (Montgomery 1995). An understanding of how land use activities affect natural processes (e.g., mass wasting, surface erosion, routing of sediment and water, tree mortality and blowdown) and inputs to terrestrial and aquatic ecosystems (e.g., the flow of energy, nutrients, large woody debris, sediment, and water from hillslope areas to the stream) is critical to developing a *preventative* (or input-oriented) management strategy to avoid significant adverse impacts before they occur. Such an understanding is also critical to predicting the output of valuable resources (e.g., fish, wildlife, habitat, timber and aesthetic values) from these ecosystems. Because ecosystems are complex, our understanding of these systems will never be complete. To help correct for this, a monitoring and adaptive management feedback loop is critical to facilitate a more *reactive* (or output-oriented) management strategy to recognize and mitigate for adverse impacts where they have the potential to occur. Chapter 5, Monitoring and Adaptive Management, describes the application of this process on JDSF.

The application of natural disturbance type replications will be considered during development of silvicultural prescriptions for individual stand management. Mitchell et al. (2003) provide the following three guidelines.

- Incorporating the concept of legacies into harvesting prescriptions, such as:
  Structural legacies (e.g., trees, snags, logs, and uproots);
  Compositional legacies (e.g., seed and seedling banks, trees, shrubs, and herbs representing different species or functional capabilities);
  Physical legacies (e.g. mineral soil seedbeds or opening sizes);

- Incorporating natural stand development processes, including small-scale disturbances, into silvicultural treatments of established stands, such as variability density thinning, decadence creation, and prescribed burning.

- Allowing for appropriate recovery periods between regeneration harvests whether in stand, gap, or individual tree replacement forest types.

Habitat Connectivity and Fragmentation

Geographical differences in species response to habitat loss and fragmentation (the process of reducing size and connectivity of stands that compose a forest and leading to population subdivision) and influence on ecosystem function are relatively recent findings. Uncertainty exists concerning differences in species response to disturbance regimes. For example, it is not well known whether forest types that have developed with infrequent disturbance events (e.g., fire, insect or disease damage) have a different response to fragmentation than other forest types. In addition, it is not well known whether spatial arrangement of habitat is less important than total amount. Examining the concept of habitat fragmentation, connectivity, and edge effects as a product of forest management in the redwood forest type is a research and demonstration topic particularly well suited to Jackson Demonstration State Forest.

Connectivity is a species-specific habitat characteristic that exists when individuals of a species can move freely among patches of habitat and for greater distances than if that habitat characteristic were not present. Wildlife managers currently hypothesize that connectivity across patches of habitat reduces the likelihood of local extinction and maintains biological diversity (species richness) when the intervening area (the matrix) is hostile to both survival and movement. Connectivity may be maintained by retaining

habitat in corridors similar to that of the patches they connect or by maintaining habitat quality suitable for movement in the intervening matrix. Little empirical evidence currently exists to support or refute the concept of corridors in forested environments and is an additional area of potential research and demonstration at JDSF. Maintaining connectivity within the matrix is likely an equally challenging prospect but may have the advantage of less operational difficulty and reduced costs (Bunnell 1999). Assessment of the benefits of landscape connectivity requires information on species movement, response to patch structure, gap crossing ability and dispersal distance. Basic information such as this is generally unavailable for most vertebrate species and is also a research priority.

Efforts to maintain the entire array of biological diversity as it is currently known on JDSF will include a blend of even and uneven-aged management, long rotations and reserves, and the maintenance as well as creation of older forest structure and late seral forest attributes in managed stands. Providing habitat for those species that associate with early-seral stages of forest development is not currently a land management or resource allocation challenge. Given the legacy of historic management practices, the maintenance and development of habitat for those species associated with late seral or old-growth forest conditions and habitat elements requires the greatest level of attention and management creativity at this time. A range of forest habitat conditions from existing old-growth groves to openings dominated by grasses, shrubs and small trees to mature forests with larger trees, snags and down logs, and a diversity of tree sizes will be maintained across the forest. This broad range of conditions will serve both habitat diversity and the need for a diversity of stand conditions to meet the needs of researchers.

This plan will implement two major efforts in habitat connectivity. The first will utilize riparian buffers, managed for the development of late seral forest, which are well distributed throughout the forest. We hypothesize that this will allow aquatic and some upland species to successfully disperse and take advantage of existing or new high quality habitat. The second approach is to link reserve and high quality habitat areas with viable corridors. Specifically, we will link old-growth groves and late seral development areas with a corridor of older forest structure, creating a 6,803-acre Older Forest Structure Zone (OFSZ). Additionally, a late seral development area managed to create murrelet habitat will be linked to the Mendocino Woodlands special treatment area, the Woodlands and Big River state park areas, and Russian Gulch State Park. These corridors will encompass an east-west and north-south gradient. Hilty, et al. (Hilty, Lidicker Jr. et al. 2006) provide guidelines for identifying, prioritizing and assessing corridors. Corridor designation is based on already identified habitat to be linked, which is based on current conditions and species of concern habitat requirements. The assessment of the efficacy of the corridors will be done by researchers over time. Guidelines for consideration of indicator taxa are provided by the authors in Table 6.

Scales of Landscape Planning

JDSF does not utilize a single approach to management, but rather applies landscape planning concepts at varying scales depending on each individual management situation. Managing the forest to produce a variety of forest stand types in a landscape context will produce a variety of benefits including the maintenance of biological diversity, management options, and research and demonstration opportunity. The following discussion, along with Table 6, provides an overview of some of the issues that are addressed in management planning at JDSF, at different scales of application. They are described individually in more detail later in this chapter and in Chapters 4 and 5.

TABLE 6. JDSF Biotic Resource Considerations at Various Scales of Landscape Planning.

Considerations	Region	Landscape/ Forest-Wide	Watershed	Stand	Species
Contribution to populations goals for T&E and Sensitive Species	X	X			
Structural Objectives (including representation of forest succession)		X	X	X	
Patch Size Distribution		X			
Unique Habitats		X	X		
Desired Watershed Stand Structures		X	X		
Riparian Management Strategies (including transportation system)		X	X	X	
Placement of Patch and Stand Structure Types			X		
Isolated Stands			X		
Adjacent Land Uses and Adjacent Watershed Patch Location			X	X	
Edge Extent			X		
Connectivity between Patches		X	X		
Patch Relationships between Aquatic and Upland Management Units			X		
Location of Replacement Stands/Patches		X	X		
Current Stand Condition				X	
Timber Harvesting Plans and Operation Specific Decisions		X	X	X	
Species Activity Sites (osprey nest sites, etc.)				X	X
Structural Components (down wood, layered canopy, snag objectives)			X	X	
Within-Stand Diversity (including hardwood & understory, etc.)				X	X
Species Composition				X	X
Survey Requirements					X
Invasive Weed Species Control	X	X	X	X	X
Species Specific Habitat Management				X	X

Forest level:

- Manage for a range of stand conditions at the landscape scale.
- Consider the existing landscape in terms of pattern (juxtaposition) composition (patch size, patch area), continuity (e.g. corridors), and possible influence on species movement and habitat requirements.
- Consistent with other management objectives manage forest stands toward late seral or old-growth conditions in those areas showing the greatest likelihood of attaining that condition or where existing late seral or old-growth associated values can be maximized.

Watershed Level:

- Forest stands will be selected for management after considering the spatial context of the vegetation polygon of which they are a part.
- Manage for a range of habitat patch types, sizes and juxtaposition.
- Develop over time a late seral forest component to conserve and restore late seral and old-growth forests and associated ecosystem processes. This will be composed of existing old-growth groves, old-growth tree aggregations, management areas identified for the development of late seral and older forest conditions and WLPZs.

Stand Level:

- Use thinning and selection prescriptions to create a range of stand stocking levels, vertical structural diversity, and horizontal diversity among neighboring stands. Employ thinning and partial cutting prescriptions to create or maintain important structural elements such as snags, down wood, canopy gaps, shrub understory, and multiple crown layers.
- Special habitat element (i.e., snags and down logs) occurrence, recruitment, and protection opportunities will be determined during development of silvicultural prescriptions.
- Provide for hardwood species in sufficient quantity and quality to maintain mast production and special habitat elements.
- Retain important stand components most at risk or difficult to replace. These components include individual trees showing uncommon evidence of wildlife use or old-growth trees with specific characteristics.
- Talus slopes, springs and seeps as well as other habitat elements of geologic origin will be identified and overstory canopy retained to protect microclimate and physical features.
- Where it is not a threat to public safety or forest infrastructure, retain non-catastrophic tree mortality and down wood within late seral development areas, Older Forest Structure Zone, WLPZs, or adjacent (within 100 feet) to old-growth groves. Recruit and/or retain snags and down logs to meet forest-wide target levels.
- Retain all dead and down wood within the WLPZ where it is not a threat to habitat value or forest infrastructure.
- Employ fire management techniques during prescribed burning to protect habitat elements where feasible.

Species Level:

- Conduct surveys for listed species.
- Protect listed species' nest sites and other areas of significance as described in species accounts.
- Maintain and promote habitat conditions suitable to meet species of concern habitat requisites.

Desired Future Forest Structure Conditions

An integral part of the sustainable forestry program of management on JDSF is to achieve a deliberate balance of successional stages on the Forest, from very young to late seral stands and old-growth stands, at all times. The major purpose of the forest structure condition goals is to provide forest stand conditions and management histories in the Forest suitable to a wide range of research investigations and demonstration opportunities, as well as a broad range of different habitats. A substantial portion of JDSF is dedicated to the development, maintenance and study of mature older forest. At the same time, the Forest needs to maintain sufficient cohorts of younger stand structures to stay relevant to its research and demonstration clientele of small and medium size private landowners, whose lands are typically dominated by early and mid-seral stands.

Table 7 represents the desired future forest conditions that will be developed on JDSF. Over time, this plan will develop and maintain a wide range of forest conditions, age classes, and seral stages available for future research and demonstration. A broad range of management practices and forest management methods, from preservation to intensive forest management, will be utilized, including even-aged and uneven-aged methods. The percentages in the table are expressed as a range rather than absolute amounts, in order to allow for forest stand dynamics including inherently unpredictable natural events such as fire, and logistical and practical uncertainties associated with planning management of a large forest property over a long period of time. The general forest will be managed to develop and maintain maximum sustained yield of high quality products.

Table 7. Desired Future Forest Structure Conditions.

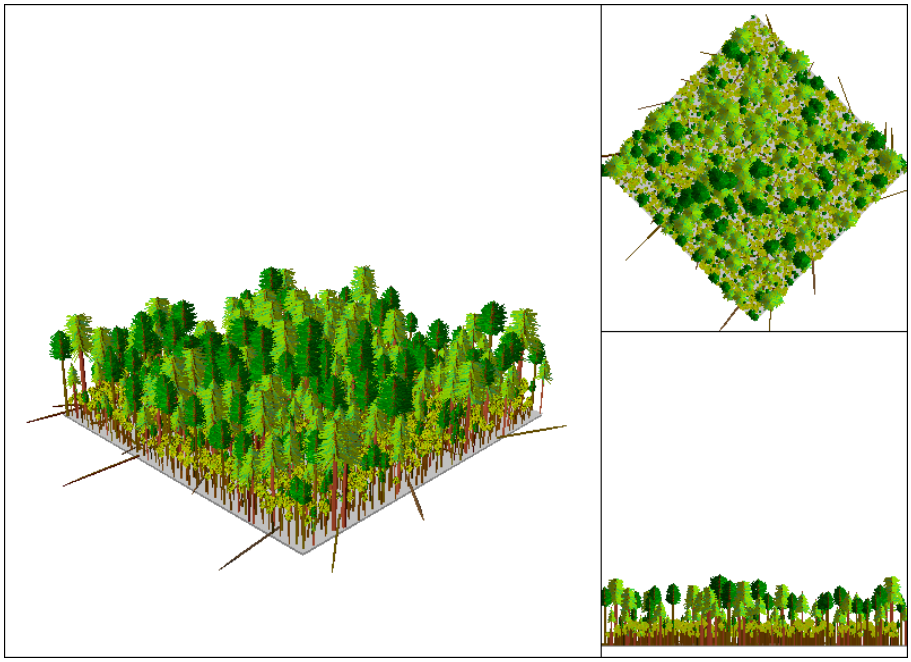
Forest Structure Condition	Percent of Forest Acres
Late seral or old-growth	15-25
Older forest structure	10-20
Mature and large trees	5-15
Mixed age and size	30-40
Regeneration and pole-size younger trees	10-20
No specific structure assigned	0-10

These forest structure conditions will be cultivated through a variety of silvicultural methods, both even-aged and uneven-aged. The stages of regeneration up through late seral can have significant cohorts of different ages and sizes of trees within the stand. The overall appearance and makeup of a stand is what categorizes it into one of the forest structure condition classes above.

One goal of management on JDSF is to maintain the relative proportions of forest structure conditions or successional stages over time. The exception is old-growth stands which will not be harvested. Management may consist of either passive (i.e., foregoing harvest) or active management (typically thinnings) to allow young stands to mature into later successional classes in order to balance the distribution of successional classes to the percentages in the table above. Management to balance the acreages of successional stages across the Forest may also consist of harvesting sufficiently many trees in a stand to reset it to an earlier successional stage. This approach can entail harvesting a sufficient number of trees in a mature stand to reset it to regeneration.

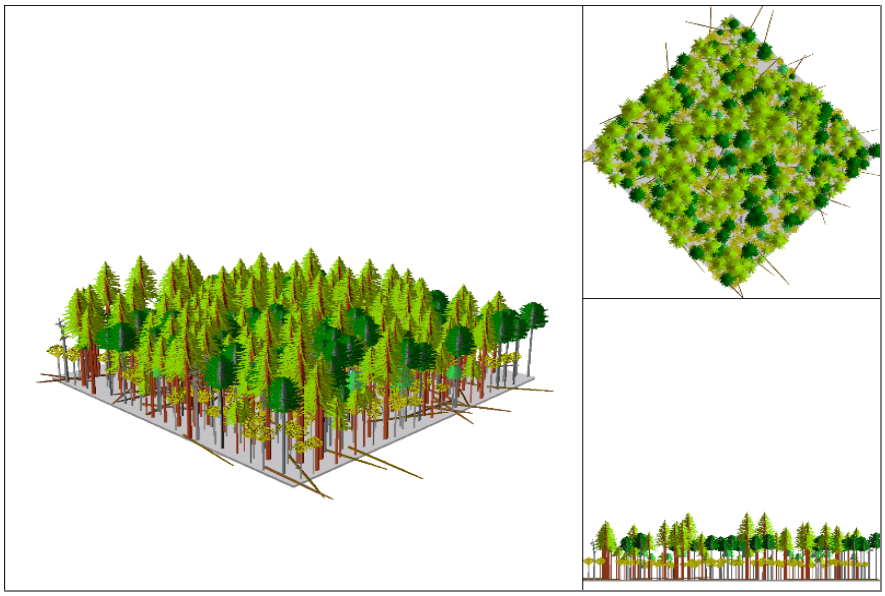
The following graphics are visual examples of actual forest stands on JDSF representative of each of the planned forest structure conditions in Table 7:

Late Seral:



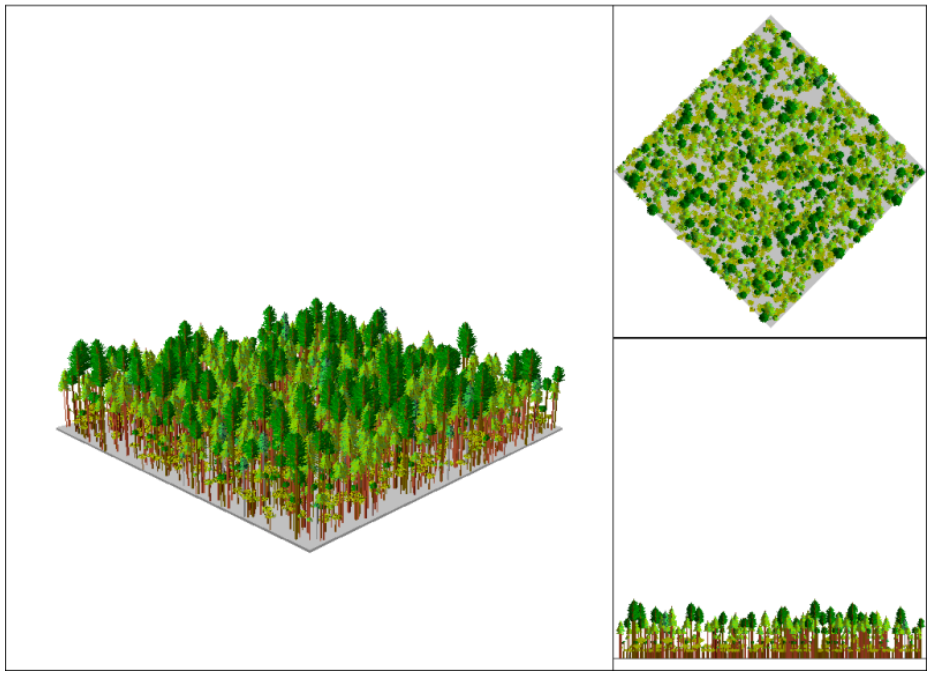
Late seral stands are dominated by large trees and have multiple canopy layers, relatively few trees per acre, and substantial amounts of large, down wood.

Older Forest Structure:



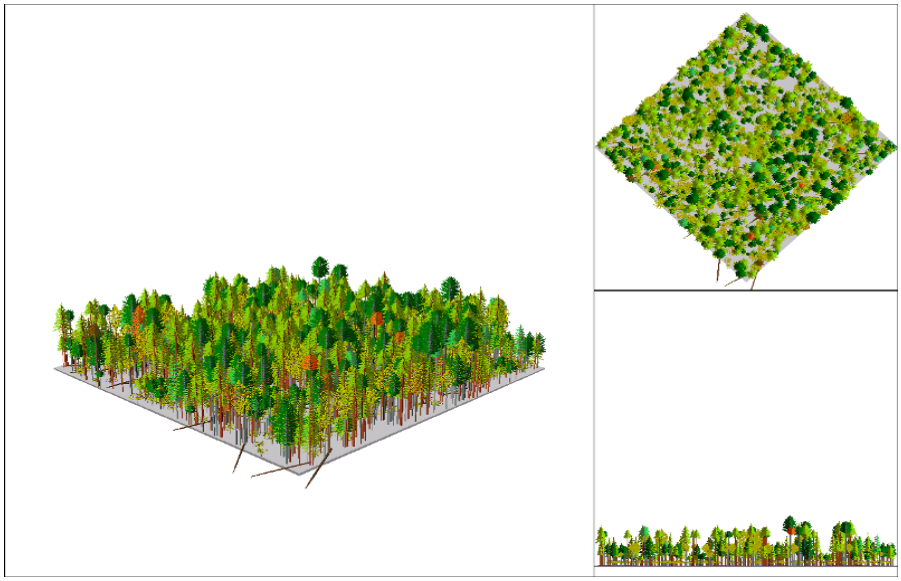
Older forest structure, relative to late seral forest, has more trees per acre but still retains multiple canopy layers and substantial numbers of large trees, snags, and downed woody material.

Mature and Large Trees:



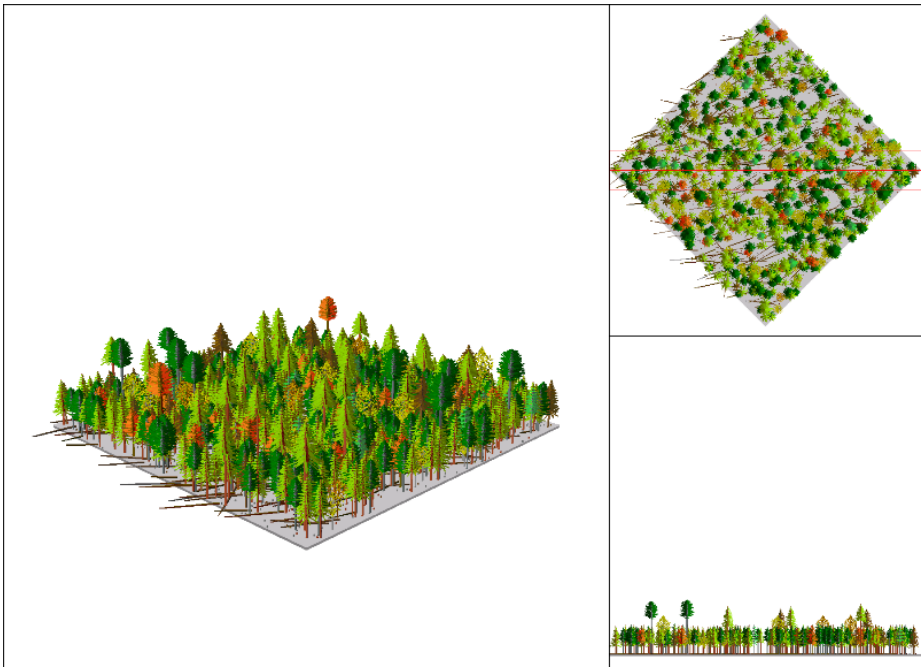
With the mature and large trees stand structure, we still have multiple canopy layers, but there is now a somewhat more open stand structure. There is a clear presence of gaps in the upper canopy that are occupied by clusters of smaller trees. As compared to the previous structure classes, the mature and large tree stands have fewer snags and less large, down wood.

Mixed Age and Size:



The mixed age and size stands have a wide range of tree sizes and ages and a larger number of trees per acre than the previous classes. As in the mature and large trees structure class, this structure class also has gaps in the upper canopy, which provide space for thick clusters of regeneration below. There are only moderate amounts of snags and down woody debris present in these stands.

Regeneration and Pole-size Younger Trees:



In the regeneration and pole-size younger tree structure class, there is greatly increased homogeneity of tree sizes. There are some dominant trees, but mostly lower canopy co-dominants. This structure class has the smallest average tree size and the highest number of trees per acre.

Structural Conditions Related to Late Seral, Watercourse and Lake Protection Zone Areas, and Older Forest Structure Zone Area

A significant component of stand management across the forest will be directed toward the creation and maintenance of interconnected older forest structure and older forest habitat. The principal areas within which this will occur are the existing old-growth groves, late seral development areas [including the watercourse and lake protection zones (WLPZs)], and the older forest structure zone (OFSZ) (see Map Figure 5). Each of these areas is organized around the geographic concept that larger units will be more effective than a collection of smaller units that are not connected. The late seral development areas and OFSZ are large contiguous areas designed in large part to provide core areas for wildlife species that prefer unfragmented areas with large trees in the overstory. These areas also have high research and recreation values.

Nearly all of the areas designated for late seral development currently are (1) immediately adjacent to core areas such as old-growth groves, State Parks, or Class I and II streams WLPZs, (2) dominated by stands with high California Wildlife Habitat Relationship (CWHR) ratings, and (3) will be managed to accelerate the development of larger trees or other older forest structures. The WLPZs are a hydrologically linked system that extends from low gradient reaches near the ocean all the way up to intermittent streams in the upper reaches of the watershed. The WLPZ goes through all stand types and management is primarily driven by evolving regulatory requirements as well as research and demonstration projects specifically designed to address riparian forest conditions. Older forests with larger trees and late seral structural characteristics will provide both high levels of canopy to maintain moister, cooler microclimates as well as provide the potential recruitment of large trees that could

eventually enter the stream systems and provide some of the in-stream structure that is critical to salmonid species.

A contiguous 6,803-acre corridor will be managed as an Older Forest Structure Zone, extending across JDSF from west to east and north to south (Map Figure 5), composed primarily of reserved Old-growth Groves, Late Seral Development Areas, and older forest development areas. This area will produce structural characteristics of older forest, which include large trees, snags, down logs, multiple canopy layers, and a high level of structural diversity.

The portions of this zone available for timber management would be managed on an uneven-aged basis to recruit these structural conditions and wildlife habitat elements, to coincidentally grow and produce timber through careful thinnings and periodic replacement of large trees, and to provide recreational opportunities.

The Older Forest Structure Zone will have high value for research concerning topics such as restoration of older forests and the ecological processes associated with older forests. It also will improve the long-term conditions for wildlife, particularly species that prefer older forests. It provides a continuous corridor of forest that links most of the Forest's old-growth groves, and also provides habitat linking adjacent industrial timberland with the forests of JDSF.

The late seral development area is concentrated in two areas, including the Mendocino Woodlands and Upper Russian Gulch areas, and in three areas adjacent to designated old-growth groves. Within these areas, the objective of management will be to develop older forest through a variety of means, from relatively passive to active management. The more active forms of management will be conducted to accelerate the development of late seral structure. Late seral structure targets will include a significant component of large, old trees (greater than 150 years), as well as large snags, large down logs, deformed trees, multiple canopy layers, and a high degree of within-stand variability. A similar management strategy will be applied in the WLPZ, although management will also concentrate upon the unique values that these areas provide to watershed processes, the stream, and the near-stream environment. This management strategy recognizes that the stream zones provide a valuable forested link within watersheds and across the Forest and that large trees within these areas are an important source of large woody debris inputs to streams.

Forest Management

JDSF is first and foremost a research and demonstration forest. This management plan identifies planned management based on biological, scientific, and social criteria. It is based on the premise that JDSF Forest managers have the discretion to allocate forest management treatments, within the framework established by this management plan based on the best available science. As mentioned above, a set of initial implementation period measures will apply for the next one to three years (see Short Term Harvest Schedule, Table 9, below). The forest will be managed to develop the desired future conditions set forth in the previous section. JDSF will pursue certification of its forest management under the third-party processes, most likely via the Forest Stewardship Council and the Sustainable Forestry Initiative. A preliminary certification scoping review under these two systems was completed in fall 2005.

The primary focus of this Management Plan is to lay out best management practices for sustainable forestry on JDSF. In some areas such as old-growth groves, areas immediately adjacent to larger streams, and parts of occupied habitats of threatened or rare species, the management will typically be "no management" except to protect the site from serious external threats or to improve specific habitat values.

The concept of sustainability requires a scientifically based long-term view with respect to the planned sequencing of forest treatments. A reasoned sequence of proposed treatments, based on sound silvicultural and ecological principles, is essential in meeting the defined land management objectives. The land management objectives and sequencing of treatments must be spatially allocated over the forest landscape in order to develop desired future conditions at the landscape level. JDSF continues to

adhere to a policy of relatively open access for researchers, and therefore cannot completely predetermine the type of silviculture that will be used in research projects. In addition, given the amount of acres that have to be treated each year to achieve the forest structure goals in Table 7, research projects alone cannot be the only vehicle for timber harvest on JDSF. In any given year, a majority of the silvicultural treatments will probably not be directly associated with a specific research project, but rather will be aimed at creating the diversity of forest structure conditions replicated across the landscape, that is necessary for conducting future research projects that will meet the Forest's mandate.

The road map to desired future conditions on JDSF is articulated in this management plan through a set of forest structure goals (as specified in Table 7), a silvicultural allocation plan (Table 8), a map of forest management areas (Map Figure 5), and a short-term harvest schedule (Table 9). The current structure and composition of the State Forest is reflective of past management and historic plans. Future management actions and natural growth processes will move the forest towards a more varied set of stand structures and habitat conditions, which are reflective of how management objectives on JDSF have evolved over the years.

The silvicultural allocation plan and short-term harvest schedule described here provide implementation guidelines for allocating harvest levels and silvicultural methods to different areas on the Forest. A key objective is to keep as many options available for future research and demonstration as possible within forest structure goals that primarily follow planning watershed boundaries. No single forest structure is favored over another. A key consideration is not to foreclose on future options, thus maintaining flexibility for future management and research installations.

Concepts applied to the silvicultural allocation plan include the following:

1. To demonstrate the variety and variable outcomes of management methods and silvicultural systems in use today or likely to be developed in the future for private timberlands within California, for both small non-industrial and large industrial timberland owners.
2. To provide sufficient areas available for even-aged and uneven-aged management systems for purposes of comparing and contrasting wildlife habitat development, watershed effects, forest growth, sustainable production, product development, economic efficiency, and other forest management outcomes.
3. To promote where possible the older forest development already in progress. Most of the planning watersheds subjected to single tree selection systems with second-growth stands in the past have been allocated to uneven-aged management in the future.
4. To distribute management systems across the spectrum of available soil productivity as well as to capture other variables in the abiotic diversity of the State Forest.
5. To test a range of approaches from fire protection only to different thinning regimes to maintain and actively develop structural elements common in older forests.
6. To promote neighbor-compatible silvicultural systems in areas near State Parks and Reserves, rural residential neighborhoods, and areas of concentrated recreational activity.
7. To create a diverse mosaic of forest age-class structures at the landscape level that will contribute to habitat stability such as connectivity of old-growth, late seral development areas, older forest structure, maintenance of biological diversity and functional forest ecosystems.
8. To facilitate future research by providing replicated and diverse forest conditions across a broad spectrum of environmental conditions.

Planning watershed boundaries were utilized to delineate basic structural target conditions or mixes of conditions within the forest. The use of watershed boundaries provides for a separation between management units that enables monitoring of environmental effects from timber operations. The creation of defined management units with structure goals provides for long-term continuity of land management practices where environmental effects can be measured and monitored over time.

The management plan makes provision for two silvicultural demonstration, experiment, and research areas within the Forest (see Map Figure 5). Within these areas, a range of silvicultural systems will be demonstrated at a relatively small geographical scale for the educational benefit of landowners and the generally visiting public. The intention is to demonstrate a range of stand management practices and

methods in close proximity, so that landowners and the visiting public can view them from an automobile or foot trail and learn about forest management.

This plan does not alter any of the protection measures associated with recognized areas of special concern. State Forest staff will continue to conduct site-specific assessments to determine the appropriateness of silvicultural prescriptions for any given area. Forms of stand management are spatially allocated by forest area in a way that establishes an area allocation plan that limits management options near the OFSZ, adjacent rural residential neighborhoods, state parks, and the Mendocino Woodlands (see Map Figure 5). For any given timber harvest, the THP process provides the CEQA-compliant project-level environmental assessment process.

The allocation of silvicultural systems addresses potential conflicts with State Forest recreational use and local public interest values. Practices similar to even-aged silviculture that would encompass 2.5 or more acres were minimized in management compartments adjacent to areas where management is constrained. Uneven-aged management, which tends to maintain a continuous forest canopy, has been incorporated within the management compartments with identified sensitive public interest values.

Forest structure is created through natural growth and stand development processes in combination with the use of silvicultural systems. Silviculture is the art and science of stand manipulation to achieve desired conditions.

Older redwood forest tends to have an uneven-aged structure in nature. In addition to the existing old-growth groves, approximately one-third of the Forest will be dedicated to the development of an older or late seral forest condition (the second structure class presented in Table 7). The form and amount of structural manipulation applied in these stands will vary according to the objectives for the given area. Active management may include light to moderate stand thinning, often of a variable nature, and other forms of stand management intended to achieve the desired conditions (the presence of large trees, snags, and large down logs within a stand that is both vertically and horizontally diverse).

Table 8 summarizes the planned acreage allocated to different silvicultural methods under this management plan. Tables 7 and 8 in combination with Map Figure 5 provide a complete summary of the forest structure goals for JDSF and the silvicultural management strategy for how to achieve these forest structure goals.

Table 8. Planned Distribution of Silvicultural Methods.

Silvicultural Method	**Acres**	**Percent of Forest Acres**
No harvest (old-growth groves, pygmy forest, cypress groups, Conservation Camps)	1,350	3
Late seral development and older forest structure prescriptions	15,801	33
Uneven-aged; single tree or cluster selection	8,933	18
Uneven-aged; group selection or single tree/cluster selection	7,325	15
Uneven-aged or even-aged; single tree/cluster selection, group selection, variable retention, two-aged or one-aged	12,788	26
Unclassified [research areas (variable silvicultural treatments) and power line right-of-way]	2,455	5
Total	**48,652**	**100**

Uneven-aged Management

Uneven-aged management is used to create and develop stands with trees of differing sizes and ages. Some common systems in uneven-aged management include single tree selection, cluster selection, and group selection. Openings within uneven-aged systems vary from an individual tree (1/100th of an acre) to clusters of trees (less than 1/4 acre) to openings designed to allow full sunlight (1/4 acre to 2.5 acres). Over time, uneven-aged systems develop trees from at least 3 age or size classes. Periodic timber harvest in these stands removes selected individual trees or small groups of trees in order to promote growth of the remaining trees and to create an opportunity for new trees to develop or regenerate.

A majority of the area devoted to timber production will be managed under an uneven-aged management system (at least 33,409 acres or 69% of the Forest area). This is the dominant system utilized by non-industrial forest landowners and others intent upon maintaining visual quality. In practice, size class differentiation often complements or substitutes for age class differentiation. The Forest will be managed to utilize two predominant uneven-aged silvicultural systems, single tree/cluster selection and group selection. The objective of this variability is to demonstrate a range of silvicultural options under uneven-aged management, and to provide multiple future research opportunities.

Single Tree/Cluster Selection:

Single tree/cluster selection will be utilized to create small openings ranging in size between single trees and one-quarter acre. Single tree and cluster selection leads to stands with continuous forest cover, small gaps between trees, and a diversity of tree sizes and ages. The intent will be to enter each timber stand every 10 to 25 years to create a new age class. The residual growing stock level and the diameter distribution of trees in a stand will be adjusted on a site-specific basis.

Stand variability will be maintained in order to demonstrate a range of silvicultural options under uneven-aged management and to provide variable conditions available for future research.

The areas designated for this silvicultural method were intended to minimize potential conflict with recreation uses and with local public interest values. These management areas also share boundaries with private lands along the western edge of the State Forest and with developed recreation sites. They also form a viewshed from Highway 20. The basic management areas, or planned structure target conditions are depicted in Map Figure 5.

Many existing selection harvest units on the Forest have not yet had the kinds of repeated harvest entries that lead to multiple age classes and canopy layers, and only a very few have had more than two such entries. Many stands to be managed under the selection system are even-aged, single-canopy second-growth stands that have not been re-entered since their establishment, or have had only one partial cut that may or may not have resulted in successful creation of a new age class. Nowhere on JDSF is there a stand that displays the full range of trees of all sizes and ages that is the ultimate structure of the regulated[4] selection stand. Within the region, the practice of selective harvest of second-growth stands began only 40 to 50 years ago. A complete transition from even-aged to uneven-aged structure is largely theoretical, thus providing research and demonstration opportunities, and may take up to 80 years or more.

Each potential single tree/cluster selection harvest unit will be evaluated to determine the most appropriate treatment to move its condition towards a stand with a balance of age classes. Evaluation characteristics may include:

- Structural needs associated with creation of a range of conditions across the Forest for future research and demonstration.
- Condition of regeneration or opportunities to promote regeneration.

[4] In the context of managed uneven-aged stands, “regulated” stand conditions are reached once the stand approaches a relatively stable and sustainable state where harvest is roughly balanced with growth over the cutting cycle.

- Stand density. An open stand tends to receive light at the level of the regeneration, so a light harvest of the overstory may be appropriate. A closed stand may indicate the need to create canopy gaps.
- Competing vegetation. Stands with large components of brush or hardwood may benefit from a more aggressive regeneration effort.

Group Selection:

Stands managed under the group selection system will eventually consist of small forest patches at multiple stages of development, from recently regenerated to mature. The cutting cycle for an area designated for group selection will range from 10 to 25 years. The goal is to establish and maintain three to five separate age classes.

The sizes of group openings will typically range from 0.25 acre to 2.5 acres. Group openings 2.5 acres and larger are considered to represent even-aged management. Within stands, group sizes may remain fairly uniform to maintain the ability for comparison between stand management options. The intent under this plan is to demonstrate and assess a range of harvest opening sizes upon factors such as tree growth, regeneration of new trees, wildlife habitats, botanical diversity, operability, and financial considerations.

Criteria for selecting the sizes and configuration of group openings in a harvest unit may include:

- Forest-wide structure goals over time.
- Height of trees surrounding the opening. Smaller openings can be accommodated when surrounding trees are relatively short.
- Logging systems anticipated. The logistics of specific systems can be accommodated by the size, orientation, and arrangement of group openings.
- Shape. Long openings may require additional size to maintain sufficient levels of light for regeneration success.
- Orientation. Openings with the long axis aligned east-west will remain shaded along the south edge, while a north-south alignment may allow more sunlight to reach the opening. This effect may be accentuated on north-facing slopes.
- Site preparation and artificial regeneration. If these cultural practices are prescribed, their implementation can be more efficiently facilitated by larger opening sizes.
- Adjacency of neighbors, recreation areas, and other potential use conflicts.
- Species composition and stocking levels.
- Specific demonstration and/or research objective.

Even-aged Management

Even-aged management is intended to create and develop stands within which most of the trees are of similar age. This form of management works best when the desired species of trees grow well with a lot of sunlight. Some common systems to be demonstrated in even-aged management include variable retention, two-aged stands and one-aged stands (commonly called clearcutting[5]). Harvest under this form of management tends to remove most of the trees from a given area to promote the regeneration of a new stand.

Even-aged management is generally used to create and maintain stands with trees of the same or similar age. This form of management works best when the desired species of trees grow well with a lot of sunlight. It is increasingly common to retain a significant number of larger trees growing above or among the more numerous younger trees. These larger trees are generally retained to increase habitat values, to shelter the younger trees, to provide a seed source, or to accumulate volume for later harvest.

[5] The term clearcutting as used here is defined as removing all the mature merchantable trees on a site.

Even-aged management will be used as necessary to achieve the forest structure conditions needed to accommodate an adequate range of research investigations (see Table 7). Within this context, even-age management also may be used to address forest health and problematic regeneration conditions, as well as immediate research and demonstration purposes. Of the Desired Conditions shown in Table 7, Mature and large trees (5-15 percent of Forest acres) and Regeneration and pole-size younger trees (10-20 percent of Forest acres) typically arise from even aged management.

A minority of the total Forest area devoted to timber production can be managed under an even-aged management system (12,788 acres or 26% of the Forest area is available to be managed under either even-aged or uneven-aged management systems). The total area receiving any form of even-aged silvicultural treatments shall not exceed 2,700 acres per decade (or 5.5% of Forest area). Clearcutting is to be conducted only where strictly necessary for purposes of research, demonstration, addressing forest health, or addressing problematic conditions for regeneration; clearcutting for these four purposes is limited to a cumulative maximum of 100 acres (or 0.2 % of Forest area) per decade. Up to an additional 400 acres (or 0.8 % of Forest area) may be clearcut per decade, but only for specific research purposes that cannot be reasonably met through any other method.

In addition, the extent of the use of even-aged management, at both the project and Forest-wide level, (a) will be tied to the Forest condition it is intended to produce and (b) will be necessary and appropriate to accommodate research investigations either immediately or at a later time. The foregoing constraints do not apply to even-aged management where necessary to address forest health or problematic regeneration conditions. All proposed even-aged management, with the exception of CAL FIRE-PSW Research Station's planned SF Caspar Creek research, will be presented to the appropriate advisory committee(s) for review and recommendation prior to implementation. The management plan reduces the potential extent of even-aged management to less than 26% of the Forest area, as well as restricting the rate at which even-aged management may be conducted. An increase in forms of uneven-aged management will tend to provide greater connectivity between forested habitats, and a general increase in aesthetic and recreational values.

In general, use of even-aged management is to be restricted to purposes of research, demonstration, addressing forest health, addressing problematic conditions for regeneration, or achieving long-term forest structure condition goals identified in Table 7.

Some forms of even-aged management that are proposed for future demonstration include variable retention, two-aged stands, and one-aged stands including clearcutting. Variable retention is a form of management in which mature trees are retained in a variable configuration, and a new even-aged stand is grown beneath or between the retained trees. Retained trees may occur as scattered individuals, in groups, or in combination. The purposes for retention of the mature trees are numerous, including habitat value, watershed, and aesthetic considerations. Two-aged stand conditions have not been widely applied within the region, but offer an important research and demonstration opportunity to meld the continuous canopy concept of uneven-aged management with the concept of creating significant space and sunlight for promotion of a second age class developing beneath and between the overstory. One-aged stands as the name implies designates stands where most of the trees are of the same age cohort.

An important consideration for the landowner when applying forms of even-aged management is the concept of rotation age. Rotation age is the age at which a stand of trees is harvested and a new even-aged stand of trees is regenerated on the site. Science has demonstrated that stands can produce maximum physical yields when the average annual growth of the stand is at or near its peak (Lindquist and Palley, 1963; Schumacher, 1930). Land managers also need to consider the economic costs and risks associated with retaining a stand to an advanced age. This continues to be a fertile area for research and demonstration. A broad range of rotation ages will be demonstrated. Most even-aged stands are capable of achieving culmination of mean annual increment at ages between 60 and 150 years, with the longest rotations applied to sites with the lowest growth potential. Economically optimal rotation ages are generally considered to be shorter, in the range of 40-70 years.

There is considerable potential to vary the schedule and placement of even-aged units in order to maintain or create different habitat patch sizes and habitat connectivity. The structural attributes of an

even-aged unit, as well as the growth and yield characteristics, can be affected by commercial thinning that may be conducted at intermediate points during the rotation. Some considerations in deciding whether or not to thin a stand include:

- Forest structure targets for research and demonstration purposes.
- Density and growth rate. A heavily stocked stand whose growth is being limited by tree-to-tree competition can benefit from thinning.
- Species mix. Different species reach tree or stand volume maturity at different ages. In mixed stands, cutting species that mature more quickly can increase overall stand health and growth.
- Time until regeneration. In a stand nearing rotation age, there may be too little time for the benefits of a thinning to be realized.
- Age class balance. It may be undesirable from a compartment-wide or forest-wide standpoint to create additional stands in the youngest age class. In this case, the productivity of a stand nearing rotation age can be extended by a thinning.

Some of the criteria that may be applicable in evaluation of stands for regeneration harvesting include:

- Forest structure targets for research and demonstration purposes.
- Stand growth. Stands with a projected mean annual growth rate that is much less than that expected may be candidates for regeneration. Conversely, stands exhibiting rapidly increasing growth may indicate harvest deferral.
- Cumulative effects. The amount of regeneration harvesting in an assessment area may need to be constrained in order to reduce the potential for adverse cumulative watershed, habitat, aesthetic, or other environmental impacts.
- Habitat diversity, habitat availability, patch-size, and connectivity.

Short Rotations:
Short rotation is defined here as even-aged regeneration harvest in stands where the average age is 60 years or less at the time of harvest. Short rotation, even-aged management is utilized extensively on large forestland holdings throughout North America. It is a common management tool in the redwood region of California. JDSF serves as a research and demonstration source for a wide range of clients, including medium to large forestland owners. Short rotation forestry will be an element of JDSF's management.

Long Rotations:
Extending the time before harvesting a stand is a management option that will be implemented and studied. This approach may have applicability where cumulative effects are a concern, structural elements are desired that require larger trees, or where there is a desire to create more complexity on the landscape. Research in even-aged stands of Douglas-fir has shown that high levels of timber yields may be sustained by thinning over many decades (Curtis 1997). A relatively new consideration in extended rotation ages is the economic and social benefit of carbon sequestration to mitigate the greenhouse effect. In California, carbon retained beyond a regulatory age minimum may be registered and sold as an offset.

Areas Not Covered by this Silvicultural Allocation Plan

There are portions of the State Forest not covered by this silvicultural spatial allocation plan that may have some limited timber harvesting. The largest area with no assigned silvicultural system is the Caspar watershed which is designated specifically for research.

The North Fork and South Fork Caspar management compartments make up the CAL FIRE-US Forest Service Caspar Creek Watershed study that has been in existence since 1962. Timber harvesting in these compartments will be planned and conducted to serve the needs of the research project. Timber harvesting is expected in one or both of these management compartments during the next ten years.

Most of the Mendocino Woodlands/Upper Russian Gulch/Lower Big River area will be managed as a late seral habitat development area. A study to demonstrate and assess the accelerated development of late seral habitat will be considered for this area. Possible management options include selective timber harvesting and/or prescribed fire to accelerate the natural stand selection process and to accelerate creation of large old trees and other functional habitat elements (i.e., snags, logs, cavities and dead tops). The State Forest will consult with wildlife management agencies, the California Department of Parks and Recreation, the California Department of Fish and Game, and other interested parties before proceeding with this project.

The Parlin Fork Management Area will continue to be managed using a group selection strategy as described in the 1992 Parlin Fork plan. State Forest staff will provide technical assistance and advice to the CAL FIRE Assistant Chief at Parlin Fork Conservation Camp in environmental assessment and protection, harvest planning, reforestation, stocking control, burning, and other management activities.

Other smaller areas not affected by the silvicultural allocation plan include the Railroad Gulch Study Area, Whiskey Springs Study Area, Stone Study Area, and the Caspar Cutting Trials (See Chapter 4 for project details). These smaller areas have established on-going demonstration or research projects that will set them aside from the overall silvicultural plan.

Initial Implementation Period and Short Term Harvest Schedule

Initial Implementation Period:

The intent of the initial implementation period standards is to provide the Board and the Department with an opportunity to obtain detailed input on the plan, and allow for consensus recommendations on potentially controversial management issues. The initial implementation period will sunset no more than 36 months after approval of the Forest Management Plan by the Board. A set of initial implementation period harvest limitations has been established, and is expected to remain in place for a one- to three-year period, while advisory bodies consider the JDSF management plan and make recommendations to the Department and the Board for possible modifications of the management plan. Decisions on stand structure for future unspecified research projects will be developed by JDSF staff in cooperation with researchers, DSFAG, and, when functioning, the new Jackson Demonstration State Forest advisory body. These restrictions are intended to assure that long-term planning options, particularly in sensitive areas, will not be precluded.

It is anticipated that revenue generated from harvest activities in the interim period will be adequate to support but not greatly exceed the revenues necessary to fund the work activities to be carried out during the interim period. Long-term initiatives should be limited in the interim period to completion of the road inventory and rehabilitation plan and its implementation, a peer review of existing timber inventory and based on that review plans to take appropriate action to improve that inventory, recreation planning, and demonstration and research related activities.

Short-Term Harvest Schedule:

The short term harvest schedule is a companion piece to the silvicultural allocation plan. This schedule lists the approximate locations of proposed harvest units and the general silvicultural treatments to be applied. This information is shown in Table 9 below and displayed in Map Figure 6. The table reflects the establishment of a set of harvest restrictions that will apply for the initial implementation period, during the next one to three years of Plan implementation, and also provides for review of some of the timber harvest plans by advisory entities.

An advisory body (the Demonstration State Forests Advisory Group or, when ready, the Jackson Demonstration State Forest Advisory Group) shall review all timber harvest plans in sensitive areas and, if practical, all plans during he interim period, provided this review does not adversely impact JDSF staff's

ability to move forward with the 2008 timber sale program. The proposed harvest plan of the Pacific Southwest Research Station in Caspar Creek shall have advisory body review.

Table 9. Short-Term Harvest Schedule.

Sale Area Name	Planned Silviculture	Harvest Acres[1] (approx.)	Planning Watershed
1. Potential Harvest Areas Intended for Operation during Initial Implementation Period (these harvests will meet initial implementation period harvest retention criteria, therefore are not subject to prior review by advisory entities)			
Northfork Spur	selection/cluster selection	452	Brandon Gulch
West Chamberlain	commercial thin/old forest structure development (commercial thin in 2005 DEIR)	515	Chamberlain Creek
14 Gulch North	selection/cluster selection (group selection in 2005 DEIR)	400	Berry Gulch
S Whiskey Springs	light and moderate commercial thin/selection/cluster selection/selection with road and trail corridor (commercial thin in 2005 DEIR)	300	Berry Gulch
Dunlap North	light and moderate commercial thin/selection with road and trail corridor/cluster selection (commercial thin in 2005 DEIR)	300	Chamberlain Creek
Dunlap South	selection/cluster selection (group selection in 2005 DEIR)	350	Chamberlain Creek/ Lower North Fork Big River/Two Log Creek
Hare Creek GHIJK	selection/cluster selection, clusters with matrix thinning, clusters with no matrix thinning/variable WLPZ demonstration	250	Hare Creek
2. Potential Harvest Areas during or following Initial Implementation Period (advisory entities will have the opportunity to review and comment if to be implemented during the initial implementation period)			
Berry Flat	commercial thinning/selection/cluster selection/with road and trail buffer (even-aged regeneration in 2005 DEIR)	50	Berry Gulch
Helms	selection/group selection/combined selection and group selection/with control stands	250	Mouth of Big River/Berry Gulch
Mitchell	selection/cluster selection (selection/group selection in 2005 DEIR)	635	Mitchell Creek
Orchard	selection/cluster selection/group selection with small groups, with and without matrix thinning (selection/groups selection in 2005 DEIR)	500	Caspar Creek
Park Gulch	group selection/silvicultural demonstration area with selection; cluster selection; group selection with small, medium, and large groups, with and without matrix thinning	300	Chamberlain Creek
Pleiades #4	selection/cluster selection (4th selective cut)	50	Kass Creek
Riley Ridge	old forest structure development using light and moderate thinning with variable density hardwood retention (group selection in 2005 DEIR)	600	Brandon Gulch

Table 9. Short-Term Harvest Schedule *(continued).*

Sale Area Name	Planned Silviculture	Harvest Acres[1] (approx.)	Planning Watershed
South Fork Caspar Creek[2]	uneven-aged and/or even-aged management; prescription specifics to be determined; represents the "next phase" treatment of a research area, designed to study the effects of forest management upon watershed resources.	1,040	South Fork Caspar Creek
Thompson Gulch	late seral development using light and moderate variable density thinning and selection	250	Berry Gulch
Upper Hare Creek	selection/cluster selection/variable WLPZ treatment demonstration	100	Hare Creek
Volcano #2	group selection with small, medium, and large groups; with and without matrix thinning/selection with road and trail corridor	500	Brandon Gulch
Water Gulch #1	commercial thinning with light and moderate thinning	300	Chamberlain Creek
Water Gulch #2	light and moderate commercial thin/silvicultural demonstration area with selection; cluster selection; group selection with small, medium, and large groups, with and without matrix thinning/two-aged stand (even-aged regeneration in 2005 DEIR)	450	Chamberlain Creek
West Berry Gulch	light and moderate commercial thin/silvicultural demonstration area with selection; cluster selection; group selection with small, medium, and large groups, with and without matrix thinning/two-aged stand (commercial thin in 2005 DEIR)	400	Berry Gulch
3. Potential Even-aged Management Areas following Initial Implementation Period[3]			
Frolic #2	two-aged stand/variable retention/alternative prescription using combination of scattered and clumped retention/with control stands/variable WLPZ treatment demonstration (even-aged regeneration in 2005 DEIR)	200	Parlin Creek
Road 80	two-aged stand/alternative prescription similar to seed tree, with clustered structure retention/clearcut (max. 20 acres total clearcut area) (even-aged regeneration in 2005 DEIR)	200	Parlin Creek
Scissors #2	selection with road and trail corridor/cluster selection/variable retention/alternative prescription similar to seed tree with clumped structure retention (even-aged regeneration in 2005 DEIR)	100	Parlin Creek
Waldo	two-aged stand/variable retention/ alternative prescription similar to seed tree with clustered structure retention/clearcut (max. 20 acres total clearcut area)/variable WLPZ treatment demonstration (even-aged regeneration in 2005 DEIR)	150	Parlin Creek
Walton Gulch #2	two-aged stand/variable retention/alternative prescription similar to seed tree with scattered and clumped structure retention/variable WLPZ treatment demonstration (even-aged regeneration in 2005 DEIR)	100	Hare Creek

Table 9. Short-Term Harvest Schedule *(continued).*

Sale Area Name	Planned Silviculture	Harvest Acres[1] (approx.)	Planning Watershed
Parlin	commercial thin/alternative prescription with scattered, grouped, and combination scattered and grouped structure retention	251	Parlin Creek
Tunnel	alternative prescription similar to seed tree, with structure retention/selection (even-aged regeneration/selection in 2005 DEIR)	54	Hare Creek
4. Enjoined Harvests Subject to Legal and Contract Resolution			
Brandon[4]	selection, cluster selection	540	Brandon Gulch
Camp 3[4]	selection, cluster selection	366	Brandon Gulch

1. For group selection units, the number in this column represents the total area of the unit. Typically, about 20 percent of the area is in group openings; the remaining area is sometimes thinned during the group selection harvest entry.

2. SF Caspar Creek research project timber harvest plan is not subject to the initial implementation period restrictions.

3. Even aged management will continue to be an integral part of the suite of management tools available for application on JDSF. Areas that include even-aged management will be deferred until the conclusion of the initial implementation period. These areas may be harvested during the initial implementation period if the silvicultural prescription is modified to eliminate even-aged management and group selection; such harvests are subject to prior review by advisory entities

4. The Camp 3 and Brandon THPs are currently enjoined from operation and subject to a stipulated agreement under First District Court of Appeal Case No. 102911 and Mendocino County Superior Court Action No. SCUK CVPT 0289022. It is anticipated that the manner in which these THPs are operated will be determined through negotiations among signatories to the stipulated agreement and the timber sale contract holders.

The potential harvests identified in this table represent the Department's current best expectations for short-term harvesting activity in the context of the programmatic nature of the Management Plan. The actual implementation of individual harvests identified here may not occur or may be modified in terms of scale, silvicultural prescriptions, timing, or other factors. Additionally, other harvests not identified herein may be developed and carried out, so long as they are within the scope of this Plan and are subjected to necessary reviews and permitting.

During the initial implementation period, harvest restrictions will be applied to the timber harvest plans in section 1 of the Short-Term Harvest Schedule in Table 9, below. Specific elements of the initial implementation period harvesting restrictions are:

1. Post-harvest conifer stocking (basal area) levels will be approximately 70 percent or greater of pre-harvest levels.
2. Average tree size as determined by quadratic mean stem diameter will be approximately equal to or greater than pre-harvest levels.

Efforts will be made to limit the extent of harvest in areas that have had little or no harvest entry since 1925 or that currently have more than 10 trees/acre greater than 30 inches in diameter (see Map Figure 7), particularly where those areas have not already had work done to prepare timber harvesting plans.

With the exception of research-related harvesting in the South Fork of Caspar Creek, harvesting of the timber harvest plans in section 2 of the Short-Term Harvest Schedule during the initial implementation period may occur only after advisory entities have had the opportunity to review and comment on it.

Timber harvest plans in section 3 of the Short-Term Harvest Schedule may be harvested during the initial implementation period only if the silvicultural prescriptions are modified to eliminate even-aged management and group selection, and advisory entities have the opportunity to review and comment.

The short term harvest schedule will be flexible and subject to modification through adaptive management. It will be reviewed and updated as necessary to maintain a five-year plan of future harvest activity. This process is important for several reasons:

- Accommodating research and demonstration needs.
- Planning wildlife assessments for Timber Harvesting Plans where some species evaluations require multiple years of surveying effort.
- Anticipating road system extensions or reopening of temporary roads.
- Conducting cumulative effects assessments.
- Monitoring consistency with both the long-term harvest schedule and the provisions of this Management Plan.
- Making revenue projections so that budget planners will know what to expect.
- Unanticipated circumstances.

The following issues were considered in the allocation of actual harvest units on the Forest:

- A cross-check against the management objectives and operational constraints as articulated in this Management Plan.
- Forest structure targets for research and demonstration purposes.
- Stand manipulation priorities. When certain stands can be either harvested or deferred, one tool to help decide is an evaluation of current stand condition along with a projection of stand growth following a proposed treatment. For example, a stand which is poorly stocked or which is growing slowly might be a better candidate for harvest than one that is vigorous and well stocked.
- Spatial distribution within the Forest.
- Cumulative effects. Without considering the sequencing of operations within a watershed or other assessment area, the potential for adverse cumulative effects could be increased. Dispersing harvests across the landscape, for example, is one way to potentially avoid or mitigate some cumulative watershed effects.
- Maintaining a balance of workload from one year to the next. With a fixed workforce, it is prudent to have a mix of high-effort and low-effort harvest planning workloads each year. Thus, two harvest plans that cover large areas and require complex assessments of road layout, harvesting systems, and environmental impacts might best be prepared in different years rather than both being completed in the same year.

Special Concern Areas

To implement the Plan, areas of special concern that constrain management were identified (Appendix II) and provisions for their management were established. Special concern areas include unique habitats, habitat for species of concern, riparian areas, recreational areas, areas near residences and parks, research areas, water supplies, and sensitive slopes (Map Figure 5).

With the special concern areas identified (e.g., unique habitats, habitat for species of concern, riparian areas), a short-term harvest plan was formulated with the consideration of the following objectives: to maintain or restore habitat, to create diverse forest types and specific structural elements, to produce high levels of sustainable timber growth, and create opportunity for a viable research and demonstration program (Table 9).

Areas of special concern can be derived from policy-driven and objective-driven management constraints, or can be imposed by external influences such as physical or biological limitations or legal requirements. Many areas may be influenced by a combination of factors, management and objective driven, as well as those imposed by external influences. Major areas affected by management policy-driven and objective-driven constraints are:

- Reserved old-growth groves.
- Late seral development areas.
- Older forest structure zone.
- Campground buffers.
- Conservation camps.
- Road and trail corridors.
- Parlin Fork management area.
- Research areas.

Some constraints are imposed by external influences such as physical or biological limitations, legal requirements, or Forest Practice regulations. These areas may also be affected by management policy-driven and objective-driven constraints, such as structure targets established for riparian zones and buffers adjacent to non-timberland neighbors. The major areas affected by these constraints are:

- Cypress groups
- Pygmy forest
- Jughandle Reserve
- Eucalyptus infestation area
- Inner gorges
- Areas with a high relative landslide potential
- Northern spotted owl nest areas
- Osprey nest areas
- Watercourse and Lake Protection Zones (WLPZs)
- Woodlands Special Treatment Area
- Domestic water supplies
- Buffers adjacent to non-timberland neighbors
- Power line right-of-way
- State Park Special Treatment Areas

Parts of the Forest not affected by these constraints are generally available for an allocation of management options that can be selected to best meet the array of management goals. To ensure that management activities do not conflict with these constraints, a comprehensive reference list has been compiled and the affected areas have been mapped.

During the course of planning regular timber harvesting operations, adjacent special concern areas where timber harvesting is allowed will be evaluated for their suitability for concurrent management treatments. For some special concern areas, notably research areas, a dedicated timber harvest or other project may be designed specifically to fulfill the objective of that area.

Timber Sales

The majority of timber harvesting operations will continue to be conducted through the same type of timber sale program that has been in place for the past 40 years, as described in Chapter 2. Typically, one Timber Harvesting Plan will be prepared for each timber sale. Sizes of individual sales will typically vary from one to several million board feet, though smaller sales may occur as further discussed below.

Three to five sales each year will usually be realized. Stumpage will continue to be sold through a bidding process. The successful bidder will normally subcontract the logging. Contract terms will usually be for one operating season for sales at the lower end of the size range, and two seasons for larger sales. Timber harvest operations are scheduled every year in order to make timely progress towards achieving the desired future forest structure, habitat diversity, and demonstration objectives. A program of annual harvests is also required by the logistical considerations of workload stability and revenue projection. Decadal average annual harvests is expected to be within a range of 20-25 MMBF and shall not exceed 35 MMBF in any given year.

Recent, current and foreseeable future market conditions rank the Forest's merchantable conifer species in the following order of value. Current stumpage values are from the State Board of Equalization. (http://www.boe.ca.gov/proptaxes/pdf/20072HFinal.pdf).

1.	Redwood	$600 to $800 per thousand board feet (Mbf)
2.	Douglas-fir	$120 to $240 per Mbf
3.	Hemlock and grand fir	$0-$30 per Mbf

Although there is a small and intermittent tanoak lumber industry in Mendocino County, to date the demand for raw products has only been sufficient to make the species little more than a byproduct of conifer management. As of this date, the market for tanoak and other hardwoods as fuel has rarely been profitable enough to warrant investment in their management. Although red alder is considered a merchantable species in parts of the Pacific Northwest and used for furniture, it is locally limited in extent and confined primarily to riparian zones.

As part of the balance between maximum production of high quality forest products and the maintenance and enhancement of other forest resources, there is value in retaining naturally occurring species as part of the forest ecosystem. Although there is some understanding of the roles played by various elements in ecosystem function, there is much that is still not understood.

Stands managed for sustained timber yields will be harvested and regenerated to favor the two higher-value merchantable species, redwood and Douglas-fir. Hemlock and grand fir, which typically occupy no more than five to ten percent of productive stands, will be managed at their current levels. Bishop pine, an aggressive pioneer species following stand disturbance, will be managed as only a minor species where it occurs in commercial stands. Hardwoods will be managed to achieve conifer/hardwood ratios similar to pre- settlement stand conditions.

Where artificial regeneration is used following a timber harvest, both redwood and Douglas-fir seedlings may be planted. The relative numbers of each species will be determined after an assessment of the site to evaluate whether it is more suited for one species or the other.

Hardwoods are a minor component of stands on the west end of the Forest, averaging approximately 11 percent of the basal area. These species are of recognized habitat value. Representative trees of large sizes will be retained or recruited in addition to trees with other structural values, such as basal hollows and cavities. In the eastern area of the Forest, hardwoods make up approximately 30 percent of the basal area on average. In this area, hardwood management prescriptions will be implemented as part of a strategy to gradually shift the species mix toward the former conifer dominated stands of pre-settlement conditions. Commercial thinning and selection will be utilized to manage hardwoods in most stands. Several methods are available to reduce the level of hardwood within forest stands. These include

mechanical cutting, promotion of competing conifers, and, under some circumstances, hand application of herbicides. If mechanical or other methods are not feasible due to potential environmental impact, stand damage, or excessive cost, selective prescriptive herbicide techniques may be considered.

Adjusting imbalance in conifer/hardwood stocking levels by utilizing herbicides will be limited to specific reforestation situations on the east side of the Forest. In specific areas toward the east end of the forest, high tanoak stocking levels are capable of preventing native conifer establishment and growth. Herbicides may be used to decrease native hardwood stocking levels only when other options are prohibitively expensive, dramatically increase fuel loading, are overly damaging to conifer regeneration, or are not likely to be successful.

Some landowners structure their timber harvest operations to sell delivered logs rather than standing timber. By contracting directly with the logging operator rather than through a timber purchaser, more control can be maintained over the quality and specifics of the harvesting operations. This can be especially important where there is a research aspect to the logging process itself and the details of the operation are critical to the study. There may also be some economic advantages that can be gained by marketing different products (log size and species mixes, for example) to different primary manufacturers. The Forest staff will consider selling at least some timber as delivered logs rather than standing stumpage sales, assuming that effective budgeting and logistical options can be implemented.

The Forest will pursue opportunities to market small blocks of timber to individuals, small businesses, and other non-traditional timber purchasers. To the extent that state regulations will allow, the timber sale staff will investigate the possibility of either targeting small sales to registered small businesses, or giving registered small businesses a preferential allowance in the bid award process. There are considerable possibilities for demonstration projects in this subject area and demonstrated local interest.

Logging Systems

The three logging systems used and anticipated on the State Forest are tractor, cable, and helicopter. Selection of the logging system for a harvest unit is based primarily on terrain and site sensitivity, with other factors such as noise and accessibility playing a role in some cases.

Tractor Logging

Tractor logging, referred to as “ground based” in the Forest Practice Rules, includes skidding with track-laying bulldozers, rubber-tired skidders, and other machines which travel along the ground and drag the logs behind them. These machines can be equipped with grapples or a winch and line. Winch lines generally do not exceed 150 feet in length. Tractor logging is used on gentler slopes where it can be accomplished with minimal ground disturbance and without jeopardizing water quality by mobilizing sediment near streams. Skidding equipment can often work on slopes up to 35 percent or more without excavating skid trails. As slopes steepen, skid trail construction and soil displacement become more likely. The practical limit of reach with a winch line is about 200 feet. On gentle terrain, and when skidding downhill, tractor skidding is usually more efficient and cost effective than cable and helicopter logging. Where protection of residual trees and regeneration is important, tractor logging often has an advantage because it is easier to control the logs as they are being moved. Adverse skidding (skidding uphill) is inefficient on slopes over about 30 percent and impractical over 50 percent. The Forest Practice Rules prohibit tractor logging on slopes over 65 percent, or over 50 percent where certain sensitive conditions exist.

Cable Logging

Cable logging involves use of a suspended cable controlled by a stationary yarding machine to provide lift to the logs being moved from slopes to the road. Nearly all cable logging done on the State Forest is referred to as short span skyline, meaning that the cable can reach up to about two thousand feet from

the yarder and can lift at least one end of the logs being skidded. Cable logging has the advantage of not requiring heavy equipment to travel throughout the harvest unit, thus reducing the amount of ground disturbance. Cable unit configuration is determined by where the yarder can be positioned. Although it is possible for some yarders to travel cross-country on gentle to moderate slopes, yarders generally operate from roads. Cable yarding is commonly conducted with the yarder positioned in a roadway above the harvest unit (uphill yarding). In some cases it is possible to log not only the slope immediately below the yarder, but also the opposite slope, lifting the logs clear of any watercourse and riparian zone in the valley. This can have enormous benefits in reducing the need for truck roads and stream crossings. One disadvantage of cable logging is that clear corridors must be created where yarded logs follow the path of the skyline cable. There is no practical limit to the steepness of slope that can be cable yarded. Communication between the yarder operator and workers below is by means of a horn which can bother residents and recreationists in the vicinity of the logging operation. In terms of efficiency and economics, cable logging typically costs about 25 percent to 50 percent more than tractor logging, although there are situations of steep but feasible slopes where cable logging may be more cost effective than tractor logging.

Helicopter Logging

Helicopters can be used to lift logs clear of the ground and move them to a roadside log landing area. This system provides a high level of protection to sensitive areas, but it is significantly more expensive than cable and tractor systems. Because of the downdraft from the rotors, helicopters can cause damage to residual trees by breaking tops and branches. Both downdraft and noise are potential impacts on nests and other wildlife elements, and noise can be a serious disturbance to residents and recreationists even a significant distance away from the operation. For safe operation of loading equipment, helicopter operations usually require larger landings than those required for cable or tractor logging.

In general, helicopter logging will be used in inaccessible and particularly sensitive areas. These would include odd corners within the property lines and long, steep or convex slopes where it is not feasible to place an access road and yarder landing above the harvest unit. Considerations of noise and disturbance impacts on nest sites and neighbors will affect the decision to prescribe helicopter use. Cable systems will be employed on steep slopes (generally above 35 percent) and in other areas where sensitive resources require protection from ground disturbance. Tractors will be used on the gentler slopes along ridgelines and on terraces.

Most of the anticipated road construction on the Forest will be to access new landings to serve one of the three logging systems described above. Thus, the design of logging and road systems go hand-in-hand.

The December 2005 DEIR identifies three mitigations for potential adverse noise impacts related to logging. For two of the three potential impacts, the mitigations were identified as needed to avoid significant adverse impacts. These three mitigation measures will be implemented as part of the Management Plan and are included in Appendix IX.

Specific Management Programs, Practices, and Standards

This section presents, by subject area, the specific management programs, practices, and standards that are to be implemented on JDSF. This section provides some of the most specific direction for the management of JDSF during the life of this management plan. Additional specific management measures and mitigations that were identified during the preparation of the December 2005 Draft Environmental Impact Report are included in Appendix IX. These measures and mitigations all will be implemented as a part of this management plan.

Road Management

The objective of the Road Management Plan (see Appendix IV) is to ensure that the design, construction, use, maintenance, and surfacing of JDSF roads will minimize sediment delivery to aquatic habitats. The Road Management Plan incorporates the Additional Management Measure for an Accelerated Road Management Plan that was developed in the 2005 DEIR. Improvement of JDSF roads to reduce sediment yield is needed due to the legacy of a road network partially relying on out-dated drainage systems and old segments located along watercourse channels. Numerous studies have shown that forest roads are a major source of management-related stream sediment. The Road Management Plan for JDSF, included as Appendix IV, is a program to inventory the existing roads and crossings, improve the road segments that will remain in the permanent transportation network, and abandon high risk roads where possible. Additionally, the road plan provides guidelines for new road construction. The goal of this program is to enhance stream channel conditions for anadromous fish, amphibians, and other sediment-sensitive aquatic organisms by reducing both fine and coarse sediment loading. The plan will also improve water quality by reducing suspended sediment concentrations and turbidity. The Road Management Plan includes the following primary components, which are summarized below.

Inventory and Priority Setting:

The inventory of roads and stream crossings will provide the basis for upgrading and mitigating the road system at JDSF. It will allow the Forest staff to identify problems that can be corrected through routine maintenance activities, assign maintenance and mitigation priorities to planning watersheds, road segments, and crossings, identify the most effective designs for roads, landings, and culvert problem sites, and identify roads to be properly abandoned. To the extent feasible, during the first three years of Plan implementation, all existing roads will be inventoried. Following a reconnaissance level screening for problem sites, staff and other consulted experts will develop site-specific mitigation measures for identified significant potential or existing problems.

The locations of critical habitat for coho salmon and steelhead will be used to prioritize the sequence of the road inventory work. Secondary factors will include existing rates of sediment delivery to sensitive watercourse channels, based on gradient and degree of confinement, and likely hazards such as high density of riparian roads or stream crossings. Following the inventory, priorities will be set for the work to be completed, including repair of problem road, landing, and crossing location sites, and proactive abandonment of appropriate roads. Forest staff will complete the priority listing of road work as quickly as feasible within the constraints of actual budgets and the road work that can be accomplished as a part of THPs.

Until the inventory is completed and Forest-wide priorities for road upgrades set, survey and evaluate all appurtenant roads as a part of each THP and complete the identified needed road upgrades as a part of the THP.

Design and Construction:

Road, landing, and crossing design will follow the current state of the practice, such as is currently described in the Handbook for Forest and Ranch Roads (Weaver and Hagans 1994), or as suggested by JDSF RPFs and CEGs where a timber harvesting plan (THP) has been submitted. Existing and new roads needed to accommodate cable yarding on slopes steeper than 40 percent will generally be located on or near ridge lines (although mid-slope roads will remain). The goal for the final transportation network is to establish roads in low risk locations that will accommodate appropriate yarding and silvicultural systems. A specific target road density, however, will not be used. Roads in unstable areas will be avoided whenever possible and are only to be built if a CEG finds it unlikely that mass wasting will deliver sediment to a watercourse.

Use Restrictions:

Wet weather operations on JDSF will be minimized. Specific measures include no truck hauling when greater than 0.25 inch of precipitation has fallen during the preceding 24 hour period (applies to the entire year, no hauling/vehicle access when road rutting is occurring at a rate greater than that found during normal road watering, resumption of hauling only after rain has ceased for 24 hours and no turbid water produced from road surface runoff is observed in ditches along the roads where hauling may occur, and seasonal closure or surfacing for roads located in WLPZs if they are subject to moderate to heavy log truck traffic during the winter period.

Inspection and Maintenance:

Proper maintenance is a key to reducing the long-term contribution of road related sediment. Permanent and seasonal roads will be inspected at least once annually to ensure that drainage facilities and structures are functioning properly. Three types of inspections will be used: (1) formal inspections, (2) rapid ad hoc inspections, and (3) storm patrol inspections. During formal inspections, all crossings and roads will be carefully observed every two years, and problem sites will be recorded on road/crossing inventory forms. To cover the period between detailed inspections, a rapid ad hoc inspection will be made by JDSF Foresters and other staff during normal activities. “Storm patrol inspections” of known or anticipated problem facilities will be triggered by large winter storm events. Abandoned roads will be inspected at least twice following the completion of the decommissioning process, including at least one inspection following a stressing hydrologic event.

Abandonment:

Information for identifying and prioritizing road segments requiring abandonment will come from the road inventory, which will be completed over the first three years of the Road Management Program. The actual number of miles that will be proactively abandoned will depend on the results of the inventory, but it is estimated to be between 50 and 100 miles. Some of the criteria that will be used to identify candidate roads to proactively abandon include unstable areas, roads in close proximity to a watercourse (particularly Class I watercourses with anadromous fish habitat), roads not needed for management purposes, and roads with excessive amounts of perched fill on steep slopes or in close proximity to watercourses.

Mitigations Related to Crossings and Watercourses:

Refer to the mitigations/management measures for the following topics that have been included elsewhere in Chapter 3 and Appendix IX to minimize potential impacts to the resources at risk: Heritage Resources, Fish, Wildlife, and Plants, and Watersheds as well as the mitigations included in the Road Management Plan (Appendix IV) and the DEIR. The following are an example of mitigations found in those sections that are specific to roads located in or near watercourses:

1. Roads to be part of the permanent road network are to primarily utilize upper slope locations without ditchlines connected to watercourses where possible.

2. Roads located within watercourse and lake protection zones (WLPZs) are to be abandoned where other existing feasible routes are available. Where there are no feasible alternatives, use will be minimized.

3. Winter storm inspections are to be used in sample and high-risk areas to insure that road drainage structures are functioning properly.

4. Work is to continue to restrict public motorized vehicular access to vulnerable sections of the road network during the winter period, as well as to educate the public regarding the importance of wet-weather road closures.

5. Road segments near watercourses that are to remain in the permanent transportation network with inadequate road surfacing will be evaluated for potential surfacing with competent rock to reduce surface erosion.

6. Placement of road spoils within the WLPZ will be avoided.

Heritage Resources

Agencies of the State of California have been directed to manage heritage resources under their jurisdiction in accordance with a variety of state policies, mandates, and regulations. CAL FIRE will continue to protect both the historic and prehistoric heritage resource sites located within JDSF. Where possible, protection will include site avoidance or mitigation intended to prevent resource damage. JDSF will, whenever feasible, avoid damaging effects on any historical resource of an archaeological nature. Preservation in place is the preferred manner of mitigating impacts to archaeological sites. Preservation in place maintains the relationship between artifacts and the archaeological context. Preservation may also avoid conflict with religious or cultural values of groups associated with the site.

In the ongoing effort to preserve and protect the heritage resources on JDSF, CAL FIRE continues to investigate methods and procedures that will improve and enhance the effectiveness of its heritage resource management program.

Management Goals:

1. Maintain the existing comprehensive, confidential heritage resources database for JDSF lands for use by designated on-site managers, including systematic mapping of prior archaeological survey coverages, and locations of formally recorded and noted heritage resources. Concurrent with this, establish a single systematic numbering system for sites assigned various designations (primary numbers, trinomials, IHR numbers, field numbers, etc.). For bibliographic references, compile copies of all heritage resources reports pertaining to JDSF and establish a numeric system for retrieving these references. Establish a reference library of pertinent regulations and laws, and relevant ethnographic, historical, and archaeological publications (cf Government Code Section 6254.10).

2. Assign responsibility for managing heritage resources to an on-site staff person who will maintain the above database and interface with professionals as needed, and serve as the point-of-contact for Native Americans who have heritage ties to the Forest and other interested parties such as local historical societies (cf. PRC Section 5097.9).

3. Formally record all historic period sites and features noted by Gary and Hines (1993) and Medin (1994) (cf. Foster and Thornton 2001:68; OHP 1989, 1995).

4. As needed during project review and in consultation with the SHPO, complete formal site significance evaluations per California Register of Historical Resources criteria for all recorded resources, relying on pertinent references, for contextual information about historic sites, buildings and structures and more recent regional studies of prehistoric resources (cf. PRC Sections 5020 through 5024; CEQA; OHP 1991).

5. Through the designated on-site heritage resources manager (Goal 2, above), consult directly with interested Tribes to identify traditional cultural properties, appropriately manage important traditional native plant collecting areas), establish protocols for Native American access for collecting, and provide opportunities for their participation in interpreting Native American history and prehistory at JDSF for public benefit (cf PRC Section 5097.9; CAL FIRE Native American collecting policy).

6. Identify and catalog existing archaeological collections and archival materials, and to the extent practical, consolidate collections in a secure place accessible for research and interpretation, establish a

collecting policy for JDSF staff and contractors, and implement a curation plan that includes accessioning future collected artifacts and pertinent records (cf. Foster and Thornton 2001:69; *Guidelines for the Curation of Archaeological Collections*, per PRC Section 5020.5(b); California and Federal NAGPRA laws).

7. Monitor and periodically inspect heritage resources on JDSF to ensure that existing polices are providing effective protection (cf. Executive Order W-26-92; PRC Sections 5020 through 5024; CEQA).

8. Conduct heritage resources training for all permanent CAL FIRE field forestry staff working at JDSF, and obtain and maintain current certification in identification of archaeological sites for key staff to assist with heritage resources surveys, site recording, monitoring of mitigation measures and site conditions, handling inadvertent discoveries, and educating contractors and the public about heritage resource protection laws and JDSF's heritage resources.

9. As funding and opportunities allow (e.g., competitive grants, interagency agreements with California State University anthropology programs), CAL FIRE will prioritize completion of a general (non-THP-specific) heritage resource inventory (including formal recordation and significance evaluation) for road systems and for those areas of JDSF suitable for tractor logging and where the highest ranked, appropriately sized merchantable conifer timber (e.g., redwood and Douglas-fir) occurs.

10. In concert with the road inventory described in the *Road Management Plan* for JDSF (DFMP Appendix IV), make it a priority to complete within three years, the heritage resources inventory for the existing road system (including rock borrow pits and related appurtenances) by employing standard procedures described in Archaeological *Review Procedures for CAL FIRE Projects* (Foster 2003). Consult with interested Tribes to determine if significant traditional cultural properties or other heritage resources such as plant collecting areas are present and may be affected. Planning for road improvements or abandonment needs to consider and implement measures to avoid or minimize potential impacts to significant heritage resources. Document heritage resources study findings using the CAL FIRE Archaeological Survey Report form or other report format consistent with OHP (1989) guidelines.

The following strategies are intended to achieve these goals.

Survey Methods:

The recent identification of previously unknown sites suggests that the potential for discovering additional prehistoric sites within JDSF has not been completely exhausted. The dense forest environment of JDSF and the resulting ground cover present an impediment to the successful identification of archaeological sites. The heavy accumulation of duff, leaf litter, slash, and thick understory vegetation can limit ground surface visibility. These conditions limit the effectiveness of visual pedestrian surface survey as a method for the identification of heritage resources. These conditions also hamper the accurate determination of site boundaries for those resources that are located. In many cases, topographic and environmental features must be employed to designate the most probable site areas.

As resources allow CAL FIRE will seek to undertake archaeological surveys at JDSF that are outside the scope of project planning activities. It is unlikely that the current inventory represents all of the archaeological sites located on the forest. The utilization of intensive survey techniques will be considered during these surveys in an effort to locate additional sites. In areas with limited ground surface visibility and where the obtrusiveness of archaeological remains is low, pedestrian surface survey may not be adequate to identify sites. More intensive survey techniques may be needed, such as periodic surface raking, mechanical vegetation removal, soil chemical surveys, or various forms of remote sensing. In these types of environments, a program of subsurface testing is usually necessary to discover buried archaeological remains. Subsurface testing can be accomplished by test pits and core sampling (Feder 1997). An attempt will be made to secure funding for intensive archaeological surveys in addition to the project-based surveys that currently occur.

Site Recording:

All newly identified archaeological sites located within JDSF will be appropriately documented soon after their discovery. Guidance for preparation of records is provided by the California Office of Historic Preservation (CDPR 1995). These records often include some combination of written description, site sketches, photographic records, and location maps as appropriate for the specific resource.

CAL FIRE will seek resources to record the known historic era sites located within JDSF. Many of the historic-era sites within JDSF have not yet been fully recorded, and some of the existing records do not meet current recording standards. Two recorded prehistoric sites, CA-MEN-1366 and CA-MEN-1694, have not been relocated since their initial documentation, although there have been attempts made to do so. Additional survey of the areas where these sites were reported to occur will be undertaken by CAL FIRE staff in an attempt to relocate them.

Site Significance:

All sites discovered on JDSF will be evaluated for potential significance. The protection of heritage resources is predicated on the perceived significance of the resource. One of the principal criteria for determining the significance of a site lies in the ability of the resource to provide information that can be useful in understanding the past. In a specific regional context, a significance assessment should take into consideration the ability of the site to address specific research questions. Integrity and condition are additional factors used to evaluate the significance of a site.

Sites that have been heavily impacted have potential to produce materials that can contribute information to answer important scientific research questions. This evidence can include ceremonial paraphernalia, formed tool artifacts, and lithic debitage. Obsidian debitage, in particular, is a valuable source of archaeological information offering the potential to reconstruct prehistoric exchange networks and cultural chronology through sourcing and hydration analysis. Formed tool artifacts can be used to interpret site function. Simply because sites have been damaged does not mean that they can no longer contain valuable information or are no longer significant.

Collections:

Artifacts in the CAL FIRE collections are linked to specific sites, but often have no accurate provenience from within the site area. As these sites are depleted of surface artifacts, it becomes more and more difficult to establish accurate site boundaries. Artifact provenience then becomes an important tool for accurately determining the site area on the ground. Collections are now located at three separate institutions making comparative analysis difficult. This also represents a missed opportunity for public interpretation. CAL FIRE should establish a uniform collection policy in consultation with CAL FIRE archaeological staff. The minimum collection standards suggested by Betts shall be considered (1999). It is recommended that CAL FIRE archaeological staff consider a centralized collection and display of resources gathered from JDSF.

Research and Demonstration:

The identification and protection of cultural resources are important components of forestry in California today. Registered Professional Foresters are required to attend archaeological training classes to acquire the ability to recognize cultural materials, and to develop resource protection measures. The Confidential Archaeological Addendum forms an integral component of THP preparation. In its role as a demonstration forest, JDSF can serve as a proving ground for the development and implementation of effective heritage resource management strategies and techniques. JDSF will continue to serve as an essential location for demonstrating viable heritage resource management strategies.

Research Design:

The conduct of modern archaeological research is directed by research designs. A research design is a statement of the theoretical and methodological approaches that will be followed in an archaeological study (CDPR 1989).

CAL FIRE shall consider review and update of the research design for JDSF. As part of the original cultural resource overview prepared for JDSF (Levulett and Bingham 1978) a set of research questions was developed in order to guide future surveys and data recovery projects. Since the development of these research questions, extensive archaeological research has been carried out in the North Coast Range region. These questions should be reexamined in light of the most current research to determine their relevance. A research design that addresses the historic archaeological sites within JDSF has not been formulated. An updated research design should be developed for JDSF that includes both historic and prehistoric resources, and is consistent with current theoretical concepts and methodological practices. This research design can then be employed to structure future archaeological investigations within the forest.

CAL FIRE's archaeological staff shall seek opportunities to conduct additional archaeological and historical research on the forest. Archaeological excavations at sites within JDSF will be undertaken when opportunities present themselves such as through an association with a state university or when necessary as a part of project planning, or if research funds become available. Consideration should be given to a long-term research project that would more intensively investigate the archaeological sites on the forest. A program of more intensive site investigation could also be undertaken in an effort to more completely and accurately define site boundaries. The delineation of more accurate site boundaries could help to avoid future management conflicts. Formal evaluations could also be undertaken in order to make determinations of the significance of individual sites. The effects of ongoing site impacts could also be partially mitigated by carrying out additional archaeological research. The two excavation projects that have been carried out on JDSF can serve as models for this type of research. The investigation at Three Chop Village (Layton 1990) was not related to potential project impacts, but was driven by a desire to explore the prehistory of the region in a spirit of stewardship for this resource. The excavation at Misery Whip Camp (Hylkema 1995) was an example of management other than protection through avoidance or alteration of project design.

Site Evaluation:

Detailed site evaluations will be considered as potential research and demonstration projects. Archaeological sites are evaluated to determine their significance. One of the principal criteria for determining significance lies in the ability of the resource to provide information that addresses specific research questions. Of the research questions developed by Levulett and Bingham (1978), to date only one has been formally addressed in an archaeological study. The question regarding the nature of Three Chop Village has been examined as a result of excavations carried out at that site (Layton 1990). This investigation produced substantial information that made a significant contribution to regional research goals. Some of the historic sites on the forest also hold the potential to provide information to answer scientific research questions. There is potential for the combination of several sites to provide answers to important research questions.

Mitigation Measures for Heritage Resources from DEIR:

The December 2005 DEIR identified 18 mitigation measures to address potential significant adverse impacts to heritage resources. These mitigations are incorporated into this Plan, refer to Appendix IX.

Minor Forest Products

The State Forest will continue to offer the opportunity to purchase minor forest products, subject to specific rules and constraints. Sales may be made to both the public and commercial private interests. Small sale (Class I) permits can be purchased for collection of products including salvage sawlogs, poles, split products, greenery (e.g. boughs, shrubs, and ferns), mushrooms, and firewood.

JDSF will strive to achieve a sustainable public use of the Forest and all its resources utilizing the following management procedures:

Continue to administer permits for collection of minor forest products.

- JDSF law enforcement staff will check for valid permits and compliance with permit conditions and other Forest use restrictions.

Continue to record, quantify, and report on permits annually. Use data to monitor resource collection trends, pressure, and forest health.

- On an annual basis, staff will review policies, prices and procedures for collection permits and revise as appropriate based on permit data collected.

Offer personal-use and commercial firewood collection following timber harvesting operations (if portions of the area can be made accessible to the public, subject to restrictions designed to protect the environment).

Firewood may be collected for use while camping, subject to a valid camping permit. Mushrooms may be collected for both personal and commercial use, subject to a valid permit.

Restrict collection of forest products where potential environmental effects are unacceptable, such as cutting of green redwood burls, manufacture of split products from desirable large woody debris, and salvage of wind-throw from riparian areas.

Identify areas on the forest where small, Class I (minor) timber sales could be developed for bid by Licensed Timber Operators.

- Small sales designed to achieve forest management goals, such as fire prevention, reforestation, hazard removal, and/or pest infestation
- Small sales designed to recover sawlogs after catastrophic events
- Small sales designed to promote research into small-log operations

Invasive Weed Species

The policy of the State Forest is to encourage the growth of vegetation that is native to our area and genetically suited for the site. This policy also supports Integrated Weed Management (IWM) as an approach to control vegetation that is not native to the State Forest. IWM at JDSF will provide demonstration value at multiple scales to a range of customers.

IWM is a prevention-oriented, ecologically based approach to managing weeds cost-effectively with minimal risk to people and the environment. IWM emphasizes control of the environmental conditions that cause or promote weed infestations. IWM includes direct suppression of existing weeds as well as modifying environmental conditions to reduce their suitability for weeds by encouraging the weeds' natural enemies or increasing competition for the scarce resources they require. IWM may make use of the benefits of cultural, mechanical, chemical (herbicides), thermal (fire), biological agents, or other techniques to reduce invasive weed populations and to promote forest health. A premise of IWM is that the most effective means of controlling weeds is to prevent their expansion into new areas while removing small, isolated infestations before they become problematic.

Management Goals:

The goals for invasive weed control on the State Forest are to:

- Emphasize the demonstration, and where appropriate, research role of JDSF regarding multiple aspects of invasive weed management on an individual population basis and on a landscape scale. This is intended to ensure IWM at JDSF provides relevant demonstrations at the ecologically appropriate scale as well as providing information pertinent to forest landowners and the public.

- Evaluate strategies for individual invasive plant species and their environmental setting to prioritize treatment. Not all invasive weeds pose the same threat to JDSF. Staff will use an incremental approach to identify and implement successful control strategies, focusing first on protecting higher value resources. Long-term success will be a key measure.

- Detect and directly control potentially damaging new infestations of invasive weeds prior to extensive seed bank establishment. This approach may be instrumental in managing invasive species with substantial local threat that are not yet widespread. This incorporates consideration of individual invasive species to those at the forest landscape-scale.

- Control existing infestations to minimize conflicts with important management objectives and to maintain natural ecosystem processes. This encompasses demonstrations at project-level scale (i.e. road systems, watersheds or timber harvest plans). The scale will be smaller and limited to experimental plots where more formal research is appropriate. The maintenance of ecosystem processes encompasses recognition of special status plants and unique areas such as Bob Woods Meadow.

- Prevent dispersal of invasive weeds into new areas. This encompasses demonstrations with the same range of scales as control stated above.

- Prevent reestablishment of infestations in areas that were formerly infested. This encompasses demonstrations with the same range of scales as control stated above.

- Staff will utilize current information pertinent to each specific weed management issue prior to selecting and implementing control methods. To the extent feasible, avoid or minimize the use of chemical (herbicides) weed management tools. See section on herbicides for more detail.

Planned Actions:

Staff will consider the impacts of invasive weeds to native vegetation during the normal course of project development. If there is a reasonable likelihood of weed spread due to a nearby infestation, mitigation will be considered where appropriate and consistent with IWM to minimize the spread of invasive weeds. Conservation and reestablishment of native vegetation will be considered in disturbed open areas adjacent to forest roads in order to minimize weed spread. For example, conserving both existing overstory and understory vegetation near roads may be an effective preventative measure. Other measures may be used to make roadsides less attractive seedbeds for invasive weeds or increase competition pressures on invasive weed seedlings.

A staff training program in identification of invasive weeds will be implemented. Training topics will include: integrated weed management, the ecological and management impacts of weeds, a weed location reporting system, and the employee's role in weed management.

Weed infestations on the State Forest will be periodically evaluated. Evaluation will include the following factors: weed species, location, probable causes of infestation, control treatments considered or applied, and the effectiveness of the treatments.

The spread of invasive weeds is a shared concern by many individuals and organizations within Mendocino County. JDSF will cooperate with local, state and federal agencies, forest landowners, private organizations (e.g., Pacific Gas and Electric Company) and public organizations [California Native Plants Society, California Invasive Plant Council and the Mendocino Coast Weed Management Group (CAL FIRE is a signatory member of the latter group)] to work towards control of invasive exotic weeds.

State Forest Staff will make an effort to identify post-harvest emerging weed populations during periodic examinations of harvest units and forest roads coincident with erosion control and forest stocking inspections. Treatment decisions will be made within the context of IWM goals.

JDSF, as one of the project initiators, will continue to support the International Broom Initiative to investigate biological control agents for French broom, Scotch broom, Spanish broom, Portuguese broom, and Gorse. The Commonwealth Scientific and Industrial Research Organization of Australia, U.S. Department of Agriculture, Cal-IPC and the State Forest are cooperators in developing environmentally safe biological control agents for these weed species.

Staff will increase their knowledge base of invasive weed species currently infesting, or potentially infesting the Forest. The ”California Invasive Plant Inventory” compiled by the California Invasive Plant Council can be used as an aid for identifying weeds species of concern. Invasive weeds of particular concern at JDSF currently include: French broom, Scotch broom, gorse, jubata grass (pampas grass), yellow star thistle, cape ivy, blue gum eucalyptus, and English ivy.

Herbicides:

CAL FIRE and the BOF recognize there is public controversy regarding herbicide use. A total ban on herbicide use would compromise research opportunities and the broad demonstration value of the Forest and could result in adverse environmental and economic consequences. JDSF staff will apply the following limitations to potential herbicide use:

- In an operational context, herbicides will be used only when no other effective and feasible control methods are found after consideration of the scope of the problem, opportunities to effectively manage the situation, and available alternatives and their potential effectiveness, costs, and risks.

- No herbicide will be used unless it is integral to long-term, ecological based management. Projects will be proactive rather than reactive. These considerations will limit and focus any herbicide use. Long-term management will often integrate a variety of treatment techniques.

- Public and environmental safety is a priority. When herbicide use is indicated, JDSF staff will reduce risk by selecting appropriate herbicide formulations and application techniques, as well as taking additional precautions.

- Recognize that some forest visitors may experience negative aesthetic reaction to dead treated plants, even if they are invasive weeds. Herbicide use will be evaluated for aesthetics where treatments could have this potential effect.

An effectiveness and feasibility analysis is required for operational use of herbicides. Herbicide use will be limited as part of an integrated pest management program. The Department will strive for effective management and control of invasive species to protect and maintain rare native plants and a natural mix of native species and plant communities. Limited use of herbicides will be use considered with a mix of mechanical and other vegetative treatments to promote natural levels of native hardwoods.

This plan limits the types of vegetation management that would be considered for herbicide use. Herbicide use will not be permitted for purposes of treatment of native species for road maintenance purposes, unless needed for a specific fire prevention project. Further restrictions on the use of herbicides are in place when used for control of hardwoods to adjust conifer/hardwood stocking rations and control of invasive weed species as part of an Integrated Weed Management program.

Additional guidance for potential consideration of herbicides use for restoration of historic conifer/hardwood ratios or for reforestation has been discussed in this chapter under Timber Sales.

Riparian, Wetland, and Floodplain Management

The goal of the prescriptions developed for the JDSF Management Plan related to watershed and fisheries values is to maintain or enhance important habitats for both anadromous and resident fishes found in JDSF and promote healthy and sustainable aquatic ecosystems. Specifically, properly functioning riparian and stream ecosystems will be protected or restored by managing forest stands in watercourse and lake protection zones (WLPZs) to promote their ecological succession to late seral forest conditions. Development of vertical structural diversity in these stands will be facilitated. A key overall management objective for in-channel areas is to increase the abundance and improve the distribution of key pieces of large woody debris (LWD). Streamside overstory and understory riparian trees in the WLPZ will provide sufficient canopy to avoid or minimize impacts to stream temperatures. Bank stability will be promoted by retaining vegetation, establishing equipment exclusion zones (EEZs) or equipment limitation zones (ELZs) along watercourses, and prohibiting ignition of prescribed fire near watercourses. Since JDSF is a publicly owned property available for research purposes, protection measures assigned to riparian areas are to remain sufficiently flexible for conducting research on the adequacy of differing riparian protection measures.

Wetland habitats on JDSF will continue to be managed in a manner that maintains or restores productivity and contributes to fish and wildlife habitat, water quality, and ecological functions and processes. The wetlands of JDSF are small in extent, but of high interest and value. They include two known Sphagnum bogs[6]6 and numerous springs and seeps with aquatic habitat values. Wetland habitat quality and hydrologic function will be protected.

Floodplain Management Measures:

Where there is evidence of floodplain connectivity for storm events with return intervals of 20 years or less in areas that are proposed for timber management, Forest staff will utilize the guidelines stated in “Flood Prone Area Considerations in the Coast Redwood Zone” (November 2005). In addition, Forest staff will be guided by the evaluation procedures included in the Riparian Protection Committee’s Final Report.

Water/Lake Protection Zone Measures:

Due to both the research and demonstration mandate for JDSF and the need for flexibility based on site-specific requirements, a range of possible riparian prescription measures will be possible. These include the following management measures (partially based on the approved BOF July 2000 Threatened and Impaired Watersheds rule package):

1. Class I – 150 foot WLPZ; class II – 50 to 100 foot WLPZ. Zone widths are to be expanded where appropriate (e.g., unstable areas, etc.). Both the Class I and II WLPZs will be managed to create late seral forest characteristics.

2. Timber operations within channel migration zones will not occur (except as allowed in the Forest Practice Rules).

3. Class I inner band– 25 feet wide beginning at the watercourse transition line: No-cut (except for harvest of cable corridor trees where needed) or limited entry to improve salmonid habitat through use of selection or commercial thinning silvicultural methods. At least 85 percent overstory canopy (where it exists prior to harvest) is to be retained within 75 feet of the channel.

4. Class I outer band– 125 additional feet: High basal area and canopy retention zone. Basal area retention will remain high through the use of single tree selection silvicultural systems. Vertical

[6] A sphagnum bog is an acid freshwater bog containing abundant sphagnum (moss), which may ultimately form a deposit of sphagnum peat.

overstory canopy (measured with sighting tube) at least 70 percent (where it exists prior to harvest) is to be retained in the outer band.

5. Class I/II: Ten largest conifers per 330 feet of stream channel retained within 50 feet of the watercourse transition line.

6. Class II inner band– 25 feet wide beginning at the watercourse transition line: No-cut (except for harvest of cable corridor trees where needed) or limited entry to improve salmonid habitat through use of selection or commercial thinning silvicultural methods. At least 85 percent overstory canopy (where it exists prior to harvest) is to be retained within 25 feet of the channel.

7. Class II outer band – remainder of WLPZ (25 to 75 additional feet): High basal area and canopy retention zone. Basal area retention will remain high through the use of single tree selection silvicultural systems. Overstory canopy will be retained to prevent water temperature increases and allow for adequate canopy recovery where required.

8. Within Class I and Class II WLPZ, retain a minimum of 240 sq. ft. conifer basal area following completion of timber operations.

9. Reentry - No more frequently than every 20 years for Class I WLPZs.

10. Class III – Equipment Limitation Zones (ELZs) will be at least 25 feet on side slopes less than 30 percent, and 50 feet on slopes greater than 30 percent. These zones will be expanded where site-specific investigations reveal that additional protection is merited for preventing sediment movement into class III channels.

11. Class III – Burning will be conducted so that the majority of large woody debris is left within the ELZ. Fuels are not to be ignited within 50 feet of Class III channels.

To further facilitate recovery of aquatic resources and habitats, the December 2005 DEIR added the Large Woody Debris Survey, Recruitment, and Placement Additional Management Measure (see Appendix IX). This additional management measure will be implemented as a part of this management plan.

Hillslope Management to Provide for Slope Stability

Forest management activities with the potential to destabilize slopes and/or damage aquatic habitat will be mitigated to help maintain stability of hillslope areas and control sedimentation. Special attention will be given to areas where mass wasting tends to occur. Site specific measures will be developed and applied in THP design and implementation for potential high hazard areas. The goal is to limit management related input of sediment into stream channels that could significantly affect aquatic habitat and water quality.

Inner gorge and unstable areas will be identified during initial THP preparation with a map and field review. A Certified Engineering Geologist (CEG) will be consulted for appropriate measures needed to avoid or minimize impacts where timber harvesting is proposed within the inner gorge, and when appropriate for proposed timber harvesting and use of ground-based equipment within unstable areas. While potential inner gorge areas for JDSF have been mapped by the California Geologic Service (largely from aerial photographs), they will be field verified prior to logging. Road construction and ground-based yarding activities in inner gorges will not take place without CEG advice.

Where road building is proposed in potentially unstable areas, the Registered Professional Forester (RPF) will seek the advice of a CEG. Appropriate prescriptions will vary depending on the site-specific conditions present. Where timber harvesting is allowed in these areas, silvicultural restrictions may apply.

Specific slope stability assessment techniques to be used as part of the JDSF Management Plan include:

a) Office Review of Existing Information. This information includes: 1) Maps of geologic and geomorphic features related to landsliding, 2) Relative landslide potential maps (see Map Figures V and W in the December 2005 DEIR), and 3) prior THPs and their geologic reports.

b) Field Review. Once office review has been completed, an on-site evaluation will be conducted throughout the project area by a Registered Professional Forester (RPF). Areas highlighted during the office review of existing information will receive special attention. The RPF will follow the 1999 "California Licensed Foresters Association (CLFA) Guide to Determining the Need for Input From a Licensed Geologist During the THP Preparation." (Appendix VIII)

c) CEG Input. A CEG is to be consulted as appropriate during the design phase of timber sale preparation work to address slope instability and erosion issues identified during office and field reviews, insuring that harvest units and road designs are proposed that adequately protect unstable areas and inner gorges. The 1999 CLFA guide will be used to aid in determining when to call for the services of a CEG.

The December 2005 DEIR includes two mitigations to be applied on JDSF to address the Management Plan's potential significant adverse impacts related to (1) landslides and (2) location on unstable geologic unit or soil. These are included in Appendix IX. These mitigations will be implemented as a part of this management plan.

Water Quality

Water temperature and sediment issues are the major water quality concerns for the watersheds occupied by JDSF. Sediment issues are the main focus of this section.

At the broadest level of water quality protection, JDSF staff will protect the beneficial uses of water by compliance with water quality objectives in accordance with the Water Quality Control Plan for the North Coast Region (Basin Plan), and by implementing required Total Maximum Daily Load (TMDL) measures. JDSF staff also will comply with other relevant regulations of the North Coast Regional Water Quality Control Board, including the Anti-degradation Policy, TMDL, Implementation Policy statement, the Nonpoint Source Policy, and other relevant current regulations, as well as any additional relevant regulations that may be implemented over time.

Sediment and Turbidity in General:

Reducing suspended sediment concentrations and lowering turbidity in waters flowing from JDSF are high priorities for this management plan. This goal relates to both drinking water standards and maintenance of a healthy aquatic habitat for anadromous fish. For example, the enforceable regulatory levels under the Safe Drinking Water Act require that all public drinking water systems not exceed the maximum contaminant level for turbidity of 5 mg/l, or approximately 5 nephelometric turbidity units (NTUs) (CDHS 1999). Laboratory data have shown that chronic turbidity levels of 25 to 50 NTUs can cause a reduction in coho salmon and steelhead trout growth (Sigler et al. 1984).

Data from the Caspar Creek watershed study shows that over the 1996 to 1999 hydrologic years, the North and South Forks have averaged 17 and 19 days over 40 NTUs each year, respectively (J. Lewis, USFS, Pacific Southwest Research Station, Arcata, CA, written communication). Turbidity levels exceeded 100 NTUs in the North and South Forks approximately 3 and 5 days, respectively, each year. It is likely that several of the planning watersheds in the western portion of JDSF have generally similar numbers of days with elevated turbidity levels.

The City of Fort Bragg's water supply intake on the Noyo River consists of a direct diversion system installed in 1992 and a Ranney infiltration gallery system built in 1982. The latter system has perforated pipe buried in 8 feet of gravel in the river bed. The Ranney system has experienced considerable problems due to sealing of the bed surface by fine sediment, hence the development of the direct diversion system. The Ranney system is still used, however, when winter turbidity levels in the river exceed 80 to 100 NTUs (Ted Steinhardt, City of Fort Bragg, Water Plant Manager, personal communication). City of Fort Bragg records indicate an increase in turbidity levels in the mid-1980s to early 1990s, with water quality improving considerably in the past 10 years. Turbidity levels are currently much like they were in the late 1970s to early 1980s. Summer turbidity levels average approximately 0.8 NTUs, while winter turbidities average about 15 NTUs. Normal winter storms elevate turbidity levels to about 70-80 NTUs, with spikes well into the 100's of NTUs. Ideally, untreated water being diverted from the Noyo would have a turbidity level of less than 10 NTUs during the winter months.

More extensive and detailed discussions and analysis of turbidity, suspended sediment, and sediment sources, including more recent data, can be found in the December 2005 DEIR. Relevant sections of that document include sections VII.6.1 Aquatic Resources, VII.10 Hydrology and Water Quality, Appendix 10 Peak Flow Analysis, Appendix 11 Overview of Existing Sediment Studies Relevant to the JDSF DEIR, and Appendix 12 Stream Temperature.

The primary techniques that will be used to reduce turbidity and suspended sediment concentrations in JDSF watercourses will relate to improved practices associated with road maintenance and timber operations. As discussed in the watershed current conditions portion of this document (Chapter 2), road related surface erosion is estimated to account for half of the sediment generated within the 15 planning watersheds draining JDSF. Implementation of the Road Management Plan is expected to significantly improve water quality. Specific items that will reduce turbidity and suspended sediment concentrations include: hydrologically disconnecting inside ditchlines along road segments from watercourses and other road upgrading actions, reducing winter hauling on wet roads, properly abandoning roads located near watercourses, and use of annual inspections of roads to improve road maintenance. In addition to road management actions, improvements associated with hillslope operations will reduce sediment entry into watercourses. These practices include reduced tractor logging on steeper slopes, better recognition and mitigation measures for unstable slopes and inner gorge areas, and use of wider equipment exclusion zones—keeping ground disturbing activities further away from stream channels.

Specific Approaches to Addressing Sediment-Related Water Quality

Roads:

For a discussion of roads, refer to the Road Management section in this chapter, above, and Appendix IV.

Riparian Zones:

Watercourse and lake protection zones are to be managed to provide high levels of large wood input for fish bearing waters. See further discussion of this issue in this chapter, below, in the section, Fish, Wildlife, and Plants.

In those areas where channel (migration) zones exist, harvesting is to be excluded from the floodplain area, except as necessary to conduct upslope harvesting operations. [Channel zone, as defined in the Forest Practice Rules, means the area that includes a watercourse's channel at bankfull stage and a watercourse's floodplain, encompassing the area between the watercourse transition lines.]

Bare soil surfaces associated with management disturbances within WLPZs and ELZs that exceed 100 square feet are to be mulched to achieve at least 95 percent coverage to a minimum depth of four inches where there is potential for soil detachment and transport.

Watercourses:

Large woody debris can play an important role in storing sediment and metering sediment movement in streams. Large woody debris may be added to fish bearing waters found to be deficient in wood loading. This work, to be conducted with a research and demonstration function, is to be coordinated with the California Department of Fish and Game and other relevant agencies and interested parties. Three Riparian Restoration Demonstration Areas have been designated on Map Figure 5 for experimentation including the LWD loading of streams. LWD measures are detailed elsewhere in this chapter and in the section Fish, Wildlife, and Plants, below.

Watercourse crossings are to be inventoried to insure that adequate fish passage is present; problems are to be corrected as needed.

Watercourse crossings are to be inventoried to locate high-risk crossings; identified crossings are to be upgraded or abandoned.

New and replacement watercourse crossings are to be sized for 100-year discharge events, as well as for passage of woody debris and sediment.

Adequate protection (i.e., Class II watercourse protection measures) is to be provided for seeps, springs, and small class II watercourses.

Water drafting specifications according to the Forest Practice Rules are to be used during timber operations.

Hillslopes:

Areas with a high relative landslide hazard potential, including inner gorges are to be evaluated in proposed timber sales (see also the Hillslope Management to Provide for Slope Stability section of this chapter, above).

Aerial yarding systems (e.g., skyline cable, helicopter) are to be utilized where possible and on slopes steeper than 40 percent.

A CEG is to be consulted as appropriate during the design phase of timber sale preparation to insure that harvest units and roads are proposed that adequately address unstable areas and inner gorges.

Winter period timber operations (November 15 to April 1) are to be avoided, except for timber falling and erosion control maintenance unless specifically developed to accommodate winter operations.

Water Temperature:

The main controllable factor with respect to water temperature is the amount of canopy cover over streams and the adjacent areas. JDSF management will protect and enhance water temperature parameters by maintaining a high level of canopy cover over streams and adjacent areas. This will be accomplished by managing the WLPZs for Class I and II streams for the development of late seral forest characteristics. The specific measures that will be applied for WLPZ protection and enhancement we previously detailed earlier in this chapter, in the section Riparian, Wetland, and Floodplain Management.

A second means of protecting and enhancing water temperature parameters is through the enhancement of deep pools that store cool water and provide refugia for fish. The measures contained in the Management Plan for recruiting and placing large woody debris in streams will provide important structural elements that support pool formation, hence cooler water temperatures. LWD measures are detailed elsewhere in this chapter, in the section Riparian, Wetland, and Floodplain Management (above)

and the section Fish, Wildlife, and Plants, below. See also the Additional Management Measure for Large Woody Debris Survey, Recruitment, and Placement in Appendix IX. This additional management measure will be implemented as a part of this management plan.

Fish, Wildlife and Plants

The overall objective for fish, wildlife and other non-timber resources is to manage habitat and special habitat elements. Discussed here are the principal areas of concern and proposed management direction. Jackson Demonstration State Forest, given its geographic location, vegetation types, and demonstration mandate, is in a unique position to develop habitats that contribute to improvement in the population viability of certain species of concern and to protect or restore other forest values. Opportunities exist for habitat restoration and management for species that may or may not presently occur on the forest. Similarly, efforts to control the establishment and spread of invasive weed species will contribute to the protection of biological diversity from both a local and regional perspective.

The measures that follow represent generally accepted habitat and species conservation practices that may be modified where appropriate for research and demonstration purposes where they are supported by experts in the field, undergo appropriate CEQA analysis, and include appropriate survey, study, and monitoring.

Protection and Enhancement of Aquatic Organisms and Associated Habitat

The FMP has been developed to achieve desired future conditions that will provide site- and species-specific protection measures that contribute to maintenance or improvement of the long-term conservation of population viability of aquatic and riparian dependent species of concern and enhance habitat values over existing conditions. Individual project stream and riparian protection and management measures will be determined on a site-specific basis and be designed to attain or maintain properly functioning condition while implementing the following protection measures.

The goal of the JDSF riparian and stream management program is to maintain "properly functioning" riparian and stream ecosystems, i.e., systems that provide essential ecological function. JDSF's management strategy will go beyond simply preventing significant detrimental effects to aquatic and riparian habitats. The goal is to ensure that the aquatic and terrestrial resources and the ecological functions of riparian areas are protected and improved or restored. JDSF will manage forested stands in water/lake protection zones (WLPZs) to promote their development to late-successional forest conditions. JDSF will retain and enhance the vertical structural diversity of these stands, and protect riparian zone special habitat elements such as snags and large woody debris (LWD) to improve habitat values.

Stream and riparian protection and management measures will be determined on a site-specific basis. A variety of conservation measures are available to avoid degradation and improve aquatic and riparian habitat. For example, large woody debris may be recruited to the stream through undisturbed buffer strips, retaining a predetermined number of trees, rotation age adjustment, or silvicultural control of recruitment rate and the species mix of trees. In order to develop an integrated conservation approach it is necessary to identify stream and riparian conditions that may already be degraded and could be affected by planned operations. As these areas are identified, measures will be developed that are intended to improve conditions, especially in regard to LWD loading.

Wetlands:

JDSF will manage wetland habitats in a manner that maintains or restores productivity and contributes to aquatic habitat, water quality, and ecological functions and processes. JDSF will protect wetland site integrity and hydrologic function.

Riparian Zones:

Riparian areas along streams and rivers are among the most ecologically important elements of forest landscapes. Forests have a range of functional links to streams and rivers, including providing energy, nutrients, and coarse woody debris. Along smaller streams, forest conditions also strongly influence light and temperature conditions. The stability, or lack thereof, of the soil and rock underlying the forest also controls the level of fine sediments, gravel, and boulders that enter the stream system and create much of the streambed structure.

The goal of the JDSF riparian and stream management program is to maintain "properly functioning" riparian and stream ecosystems, i.e., systems that provide essential ecological function. Management measures and discussion of riparian zone management can be found in the previous section of this Chapter (Riparian, Wetland, and Floodplain Management) and in Appendix IX for a complete description of protection measures for riparian areas. Additional specific aspects of the management strategy previously discussed concerning aquatic organisms and their habitat are detailed in the sections that follow.

These habitat protection measures will be implemented within riparian zones to promote and protect riparian ecosystem function:

- Natural springs and seeps that may provide habitat for non-fish aquatic species are provided the same protections as Class II streams.
- LWD within the WLPZ will be retained and recruited to the stream system unless it presents an imminent risk to safety or drainage structures.
- The Road Management Plan will be implemented to minimize delivery of road-related sediment to aquatic habitats and facilitate fish passage at Class I and II road crossings.
- Selected roads within the WLPZ will be abandoned and decommissioned as described in the Road Management Plan. Construction and abandonment will be consistent with the standards described in the Road Management Plan.
- Road construction and harvesting proposed in inner gorge areas may be approved only after conferring with a Certified Engineering Geologist.
- Fish passage at Class I crossings will also be assessed and addressed as needed.

Large Woody Debris Survey, Recruitment, and Placement:

The recruitment of LWD to the stream environment over time and consequent influence on the formation of pool habitats is also achieved through a variety of other habitat conservation strategies. In addition to the management measures listed above, the following strategies will be applied where they overlap with stream environments:

- Retain native hardwoods in the WLPZ except where species imbalance has occurred.
- Old-growth groves and residuals are protected per the JDSF old-growth conservation strategy.
- Salvage of dead or dying trees will not occur within the WLPZ, old-growth augmentation area, species-specific management area described in a habitat conservation strategy, or other area specifically identified. Exceptions may exist in response to large-scale occurrence of fire, insect attack, windthrow, or threat to infrastructure.

Please see Appendix IX for an additional management measure related to large woody debris, originally developed as part of the DEIR. This additional management measure will be implemented as a part of this management plan.

Protection and Enhancement of Wildlife Species, Habitat, and Forest Structure

The wildlife management objectives of the Forest are designed to protect or improve current populations and habitat by maintaining a diverse, dynamic matrix of forest habitats and seral stages suitable for a wide variety of native wildlife populations. Manage designated old-growth reserves for maintenance of late seral habitat values. Maintain and recruit special habitat elements necessary for properly functioning habitats. Management goals and direction are intended to initiate a trajectory of management that will result in about one-third of the Forest area being in older forest structure, late seral forest, or old-growth.

Recruitment of Late Seral and Older Forest:

Management areas have been designated adjacent to three existing old-growth groves or complexes [Road 334 Grove (an additional 492 acres), Waterfall Grove complex (an additional 250 acres), and Upper James Creek Grove (an additional 38 acres)] to provide for the recruitment of additional late seral forest stands. These management areas will receive the same site-specific protection measures (i.e., special silvicultural management zones) as the old-growth grove reserves when THPs occur adjacent to these areas. These protection measures will increase the ecological values of these groves as habitat for marbled murrelet and other species, and help buffer the groves from various types of disturbance.

Late seral forest characteristics will also be cultivated in the Mendocino Woodlands Special Treatment Area (2,224 acres located in the Lower North Fork Big River planning watershed excluding the Railroad Gulch Research Area). Management in this area may include thinning from below and individual tree selection designed to emphasize development and retention of large trees.

An additional area that encompasses part of the Russian Gulch and Lower Big River watershed (1,549 acres) has been designated for marbled murrelet habitat recruitment/late seral development. This area has important habitat potential due to its close proximity to the coast, State Park lands (Big River and Russian Gulch), and the Mendocino Woodlands Special Treatment Area (discussed above).

Where timber harvest is proposed near old-growth groves, late seral development areas, or the Older Forest Structure Zone, a buffer will be applied. No even-aged silvicultural systems may be used within 300 feet, and only single tree selection may be used within the first 100 feet adjacent to these areas.

The WLPZs on Class I (150-feet wide) and Class II (100-feet wide) streams will be managed for the development and maintenance of late seral forest characteristics. These areas cover approximately 7,436 acres.

Portions of other special concern zones may have designated areas where silvicultural activity will not occur. This management will allow for the recruitment of large trees that may develop the structural characteristics commonly associated with old-growth trees.

JDSF intends to recruit trees with late seral or old-growth characteristics in areas that enhance the ecological effects of forests with these structural characteristics. Trees with old-growth or late seral characteristics cannot be recruited during the life of the management plan. However, second-growth trees, over time, can be allowed to grow to develop structural characteristics similar to old-growth trees. The JDSF Management Plan makes a commitment to manage identified forest areas to achieve that goal in as short a time frame as possible.

Older Forest Structure Zone:

To provide for an extensive corridor or older forest structure across the Forest, from west to east and north to south, a 6,803-acre Older Forest Structure Zone (OFSZ) has been designated. This corridor is indicated in Map Figure 5. The OFSZ corridor connects most of the old-growth groves and late seral development areas on the Forest. The OFSZ and its management has already been described earlier in

this chapter in the section Structural Conditions Related to Late Seral, Watercourse and Lake Protection Zone Areas, and Older Forest Structure Zone Area.

Old-growth Forest:

Existing old-growth groves will be retained, as will aggregations of old-growth trees. Individual old-growth trees found outside of stands or aggregations and exhibiting specified characteristics will be retained, with limited exceptions, such as where the tree presents a public safety issue or retention would result in the potential for greater long-term environmental damage. Old-growth retention and recruitment measures are presented below. In addition, refer to DEIR section VII.6.3 Timber Resources for a discussion of the old-growth protection measures.

Old-Growth Management Objectives and Definitions

The management objectives for old-growth stands and trees are to:

- Protect existing old-growth groves and improve their value as wildlife habitat, and manage selected second-growth forest stands for old-growth and late seral attributes.
- Retain small aggregations within larger young-growth stands to maintain and enhance the ecological value of these stands for native species.
- Retain individual trees not found in groves or aggregations that are identifiable as old-growth trees based on specified characteristics.

An old-growth conifer tree is any live conifer, regardless of size or species that was present in the original stand before the first historic logging on JDSF (1860), based upon the professional judgment of JDSF staff. Characteristics often found in old-growth trees that can help identify them are:

The bark is more deeply furrowed and more weathered on old-growth trees than on young-growth trees, often having a plated appearance. Bark scorching may be heavier on old-growth trees, indicating that they were present during fires that occurred before the first logging in the Forest. A tree size that is larger than would be expected for the stand age, management history, and site quality may indicate an old-growth tree. Limbs often significantly larger in diameter than expected for the stand age, site quality, and canopy closure may indicate an old-growth tree. Limbs often extend from the trunk at more of a downward angle than is common in younger trees.

Old-growth conifers that also have one or more of the following structural characteristics will be retained unless specified otherwise in the Plan:

a) DBH greater than 48 inches.

b) Goose-pen (an opening one foot or more in diameter inside and above the top of the trunk opening).

c) Platform branches greater than 8 inches in diameter.

d) Exfoliating flanged bark slabs.

e) Chimney top (hollowed upper stem)

f) Dead top at least 16 inches in diameter and 16 feet long.

Guidelines for Protecting Old-Growth Trees and Reserves

Old-growth conifers with any of the attributes described in a. through f. above will be retained in any prescription unless the tree presents a public safety issue or retention would result in the potential for greater long-term environmental damage, including but not limited to issues related to road and landing sites, soil instability, damage to aquatic resources, or cable yarding requirements.

Since it is often difficult to visually distinguish between young-growth and old-growth hardwoods, size will serve as a surrogate for age. All hardwoods 36" DBH + will be considered for retention, as will other hardwoods that appear to be old-growth and possess characteristics similar to those in a. through f. above. Where forest stands appear to have greater hardwood site occupancy than in the past, hardwoods of any age may be removed to restore former species balance, favoring old-growth hardwoods for retention whenever appropriate.

Known old-growth stands have been identified and will be retained. Some of these old-growth stands are to be augmented with surrounding late seral development areas to enhance their function and value to wildlife.

Old-Growth Aggregations

An old-growth aggregation is defined as an obvious, intact, undisturbed remnant of the original stand, with an area of at least two acres. Delineating the boundary of an aggregation will be guided by the principle that a gap of 200 feet or more between trees breaks the continuity of a potential aggregation. No trees, young or old, shall be designated for harvesting in an old-growth aggregation, except as necessary for the construction or use of truck roads, landings, skid trails, cable corridors, tail holds and guy anchors needed for timber harvesting. All identified aggregations will be mapped. No old-growth trees within aggregations will be removed unless the tree presents a public safety issue or retention would result in the potential for greater long-term environmental damage, including but not limited to issues related to road and landing sites, soil instability, damage to aquatic resources, or cable yarding requirements.

Structural Retention and Restoration:

At the time of a timber harvest, the retention of existing stand elements for inclusion in the replacement stand provides refugium and inoculum for the re-establishment of organisms. This is accomplished through the use of live and dead elements in various spatial configurations (i.e., dispersed or aggregated). Structural elements include snags, downed logs, and live trees of varying sizes. This approach is increasing and is a high priority for research associated with the habitat value associated with a range of habitat elements and spatial arrangements.

Structural restoration represents management activity intended to accelerate the development of complexity in structurally simple stands. The retention of existing old-growth groves provides a baseline for measuring complexity. The older forest structure zones and blocks adjacent to parks and large corridor units are priority candidates for structural restoration. Some of these elements are discussed below. Basal hollows are another element that have received some study on the forest (Mazurek and Zielinski 2004). The efficacy of basal hollows in improving habitat is deserving of additional study as are methods to create these structures in the absence of wildfire.

The ability to influence structural restoration through management is illustrated in Figure 2. By reducing redwood density through thinning, biomass was concentrated on fewer trees resulting in substantially larger trees within a few decades (Lindquist 2004).

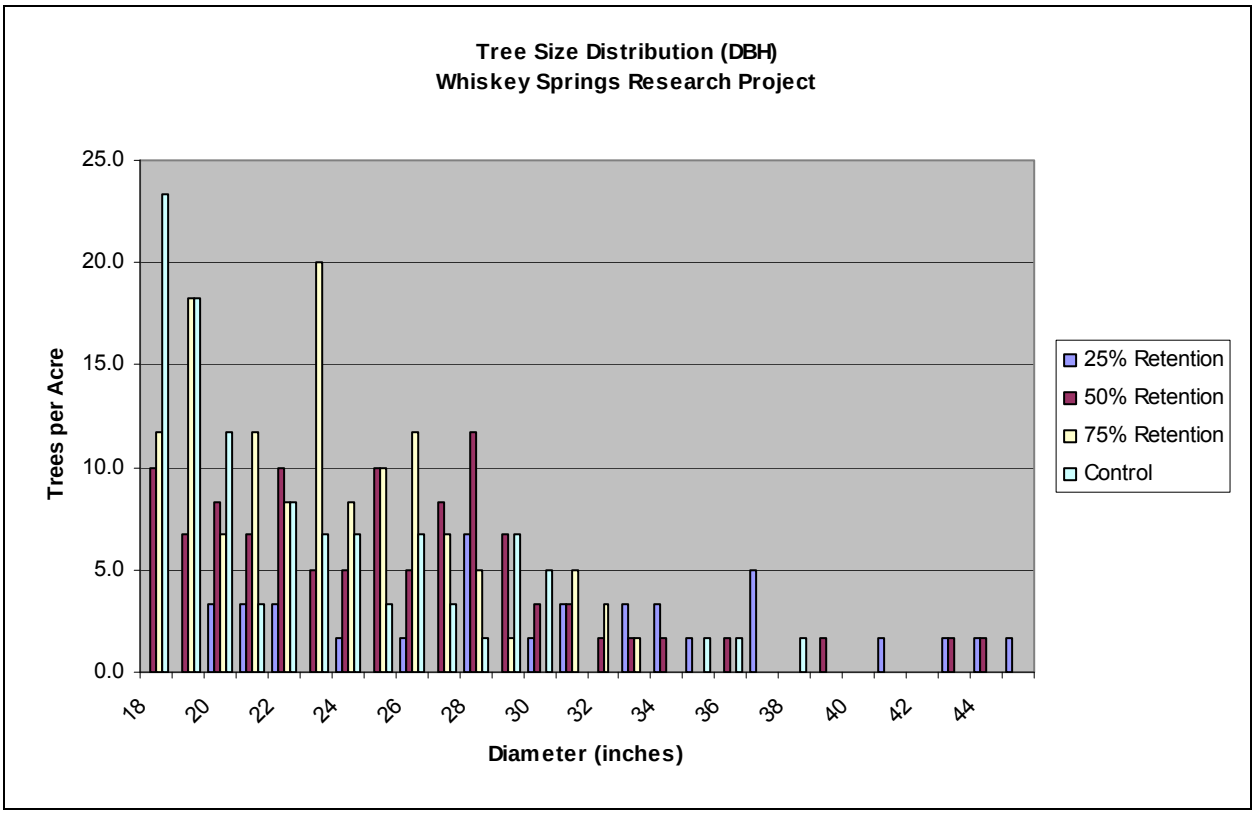


Figure 2. The effect of stand density on tree size development.

Snag Retention and Recruitment:

Snags are standing dead trees that provide important structural components of the forest ecosystem. Wildlife species' use of snags varies from incidental use to dependence. In modeling wildlife habitat dependence in Mendocino County, the Wildlife Habitat Relationship results indicate that 90 vertebrate species prefer or require snags to fulfill a portion of their life history needs (2 species of amphibians, 54 birds, and 36 mammals) (DFG 1996).

Snag diameter influences its longevity and value to wildlife. The minimum size that provides value to most wildlife are dead trees greater than 11 inches in diameter at breast height (DBH) and 12 feet or greater in height. (Thomas et al 1979). In general, larger snags provide better habitat than smaller snags because they last longer (before they decay and fall), provide better thermal cover, and accommodate a more diverse spectrum of wildlife species.

All snags will be retained within all timber harvest areas with the exception of snags that pose a fire or safety hazard, or are within the alignment of roads proposed for construction.

A goal for the entire forest is to attain one snag per acre (on a 160-acre sub-watershed scale) that is at least 30 inches DBH. The desired future condition for snags in all WLPZs and wildlife special concern areas (i.e. old-growth groves, older forest structure zone, and late seral development areas) is to have three snags per acre, of which two are at least 20 inches DBH and one is at least 30 inches DBH, averaged over a 160-acre sub-watershed area. Periodic sampling will be utilized to monitor snag density as part of the CFI inventory system.

Snags will be unevenly distributed across the forested landscape in both riparian and hillslope areas. The distribution pattern of snags will include grouped and scattered single trees. JDSF also will recruit snags through indirect measures, such as retention of larger conifers (at least 30 inches DBH) in select areas to

provide wildlife habitat. Snag retention policies are designed to provide habitat for maintaining viable populations of cavity-dependent and facultative snag-using species, and to provide for recruitment of large woody debris on the forest floor.

The December 2005 DEIR provides a mitigation to address potential impacts to snag- and large-woody-debris-dependent species; it has been included in Appendix IX. This mitigation will be implemented as a part of this management plan.

Large Woody Debris on the Forest Floor:

Large woody debris (LWD) includes downed logs, limbs, bark, root wads, and stumps. Lack of LWD on the forest floor can be a limiting factor to habitat use. Past timber harvesting practices have greatly reduced the amount of large woody debris on the forest floor in managed forests. Large woody debris is also an important structural component in aquatic and riparian habitats. The objective of retaining large woody debris on the forest floor is to maintain or enhance wildlife habitat and soil nutrient levels.

JDSF will manage for a minimum of two downed logs per acre that are at least 20 feet in length with a diameter of 16 inches on the large end and one log per acre at least 24 inches in diameter on the large end and at least 20 feet long. Log densities are averaged over a 160-acre subwatershed area. WLPZs and special concern areas will contribute a greater proportion of downed logs.

Hardwoods:

JDSF will maintain the naturally occurring hardwood components in riparian stands (WLPZs) and other special concern areas when consistent with the objectives of that area. The goal is to maintain hardwood tree composition at approximately 10 percent (West End) to 15 percent (East End) of the stand basal area. Maintaining and recruiting hardwoods on JDSF, including larger size classes, will enhance not only wildlife species diversity but also forest structural diversity.

Snag and Cavity Dependent Species of Concern:

JDSF management objectives are to maintain or increase the number and productivity of these species through forest management practices that enhance nesting or roosting opportunities by providing site and species specific protection measures including the maintenance or development of requisite habitat. See Snag Retention and Recruitment and Large Woody Debris on the Forest Floor objectives above.

Protecting and Enhancing Specific Wildlife Species of Concern

The FMP includes general riparian protection measures for the Olive-sided Flycatcher and Yellow Warbler. The FMP includes specific protection measures for the Northern Spotted Owl, Osprey, Snag and Cavity Dependent Species of Concern, Marbled Murrelet, Northern Goshawk, Cooper's Hawk, Sharp-shinned Hawk, Vaux's Swift, Purple Martin, and Sonoma Red Tree Vole. For other species, JDSF will evaluate the potential for individual land management actions to have a significant impact on listed (rare, threatened, or endangered) species. In those cases where that impact may be significant, appropriate survey and mitigation measures will be implemented. Although individual project circumstances will dictate the procedures to be used to determine degree of project associated impacts, in general, a scoping process followed by surveys and mitigation development will occur. An assessment area that extends beyond the boundaries of the planned activity also may be required for some species. For unlisted species identified as sensitive, evaluation and mitigation practices are likely to vary according to identified need, the current state of species knowledge and through consideration of input provided by DFG.

Species Surveys:

Special status species make an important contribution to forest biological diversity and are addressed in federal and state laws, some which are included in this plan. JDSF's objective for long-term special status species management is to determine what specific forest management activities are needed to assure long-term conservation. The JDSF management plan outlines species and/or habitat management protections and management actions to meet that objective. To better identify and conserve species and meet our commitment to maintain biologically diverse and healthy ecosystems, JDSF conducts pre-project species scoping and implements surveys as necessary to assess ecological requirements and species driven management opportunities and constraints.

1. Pre-Project Scoping

JDSF will engage in a project-specific scoping process to identify those special status species likely to occur in the affected environment of a project area and the potential habitat impact from the activity either individually or cumulatively. A variety of sources of information will typically be consulted and contribute to the planning process. These include the California Natural Diversity Database and the JDSF GIS database, as well as a variety of completed survey and focused species inventory and research efforts. The scoping process will evaluate likelihood of species presence, habitat availability, survey methodology and timing, and possible mitigation or opportunities for habitat enhancement. Population density and detectability of the special status species, habitats occupied, and the level of habitat disturbance expected from the land management action guide survey intensity..Current literature and species authorities will be consulted as necessary.

2. Training

JDSF will provide for, on an as-needed basis, a sensitive wildlife identification training program to enhance the ability of field personnel to recognize these resources. Personnel who will be responsible for northern spotted owl and marbled murrelet surveys will meet the USF&WS and/or DFG recommended qualifications for conducting the appropriate survey. JDSF supports personnel seeking more formal instruction and training in this area.

3. Biological Survey

Surveys conducted for special status animal species, when indicated following pre-project scoping, will be to established protocols, after consultation with federal or state wildlife management agencies as appropriate, or practices commonly accepted by CAL FIRE and DFG for Timber Harvesting Plan review. In general these species are listed and may be among those considered Species of Special Concern by the DFG California Natural Diversity Database or otherwise recognized by state or federal endangered species acts. Surveys for special status species will include suitable habitat within the proposed project impact area and inquiries regarding occupancy or suitable habitat off-site that may be affected by project implementation. Surveys, irrespective of the state of protocol development, are conducted at a time of year that facilitates positive identification and maximizes the likelihood of contact in the field. Observations of rare, threatened or endangered plants, animals or plant communities will be recorded on Field Survey Forms and copies provided to the DFG California Natural Diversity Database (CNDDB). Survey summaries will form the basis for the development of monitoring and adaptive management strategies that may include modification of the nature and location of land management prescriptions.

Management and the analysis of cumulative effects must ultimately shift away from a single-species approach to one that is inclusive of single species and ecosystem structure and function. Concentration on the needs of individual species can result in mismanagement of other more common species and their

habitat, additional listings, public polarization, and an unstable regulatory environment. In general, it is more efficient to evaluate risk to a species by examining impacts to its habitat when that information is available rather than directly counting or modeling population levels over time. Key components of this approach involve a temporal evaluation of amount, quality, and spatial arrangement of habitat. Implementing forest planning with a habitat approach requires descriptions of species-habitat relationships and landscape pattern that capture the diversity within the region (Wildlife/Science Committee 1994). Broad resource assessments and analyses as informed by all-species surveys are an important first level element.

Floristic and faunistic surveys (all-species surveys), as distinct from focal species surveys, can be beneficial to project and species management planning and cumulative effects analysis when sufficiently supported over the long term. These kinds of surveys can help identify unique or previously unknown habitat associations, range extensions, evaluate the likelihood of congeneric species presence, and assist in the validation of species-habitat relationship models. One additional benefit of an all-species survey is that currently common species can be related to habitat measures and form an informational base for the development and validation of spatial habitat relationship models and improved cumulative effects analyses.

Conversely, all-species surveys are beset with many of the same issues as focal species surveys but at a somewhat greater scale and cost, particularly for animals. Variable wildlife migration or activity period, and the variety of survey methodologies required for wildlife species make all-species surveys at any scale relatively problematic and costly. In general, it can be expected that a greater number of surveyor visits will be required to fulfill the objectives of an all-species presence/absence determination. This level of survey also requires a greater level of surveyor biological expertise to achieve desired accuracy and consequently, greater up-front costs over the short-term. In addition, formal listing of a species previously noted in an all-species survey would not obviate additional survey visits for any new project planning and implementation to ensure appropriate protections are put in place. Similarly, floristic survey costs are influenced by the ability and experience of the surveyor, market factors driven by surveyor availability, access, terrain and vegetation variables, and number of visits needed to observe species during the appropriate identification period.

As JDSF re-builds staff, expertise and research capacity, an improved understanding of biological resources will result. At this point in time JDSF must rely on current sources of predictive habitat relationship models, occurrence data, and pre-project scoping that is followed by focused survey effort for special status species as necessary. Included are continued development of a forest GIS database of species occurrence, data capture from prior project survey effort, and forest-wide research/survey results completed by other agencies and academia. It is expected that over time and with consistent data capture in JDSF's database, improvement in the predictability of the status and occurrence of special status species will emerge. Floristic and faunistic survey effort to address the occurrence of all-species regardless of status remains a managerial option pending need, resources, and personnel availability.

Northern Spotted Owl Conservation Strategy:

Forest management objectives for northern spotted owls on JDSF are to maintain or increase the number and productivity of nesting owl pairs through forest management practices that enhance nesting/roosting opportunities and availability of a suitable prey base.

Habitat Protection

- Habitat protections provided for existing activity sites are described in detail in the Forest Practice Rules and the March 25, 2005 CAL FIRE memo (http://www.fire.ca.gov/rsrc-mgt_content/downloads/NSOReviewGuidelines03_25_05.pdf). Activity sites are considered a nest or primary roost site occupied by a resident single or pair of birds irrespective of their reproductive success. Activity sites are valid if occupied at least one year in three. Activity sites are protected with

a one-quarter mile radius seasonal disturbance buffer, a 1,000-foot habitat protection buffer, and other measures to prevent take as described in the Forest Practice Rules unless otherwise modified during consultation with the USFWS.

Species Protection

- All proposed timber harvesting plans containing suitable nesting or roosting habitat will continue to be surveyed following established survey protocols endorsed by the responsible state or federal agency.

- All timber operations within the disturbance buffer of an active site will occur outside of any seasonal closure to prevent disturbance. The determination of seasonal closure dates to prevent disturbance during the nesting period are between February 1 and August 31 as described in the CAL FIRE memo (March 25, 2005).

Habitat Management Practices

- Within 500 feet of the nest site, habitat will be retained as follows: 25 percent of area composed of trees greater than 11 inches DBH and 60 percent or greater canopy cover. 75 percent of area composed of trees greater than 24 inches DBH and 60 percent or greater canopy cover. Trees greater than 24 inches DBH and over a distinct layer of trees of 6-24 inches DBH and greater than 60 percent canopy closure may contribute to the 75 percent.
- Within 500-1000 feet of the nest or roost site, habitat will be retained as follows: trees greater than 11 inches DBH and greater than 40 percent canopy closure.
- Within a 0.7-mile radius of the activity site 500 acres of habitat will be provided (inclusive of the 1000 foot radius buffer above).
- Within a 1.3-mile radius of the activity site 1336 acres of habitat will be provided (inclusive of the 0.7-mile radius buffer above).

Operational Protection Measures

- Helicopter yarding within 0.5 miles of an activity center will be prohibited between February 1 and August 31.

Osprey Conservation Strategy:

JDSF management objectives for osprey are to maintain or increase the number and productivity of nesting osprey through forest management practices that enhance nesting opportunities.

Habitat Protection

- Osprey nest trees will be protected with a buffer zone using topography to minimize disturbance to the maximum extent possible. Disturbance buffer location and configuration will be determined in consultation with the California Department of Fish and Game (DFG).
- A nest site will be considered unoccupied and protection standards do not apply if after a period of 3 years occupancy cannot be documented. However, the nest tree and any associated screen trees will be protected.
- Protect perch, screen and pilot trees identified in consultation with DFG. These trees will be designated in the interest of long-term occupancy of the territory and not based just on an individual bird's tolerance or accommodation of disturbance.

Species Protection

- Nests within the boundaries of the proposed management activity or unit of treatment will be surveyed prior to operations to assess occupancy. These surveys will also be conducted within the largest disturbance buffer established (see below). Nest surveys are defined as two visits of up to 3 hours long to the nest site and distributed across the nesting period to assess occupancy.

- All timber operations within the buffer of an occupied nest site will occur outside of any seasonal closure to prevent disturbance to occupied nests. The critical period that defines seasonal closure dates to prevent disturbance during the nesting period is described in the Forest Practice Rules (919.3(d)(5) as March 1 to April 15, extended to August 1 for occupied nests) unless site-specific conditions warrant otherwise. DFG will determine the need for modification of seasonal closure dates.

- Disturbance buffers (within which the seasonal closure will apply) specific to management activities will be established per the Forest Practice Rules.

- There shall be no log hauling within 300 feet of an active nest during the nesting and fledging seasons. The log-hauling buffer shall not apply for nest sites within 300 ft of permanent haul roads when there is no other feasible existing haul route available.

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Marbled Murrelet:

CAL FIRE has identified key areas for assessment of their suitability for current habitat and for future potential marbled murrelet habitat development and species recovery: Russian Gulch, Lower Big River, Mitchell/Jughandle Creek, and lower Hare Creek**.** The designated area within Russian Gulch and lower Big River comprises 1,549 acres that are devoted to development of late seral forest habitat primarily for the benefit of the marbled murrelet. In addition, the creation of 6,803-acre OFSZ also will provide additional potential murrelet habitat over time.

The US Fish and Wildlife Service has proposed a change in the designation of critical habitat for the marbled murrelet on portions of the Forest [FR 71(176):53838-53886, September 12, 2006]. This designation, if finalized at a future date, may affect management of this area where a nexus with federal permitting or funding exists, in order to prevent destruction or adverse modification of the critical habitat. At this point in time, the potential effects upon future management in the area are speculative.

Under an additional management measure developed in the DEIR process, CAL FIRE proposes to conduct an assessment to determine which areas offer the greatest potential for current and future Marbled Murrelet habitat (see Appendix IX). This assessment will include areas the DFMP already establishes for old-growth protection and late seral forest development, as well as the Mitchell/Jughandle Creek and lower Hare Creek areas. The purpose of this new management measure is to ensure that management of JDSF contributes to providing additional suitable habitat that is intended to aid recovery of Marbled Murrelet populations. This assessment process may result in a spatial reallocation of the acreage currently identified for the recruitment of late seral forest conditions and potential Marbled Murrelet habitat. Areas outside JDSF with murrelet sightings and potential to minimize fragmentation and edge effects, corvid (raven) predation, and human disturbance will be included among the factors to guide murrelet habitat emphasis areas. If late seral forest areas are reallocated to improve Murrelet habitat protection and improvement, there will not be a reduction in the total acreage designated for late seral development, and there may be an increase. Any reallocation will be done in a way so as to not compromise other resource protection values provided by the late seral forest allocation contained in the FMP. Until the assessment is completed, the forest stands within the assessment area consisting of Mitchell/Jughandle Creeks and lower Hare Creek may be managed in a manner consistent with development of late seral forest characteristics.

CAL FIRE proposes to conduct this assessment and potential late seral reallocation during the first 18-24 months of DFMP implementation. CAL FIRE would involve relevant wildlife agencies, adjacent landowners such as State Parks and the Conservation Fund and other interested parties in the assessment process.

Marbled murrelet management issues are addressed with both short- and long-term site- and species-specific protection measures. For the purposes of this Management Plan, potential marbled murrelet habitat is defined as any intact remnant stand of old-growth forest at least two acres in size and 200 feet across, or other forest area agreed upon by consultation between CAL FIRE and DFG.

Short-Term Marbled Murrelet Protection (Conditions are met within the term of the management plan)

Habitat Protection

- Augmentation areas composed of second-growth forest have been delineated for three old-growth groves or complexes to enhance functional characteristics, minimize edge and increase size: Road 334 Grove (492 acres of augmentation), Upper James Creek Grove (38 acres of augmentation), and Waterfall Grove Complex (250 acres of augmentation). Additional areas within which murrelet habitat may be developed over time include most of the Mendocino Woodlands special treatment area, the Upper Russian Gulch area, and the Lower Big River area. These areas will be managed to recruit late seral habitat conditions.

Species Protection

- Surveys to protocol endorsed by DFG will be conducted on all project sites with potential habitat and include the largest disturbance buffer established (see below), if management activities have the potential to affect occupied marbled murrelet habitat and management activities are to be conducted within the seasonal closure period to prevent disturbance.
- The marbled murrelet breeding season and disturbance seasonal closure is March 24 through September 15. From August 6 through September 15 there will be no operations until two hours after sunrise and no operations within the buffer area after two hours prior to sunset to prevent disturbance to occupied habitat areas, unless protocol surveys document murrelet absence.
- Disturbance buffers (within which the seasonal closure will apply) specific to management activities will be established as follows as measured from the occupied nest site:
  - Blasting operations: one mile.
  - Helicopter use: within 1/4 mile.

Habitat Management Practices

- CAL FIRE will consult with an interagency prescription team that includes representation from the USFWS, DFG, and CAL FIRE to develop further details on silvicultural prescriptions applicable to augmentation, old-growth areas, and the Mendocino Woodlands Special Treatment Area.
- THPs that are proposed adjacent to augmentation areas will provide a 100 to 300 foot special silvicultural zone (single-tree selection managing for large trees) depending on silvicultural prescription adjacent to augmented and old-growth groves. Uneven-aged units adjacent to the augmented groves will receive a 100-foot special silvicultural zone; even-aged units will receive 300 foot special silvicultural zone.
- Special silvicultural zones will be subject to harvest activities but only during times outside of the seasonal closure for disturbance or if protocol surveys document the absence of murrelets.

Long-Term Marbled Murrelet Protection (Conditions are not fully met within the term of the management plan)

As discussed above in the section Recruitment of Late Seral Forest, several areas of JDSF will be managed as late seral forest development areas to, in part, over time recruit potential habitat for the marbled murrelet. Similarly, Class I and Class II WLPZs will be managed to create late seral forest characteristics over time, thus also recruiting potential murrelet habitat.

Northern Goshawk, Cooper's Hawk, and Sharp-shinned Hawk:

The northern goshawk is not currently known to inhabit JDSF or adjacent lands, but may be present.

Species Protection

- Northern goshawk ,Cooper's hawk, and Sharp-shinned hawk surveys will be conducted in potential habitat areas subject to timber management activity and include the largest disturbance buffer to be established for that management activity (see below).
- Occupied northern goshawk nest sites and associated habitat (including perch, screen, and pilot trees) will be protected and mapped when the species is located during Timber Harvesting Plan preparation or other project surveys. The area protected will include the nest site (100 acres) and Post Fledging Area (PFA) (300 acres). Cooper's and Sharp-shinned hawk nest sites will be provided protections after consultation with DFG.
- All timber operations will occur outside of any seasonal closure to prevent disturbance to active sites. The critical period that defines seasonal closure dates to prevent disturbance is described in the Forest Practice Rules (919.3(d)(4) March 15-August 15) unless site-specific conditions warrant otherwise. DFG will determine the need for modification of seasonal closure dates and those required for Cooper's and Sharp-shinned hawk.
- Disturbance buffers (within which the seasonal closure will apply) specific to management activities will be established in accordance with the Forest Practice Rules.
- DFG will be notified when nesting northern goshawk, Cooper's or Sharp-shinned hawks are detected to facilitate enforcement of falconry laws.

Habitat Management Practices

- Vegetation structure of an active northern goshawk nest site and post fledging area (PFA) will be managed outside of the seasonal closure established for disturbance to attain the following structural characteristics:
- Nest Site: for goshawk nest sites maintain CWHR 5D or 6 (if not available, then CWHR 4D) or other condition derived by an interagency prescription team that includes representation from DFG and CAL FIRE.
- PFA: interagency prescription team will meet to develop details on silvicultural prescriptions to be applied.
- Vegetation structural stage objectives for nest site and PFA conditions may be altered under an adaptive management approach as additional data is acquired regarding northern goshawk habitat requirements in redwood and Douglas-fir forests.

Vaux's Swift and Purple Martin:

Habitat Protection

- Retain trees exhibiting cavities considered suitable for Vaux's swift and purple martin that do not interfere with the development of required forest infrastructure.
- In even-aged regeneration silvicultural treatments (including clearcut, shelterwood, seed tree seed

step, and shelterwood or seed tree removal) and group selection, all snags will be retained unless representing a worker safety or fire control issue.

Habitat Management Practices

- Within the WLPZ, recruit snags by retaining large fir trees as a stand component.
- Salvage of dead or dying trees will not occur within the WLPZ, old-growth augmentation area, species-specific management area described in a habitat conservation strategy. Exceptions may exist in response to large-scale occurrence of fire, insect attack, windthrow, or threat to infrastructure.
- Snags reflective of the range of conifer species present will be recruited within or nearby even-aged and small group selection areas. Snag recruitment trees will be clustered if practicable specifically in areas that are considered important to purple martin: ridge lines, adjacent to ponds or other natural forest openings, or areas of prevailing wind.

Sonoma Tree Vole:

Sonoma tree vole management issues are specific to the maintenance of habitat connectivity and forest tree species composition.

Habitat Protection

- Potential habitat is defined as those areas that are at least 40 percent forested by trees greater than 11 inches DBH, 60 percent canopy closure and a high proportion of Douglas-fir.
- Management will maintain a significant area of potential habitat in a connected state with a significant component of Douglas-fir. It is anticipated that uneven-aged management, stream zones, and other connected patches of timber meeting the potential habitat definition will accomplish this goal.

Species Protection

- CAL FIRE will encourage a research effort to examine Sonoma tree vole habitat, seral stage use and habitat connectivity requirements in JDSF and adaptively manage for the species based on results.

Habitat Management Practices

- Each planning watershed will maintain a significant Douglas-fir component.

Protection of Unique Habitats

Pygmy Forest:

JDSF will maintain the current distribution and species composition of this plant community and protect it from harmful human disturbance, while continuing to allow compatible recreational activities. Sphagnum Bogs will be protected due to their location within the Pygmy forest and their wetland status.

In addition, Cypress Groups, elements of bishop pine/pygmy cypress forest on unproductive soils (non-timberland) will not be subject to harvest. Some of this vegetation may also be considered Northern Bishop Pine Forest, a series or association considered rare and worthy of consideration by California Natural Diversity Database (dated 9/2003). Note that both Bishop pine and pygmy cypress can occur on disturbed more fertile redwood forest. In these areas (i.e. timberland) harvest may occur. As a special status plant species, effects to individual upland pygmy cypress will be evaluated on a project basis.

Mushroom Corners:

The Mushroom Corners area partially overlaps the Caspar Experimental Watershed, Russian Gulch/Lower Big River - a Late Seral Recruitment area, county roads with visual and recreation concerns, as well as proximity to State Parks and private land ownerships (see Map Figure 5). In California, there are no fungi species listed as Federal or State Endangered or in the more inclusive Department of Fish and Game, Natural Diversity Database special status lists. Longbeard lichen occurs on JDSF and has been assigned special status by CNDDB. This area is particularly important to the mycological research community, in part due to its ease of access and presence and abundance of a diverse number of species.

Although the analysis in the December 2005 DEIR did not find any potential adverse environmental impacts to the Mushroom Corners area, it did provide an additional management measure, which is included in Appendix IX.

Plant Species of Concern

The following plant and lichen species of concern (Listed species or CNDDB 1 and 2 status) are currently known to occur on JDSF:

Arctostaphylos mendocinoensis, pygmy manzanita
Astragalus agnicidus, Humboldt milkvetch
Campanula californica, swamp harebell
Carex californica, California sedge
Cupressus goveniana ssp. *pigmaea,* pygmy cypress
Lilium maritimum, coast lily
Lycopodium clavatum, running-pine
Pinus contorta ssp. Bolanderi, Bolander's pine
Usnea longissima, long-beard lichen

JDSF will provide site and species specific protection measures that contribute to maintenance or improvement of long-term conservation of population viability of plant species of concern throughout their range.

Habitat Protection

- Management activities will be altered (including avoidance of the plant population) if necessary to prevent significant negative effects.
- California Forest Practice Rule protections for wet meadows, springs and other wetland habitats.
- Survey measures discussed below.

Guidelines for Plant Species Surveys and Avoidance of Significant Impacts

Rare, threatened, and endangered species, as defined by Section 15380 of the CEQA Guidelines, will be addressed during the scoping, surveying, and mitigation-development processes. For species that do not meet the Section 15380 definitions of a rare, threatened, or endangered species but that are CNPS list 3 or 4 species, evaluation, scoping, and mitigation practices are likely to vary according to identified need, the current state of species knowledge, and consideration of input provided by DFG through the scoping process.

Scoping

The scoping process would normally begin with the identification of sensitive species and their habitats that may be affected by the project and are of management concern. For habitat issues, the scoping process may include habitat issue characteristics, a description of presence in the assessment area, and where potentially impacted, a description of the potential impact, measures to minimize the impacts, and an analysis of significance. For individual species, project-associated risks, limiting factors and current status will be considered. Project specific review may include an evaluation of the availability, quality, and quantity of suitable species habitat within the project and assessment area including an evaluation of known actual or potential presence of the species. To be thorough, the pre-project scoping process will include referencing the JDSF plant list from the EIR and current updates, available database information from the California Natural Diversity Database and CNPS Inventory, and other sources of sensitive plant habitat and occurrence data.

Surveys

When suitable habitat is present within or immediately adjacent to the project area, project-planning documentation will include surveys as described below, and a discussion of the efforts made to determine presence or absence of the species in question. An assessment area that extends beyond the boundaries of the planned activity may also be required for some species.

For timber harvest plans and other large projects with the potential for negative effects on rare plants, JDSF shall follow the Guidelines for Assessing the Effects of Proposed Projects on Rare, Threatened, and Endangered Plants and Natural Communities (DFG 2000). On smaller scale projects, the survey effort will be appropriate for the level of CEQA analysis and the risk of impact to rare plants.

Observations of rare, threatened, or endangered plants or plant communities will be recorded on field survey forms and copies provided for the DFG California Natural Diversity Database.

Mitigation Development

Upon determination that a proposed action is likely to result in a significant adverse effect, mitigation measures proposed to substantially lessen or avoid the impact will be included in project-associated documentation. Avoidance measures and other necessary mitigations will be specified. Some projects will require consultation with a DFG Botanist which may lead to implementing an adaptive management approach. For example, JDSF undertakes invasive weed control and road maintenance modification in areas with existing Humboldt milk-vetch (*Astragalus agnicidus*) occurrences as part of a management approach resultant from an agreement with DFG.

Improving Knowledge of Rare Pants

JDSF will provide for, on an as-needed basis, a sensitive plant identification-training program to enhance the knowledge of field personnel that may encounter sensitive plant resources. Personnel who will be responsible for botanical surveys should meet the recommended qualifications for botanical consultants included in the DFG survey guidelines (DFG 2000).

Species Protection from Invasive Weeds

The December 2005 DEIR provided an additional management measure related to the protection of rare plants from invasive species, which is included in Appendix IX.

Recreation, Aesthetics, and Public Use

In accordance with Board of Forestry and Fire Protection policy, recreational facilities will generally be maintained to provide a rustic and informal experience. Existing recreational opportunities and associated management measures (i.e. infrastructure maintenance and improvement) will continue (as described in Chapter 2), and new opportunities will be created. Implementation of the following objectives will facilitate attainment of the Recreation Goals listed in Chapter 1.

Recreation Input and Planning

Form a User-Group Recreation Task Force

JDSF will develop new relationships with the full range of groups who are interested in joint stewardship to enhance the recreational opportunities on the Forest. Staff will solicit representatives from different place-based groups, interest-based groups, recreationalists and schools for participation in a Forest Recreation Task Force or other organized capacity. The intent of the task force will be to share in stewardship, development of policy recommendations, and carry out other responsibilities regarding recreation on Jackson Demonstration State Forest. Meetings will occur at least annually. Participants may include, but not be limited to: JDSF neighbors, cyclists, equestrians, target shooters, teachers, hunters, hikers, campers, bird watchers, nature photographers, trail guide writers and event organizers.

JDSF will contact leaders of local recreation interest groups to meet as a whole, one or more times during the calendar year, with the following goals:

- Recreation user groups will review recreation policies and plans, and develop survey concepts specific to their interest area. Surveys will provide feedback to JDSF staff on facilities and trails, changes needed to policies and plans, and recreation impacts from planned timber harvest and demonstration projects. Users will provide input on changes needed to address recreation user conflicts, such as conflicts between hunters/shooters and hikers; bicyclists and equestrians; campers and equestrians, etc.

- Recreation user groups will help define a JDSF recreation corridor, particularly around the campgrounds and heavily-used trails, where recreation impacts will be given strong consideration with respect to state forest management activities. User groups will help define recreation attributes that should be protected within the corridor, and make recommendations accordingly, such as
    - Measures to minimize aesthetic visual and noise impacts; and/or
    - Designing timber management activities to improve and/or demonstrate recreation opportunities, principles, or practices.
- User groups will address how to mitigate land adjacency conflicts, such as recreational shooting, off-road vehicle use, and mushroom collecting. User groups will be asked to provide input on how to reduce resource damage from illegal dumping and off-road vehicle use. User groups will be invited to participate in developing and maintaining trails and associated infrastructure such as benches, natural bridges, and erosion control structures.

- Recreation user groups will help develop a recreation calendar for annual planned events. Staff will work with groups interested in docent activities, conducting tours, creating better public awareness, and a developing a recreation-based website.

Recreation Users Survey

As described above, the Recreation Task Force will be used to help develop recreation user survey concepts. JDSF will contract with a professional to develop and administer the surveys and to prepare a report of the results and recommendations for how JDSF might respond to the findings. The professional hired will be asked to confer with the Recreation Task Force during this process.

Develop a Recreation Plan

Using the guidance of the Recreation Task Force, the results of the recreation users survey, and the advice of the new JDSF advisory group, develop a recreation plan for the Forest that identifies short-term and long-term priorities for enhancement of recreation opportunities, including those related to the development of new recreation facilities (e.g., trails, campgrounds, interpretive sites) and the operation of existing facilities.

Improve JDSF Recreation Facilities and Information[7]

JDSF will inventory trails and schedule repairs and signage needs, update and reprint supplies of trail brochures, maintaining availability at trailheads. Staff will work with recreation user groups to identify need for new trail links, new trail maps specific to user types, and new trail development as needed.

JDSF will update and develop new posters for displays roadside and onsite, which address historic and pre-historic use (Native Americans, etc.) of the Forest, and provide educational and interpretive posters and pictures. In addition, road signage will be improved.

JDSF will update and develop new maps, handouts and brochures for the office foyer, including state forest brochures. *All new brochures will include a statement about how to protect cultural and natural resources on the forest.* Brochures will include (but not be limited to) interpretive trail brochures/maps, handouts on tree ID/ growth characteristics and silviculture information, and handouts on JDSF wildlife, flowers, mushrooms, the Caspar Watershed Study, history of the State Forest, and user-specific recreation maps.

Where businesses express interest, information on recreational opportunities on the Forest will be made available at local and regional sporting goods stores and other places that the interested public might frequent.

The Little Red Schoolhouse, an historic site, will be restored and opened to the public (located at Camp 20). Hours of operation will be determined based on the public's interest and availability of volunteers to assist in staffing the building.

Promote Personal Safety and Protect Natural Resources on JDSF

JDSF will recruit and train qualified camphosts to be Volunteers in Prevention (VIPs). Camphost VIPs will continue to issue campfire permits and convey the JDSF recreation goals, purpose, policies, and rules to visitors during the camping season, and to promote a safe and fun camping experience. The two host campsite facilities will be improved to attract more applicants.* (Currently neither site has electricity or plumbing.)

JDSF will explore the need for new or revised laws and policies as necessary to improve the recreational experience while protecting the environment, historic sites, artifacts, and habitat integrity. Staff will revise

[7] May require increased recreation budget allotments for operating and personnel expenses associated with identified tasks.

permits for campfire, and non-commercial (free) mushroom and campfire wood collection permits as necessary to emphasize the need to protect both cultural and natural resources, including a statement on contacting state forest staff if archaeological sites are discovered, and/or if there are illegal uses or known resource abuses.

JDSF will refine the development of determining recreation carrying capacity for the following recreation-related activities: campgrounds, including rules on parking, number of persons/campsite, outhouse constraints, access points, seasonal wildlife and water quality constraints, trail and road constraints (weight limits and seasonal closures).

Carrying Capacity

Board policy directs that a recreational carrying capacity is to be developed as part of the management plan to guide the development of new campgrounds, picnic areas and trails. Carrying capacities for other recreational uses are not asked for; those other uses either occur primarily on the forest road system (e.g. bicycling, horseback riding, sight-seeing) or are dispersed across the landscape (e.g. mushroom gathering, deer hunting), and are not tied to facilities or improvements specifically developed for recreational activities.

There are several approaches to defining "carrying capacity."[8] Most focus either on the maximum physical capability of the facilities, or on the level of use that can be sustained without an unacceptable impact on the facilities and on other resources. Carrying capacities can be calculated for existing facilities, and for what might be possible with development of appropriate additional facilities.

The summary table below presents current maximum and sustainable carrying capacities, and potential future sustainable carrying capacities. See Appendix V for specifics of how the carrying capacities were determined.

Table 10. Recreational Carrying Capacities

Recreation Use	Maximum Physical	Current	Potential Sustainable	Potential Increase
Campgrounds (camper-days)	120,296	24,059	30,074	6,015
Picnic areas (picnic-days)	45,260	9,052	11,315	2,273
Trails (hiker-days)	186,880	81,030	162,060	81,030

It is clear from this summary table that the vast majority of the potential increase that is within the carrying capacity of the forest will involve the increase use and expansion of the day use trail system. Jackson has a wide variety of trail users that range from afternoon hikers, dedicated birders and wildlife watchers, mountain bikers, and horse back riders.

Management Measures for Recreation

1. Timber harvesting within 300 feet of campgrounds and day-use areas will be planned and conducted with the designated site use in mind. Main access routes to high-use recreation areas will have slash abatement within 50 feet of the road.

2. Active timber operations within the vicinity (to be discussed at time of sales preparation) of occupied campgrounds and picnic areas will be limited to weekdays and non-holidays. Noise abatement

[8] Schwarz, C.F., E.C. Thor, and G.H. Elsner. 1976 Wildland planning glossary. General Technical Report PSW-13. USDA Forest Service, Pacific Southwest Forest and Range Experiment Station, Berkeley, California.

mitigation will be included in any timber sale within 1000 feet of an open campground for timber operations occurring between July 1 and Labor Day. Camp Hosts will be kept informed of activities associated with timber operations affecting campgrounds under their jurisdiction.

3. Road surfacing for heavily used recreational roads will be upgraded in order to limit erosion, protect the beneficial uses of water, and provide safe driving conditions.

4. JDSF will seek joint efforts with the Department of Parks and Recreation and the Mendocino Woodlands Association to manage the area adjacent to the Mendocino Woodlands Outdoor Center for educational and recreational purposes.

5. Recreation facilities such as trails and roads used for recreation also are addressed in the FMP by their inclusion in the Road and Trail Corridor Special Concern Area.

Mitigations to Avoid Potential Recreation and Visual Impacts

a. For even-aged timber harvest plans or harvest plans adjacent to buffer areas, conduct field evaluations by a RPF or his or her designee to determine the visibility of the THP area to the Forest visitor as seen from roads, trails, and recreation areas. Evaluations will include, but not be limited to: the degree and duration of vistas and general topography of the THP area in relation to the view aspect, and type and density of forest canopy and understory cover of forest areas surrounding the THP area. Where appropriate to visually soften and mitigate impacts created by even-aged management on the integrity of scenic views visible to the general forest visitor, develop the THP to include one or a combination of the following: modify the configuration of the harvest area to better reflect topography; modify the configuration of the harvest area to avoid spanning ridgelines in whole or in part; or leave selected standing trees along the harvest edge boundaries.

b. For public safety, post and maintain signs around all areas closed to public access for timber operations that include information defining the period of closure. In order to avoid conflicts between recreation uses and for public safety, post and maintain appropriate signs around all areas closed to hunting, trapping, and the use of firearms. Signs should be posted at all points where roads and trails enter such areas and, in the case of hunting restrictions, at legally required intervals along the perimeter of such areas.

c. Other recreation facilities such as trails and roads used for recreation are addressed in the FMP by their inclusion in the Road and Trail Corridor Special Concern Area.

The December 2005 DEIR provided several mitigations to avoid potential significant adverse recreation or visual impacts, which have been included here and in Appendix IX. These mitigations will be implemented as a part of this management plan.

Forest Protection

Fire Protection

The Mendocino Unit Chief is responsible for fire protection in the State Forest. The Forest Manager, the Operations Officer, the Fire Prevention Battalion Chief, and the local CAL FIRE Battalion Chief will work together to ensure an adequate fire protection program is in place for JDSF. In addition, the State Forest staff will work with other agencies, adjoining landowners, and timber sale purchasers as needed to provide a comprehensive fire protection program for the State Forest.

Pre-suppression

Pre-suppression is defined as fire protection activities performed before fire occurrence to ensure effective fire prevention and suppression. Pre-suppression plans discuss site-specific ways to minimize loss and reduce fire hazard and risk. The local CAL FIRE Battalion Chief will be requested to update the current pre-suppression plan for JDSF with assistance from the Forest Manager and the Fire Prevention Battalion Chief. The more comprehensive plan will include definitions and assessments of high risk and hazard areas, maps of fire defense improvements, descriptions of prevention techniques, and an evaluation of available resources. This plan will also identify potential locations for incident camps in the event of a large extended-attack fire.

Fire History

Establishing the known fire history is an important part of any pre-suppression plan. A fire history helps to identify the risk of natural or human-caused fire over any given time period, and provides a better understanding of the forest ecosystem as it currently exists. A complete and current fire history for the State Forest is partially complete. The local CAL FIRE Battalion Chief and Forest Staff will be encouraged to continue to update the fire history as more information becomes available. Sources of information may include prehistoric (fire scars and the use of dendrochronology) and historic (fire reports) records.

Fire Defense Improvements

Where installed, fire defense improvements will be strategically located to protect forestland and neighboring properties. Improvements in the State Forest include water tanks, water sources, shaded fuel breaks, and helispot locations. The water sources and tanks will be positioned so that water will be available during a fire emergency. In addition, appropriate road signing, fire hazard reduction, and adequate access to roads and trails will be added or maintained. Fire hazard and prevention information as well as Forest regulations will be posted on information boards. The day-use areas, campgrounds, and picnic areas will be treated as necessary to reduce fire hazards for safety and demonstration purposes. The major roads and trails in the Forest are in the process of being maintained to provide access for fire protection purposes. A system of road signing will assist fire control personnel in finding key locations when prompt action is required.

A system of shaded fuelbreaks will be considered for construction in the State Forest with the help of crews from the Parlin Fork and Chamberlain Creek Conservation Camps. These fuelbreaks serve as preplanned fire control lines when a wildfire escapes initial attack. They will be constructed in defendable areas along main ridges, adjacent to high-use roads, and adjacent to rural residential neighborhoods. Appropriate project-level CEQA analysis will be conducted for fuel break construction.

A program to locate archeological and other sites requiring special protection measures will be established for shaded fuelbreak areas since these areas will likely be subject to heavy equipment operations during an emergency wildfire situation. A preplanned approach to special resource sites can often make a difference with regards to their protection when prompt action is required to protect lives, property, and the environment during fire fighting operations.

A system of helispots with forest road access will be established for fire suppression and medical evacuation operations.

Regulations

Potential ignition sources such as campfires and smoking are controlled on the Forest. Campfires are restricted to developed fire pits within campgrounds. Smoking is only allowed in areas sufficiently cleared of light fuels.

The period of high fire danger generally occurs between July and November, though this period may be extended by severe weather conditions. The Forest Manager will coordinate with the Operations Officer to determine necessary actions to be employed. The steps may include increasing patrols of the Forest, posting alert signs, providing more fire prevention information and awareness of current conditions to Forest visitors, and reducing activity in the Forest by closing specific areas.

Education

JDSF will coordinate with the Fire Prevention staff for educational purposes. Educational information will be encouraged in an attempt to prevent human-caused fires within the State Forest. Target groups may include neighbors, visitors, timber operators, school groups, and local organizations. Appropriate fire safety information will be included in informational brochures about the Forest and its recreation opportunities.

Enforcement

Forest patrol is an important element of fire prevention and fire protection. JDSF staff will coordinate with Fire Prevention staff for patrol purposes. Patrols will include public contact, fire detection, and movement along forest roads during the fire season.

Suppression

Suppression tactics are based on the pre-suppression plan. JDSF staff will support fire control personnel by taking direct actions to control wildfire and by providing local expertise regarding road conditions, vegetation, cultural, wildlife, and watershed resources. The staff may also evacuate visitors, close the fire area, perform law enforcement tasks, and assist with delivery of information as appropriate.

Detection

Detection strategies include patrol, searching for evidence of fires, and patrol flights during extreme fire danger periods or after lightning storms. JDSF participates in a cooperative air patrol program. The Unit's Emergency Command Center personnel routinely check the Automatic Lightning Detection System for possible strikes in the Forest.

Communication

As part of communication, CAL FIRE will maintain an adequate radio system and stay in close contact with local fire departments. Local CAL FIRE fire control personnel will remain familiar with the pre-suppression plan for the State Forest.

CAL FIRE's resource tracking system will be used to dispatch the appropriate personnel and equipment to any fires on JDSF. The State Forest is a defined response area.

Post-suppression

Post-suppression activities include the evaluation of pre-suppression information, suppression actions, and rehabilitation needs. Rehabilitation involves erosion control and other restoration activities. Unit personnel will evaluate post-suppression activities on an individual fire basis.

To minimize increases in wildfire risks resulting from increased public use in the Forest, CAL FIRE will record and compile descriptions of all wildfires occurring within JDSF. If an increase in wildfire frequency occurs, appropriate measures will be implemented as needed to reduce wildfire risk.

Prescribed Fire

Fire is a natural ecosystem process within the coast redwood forest type. Fire exclusion over the long run is not possible and may not be desirable in maintaining natural ecosystem processes. However, forest structure and fuel loading have been altered by long-standing fire suppression policies. There is potential for use of JDSF as an area for site-specific research in the use of fire as a management tool. The use of fire can facilitate fire hazard reduction, silvicultural and habitat research, and ecosystem management research. A prescribed fire program that involves these objectives will be considered for JDSF as resources allow.

Law Enforcement

State law requires CAL FIRE to protect the State Forest "from damage and to preserve the peace therein." The Mendocino Unit Chief is responsible for the enforcement of state law on the State Forest. The Forest Manager, the Fire Prevention Battalion Chief, and the local CAL FIRE Battalion Chief will work together to ensure that all relevant state laws are properly enforced. CAL FIRE will continue to employ peace officers that are dedicated to enforcing state laws on the State Forest. There are a number of laws that are specific to the state forest system that address camping, campfire permits, noise, firearm use, firewood, rubbish dumping, smoking, and the protection of archeological features.

Forest Pest Management

Forest pests such as insects, diseases, and vertebrates have long been established in California's native timberlands. Populations of pests are dynamic and fluctuate in response to climatic and environmental changes such as drought, forest stocking, windthrow, fire, and other site disturbances. The effects of pests may reduce tree growth, affect species composition, or impact forest stocking. At the same time, other forest resources, such as wildlife habitat, may be impacted by the change in forest structure brought upon by excessive tree mortality. Integrated forest pest management provides a means to address these issues.

The intent of integrated pest management (IPM) is to prevent or suppress forest pest problems with population suppression and the minimization of factors that predispose trees to infestation. IPM makes use of the benefits of cultural, mechanical, chemical, semi-chemical (e.g. synthetic pheromones), and biological pest management alternatives.

Pests known to have caused tree mortality within or adjacent to JDSF are listed in Table 11. There may be other pests of local tree species that are seldom detected or reported.

State Forest staff will continue to monitor the Forest for early signs of forest pests or conditions that may lead to infestation. JDSF will also assist the pest-monitoring program of the California Department of Food and Agriculture by allowing deployment and inspection of gypsy moth traps in high use areas of the Forest.

Other efforts to reduce pest damage or predisposition will include:

- The minimization of injuries to residual trees during forest management activities.
- Reuse of old skid trails where available to reduce soil compaction.
- Retention of a diverse species composition in or adjacent to stands following forest management activities and within or nearby future regeneration units.

Table 11. Common Forest Pests on JDSF

(also Table DEIR VII.6.4.1.) **Common Forest Pests on Jdsf.**[1]					
Diseases	**Douglas-Fir**	**Grand Fir**	**Mendocino Cypress**	**Western Hemlock**	**Redwood**
Heterobasidion annosum Annosus Root Disease	X	X			
Armillaria mellea Armillaria Root Disease	X	X	X	X	X
Leptographium wageneri var. *pseudotsugae* Black Stain Root Disease	X				
Phaeolus schweinitzii Velvet Top Fungus	X				
Phellinus pini White Pocket Rot	X	X			
Insects					
Melanophila drummondi Flathead Fir Borer	X				
Dendroctonus pseudostugae Douglas-fir Bark Beetle	X				
Scolytus unispinosus Douglas-fir Engraver Beetle	X				
Pseudohylesinus nebulosus Douglas-fir Pole Beetle	X				
Scolytus ventralis Fir Engraver Beetle		X			
Pseudohylesinus seriaceus Silver Fir Beetle	X	X			
Phloeosinus sequoiae Redwood Bark Beetle					X
Vertebrates					
(several species suspected)[2] Tree squirrel(s) (upper stem girdling)					X
Odocoileus hemionus[3] blacktail deer (seedling/sapling browsing damage)	X	X	X	X	X
Neotoma fuscipes dusky-footed woodrat (girdling of branches and top)					X

[1] Robinson, 1993.
[2] Marshall, 2002.
[3] Assumption based upon general knowledge (not documented in the original table).

- Avoidance of non-native tree species that may be predisposed to pests with few local pest predators and parasites.
- Use of CAL FIRE or other forest pest management specialists to train employees in forest pest recognition and management.

Sudden Oak Death:

California Code of Regulations--The Oak Mortality Regulation, as Applied to State Lands.
JDSF is within the declared SOD Zone of Infestation established by the California State Board of Forestry and Fire Protection and is within the "regulated area" for SOD as designated by the California Department of Food and Agriculture. The Zone and regulated area are identical and cover all portions of the fourteen infested counties identified in the California Department of Food and Agriculture (CAL FIREA) Section 3700 regulation (refer to the list of counties presented below, "Regulated Area").

Federal regulations from the USDA-APHIS, and state regulations from CAL FIREA address SOD concerns. CAL FIREA regulations limiting the movement of host materials apply to forest management activities on JDSF including timber harvest, timber stand improvement activities, and harvest of minor forest products. Under the state regulation, host material cannot be transported from the regulated area unless accompanied by a compliance agreement. The Forest Practice Rules (FPRs) do not specifically address SOD. However wherever a Zone of Infestation applies, the FPRs [14 CCR 917.9(a)] require that mitigations be included in Timber Harvesting Plans (THPs) to prevent the spread of the infestation. The following section includes a discussion of the applicable regulations, descriptions of host material, the "free-from" protocol, what constitutes a "compliance agreement," and mitigation measures to prevent the spread of SOD.

A federal quarantine for *P. ramorum* was issued as an interim rule by USDA -APHIS on February 14, 2002. For more information on the Federal rule see http://www.aphis.usda.gov/ppq/ispm/sod/.

Host Material, The Oak Mortality Regulation. This is a California state law (Section 3700 in Title 3 of the Code of Regulations). The law defines the regulated articles (plants or plant parts) and commodities (unprocessed wood, wood products, and any other product, article, or conveyance presenting a risk of spreading the pathogen). On CAL FIREA's regulatory web page, with a link to APHIS' updated (January 10, 2005) host list, 31 proven hosts and 37 associated plants (nursery stock) are now regulated as either entire plants or specific plant parts thereof. To review this list and keep abreast of updates, consult CAL FIREA's web site at http://pi.CAL FIREa.ca.gov/pqm/manual/htm/455.htm.

Based upon currently available information, CAL FIREA, the County Agricultural Commissioners, USDA Forest Service, and CAL FIRE have ranked the regulated articles according to their potential for transport of *P. ramorum* and believe that the highest risk for transport is from nursery stock of host species, followed by green waste, then firewood and logs. Lumber and manufactured wood products are not considered a risk for transport of *P. ramorum*. Soil is not included in California's regulations, but is in the federal regulations. The enforcement rules are strictest for the highest risk regulated articles. Green waste is considered higher risk than firewood because the pathogen sporulates readily on leaves from tanoak, rhododendron, bay, and some other hosts. However, sporulation is rare on wood.

On JDSF, host material that is likely to be transported may consist of logs from host species produced as part of a harvest plan. In addition, there is the potential for minor forest products such as salvage sawlogs, firewood, and greenery to be moved from the regulated area.

Trained JDSF personnel will submit samples of symptomatic hosts and non-hosts to CAL FIREA for confirmation of pathogen in new areas or on new hosts. As new hosts are confirmed by CAL FIREA, the entire plant or specific portions thereof are amended to the rules as regulated articles. CAL FIREA currently recognizes only RPFs, government agency personnel, and others that have been approved to attended specific CAL FIREA-certified COMTF training as "official samplers." CAL FIREA will use the training session attendance roster as a list of official samplers.

Only an official sampler can complete a free-from survey as discussed below. The completed free-from survey, if part of an approved THP, will allow the plan to serve as a compliance agreement for a period of one year.

Regulated Area. As of May 1, 2005, regulated counties are Alameda, Contra Costa, Humboldt, Lake, Marin, Mendocino, Monterey, Napa, San Mateo, San Francisco, Santa Clara, Santa Cruz, Solano, and Sonoma.

Distribution of SOD. Check the website http://www.cnr.berkeley.edu/comtf/ for known infested areas. Information on local distribution may also be obtained from the County Agricultural Commissioner's office or CAL FIRE.

State Regulation. SOD can spread via host material. Therefore, plants, plant parts, unprocessed wood and wood products, and other products of the above mentioned hosts cannot be moved from counties infested with SOD without authorization by the County Agricultural Commissioner or CAL FIRE's and USDA Forest Service's harvest document approval process. The term "harvest document" refers to any document filed with the California Department of Forestry and Fire Protection that authorizes the removal of forest products for commercial purposes.

See http://pi.CAL FIREa.ca.gov/pqm/manual/htm/455.htm for California Department of Food and Agriculture's (CAL FIREA) regulations regarding commodities covered and restrictions of their movement.

Compliance Agreement. A compliance agreement is required to move regulated articles of host material from the regulated area. A compliance agreement may be obtained through the County Agricultural Commissioner's office. An inspector will complete an inspection and make a determination that all the regulations are understood, that compliance with the regulations will be achieved and that all provisions of the compliance agreement will be carried out. Once a landowner and USDA-APHIS sign a compliance agreement, the regulated host material may be moved interstate as stipulated in the compliance agreement. A compliance agreement consisting of a free-from certification is only valid in California, as APHIS does not have allowance for free-from surveys in its regulations. A THP or other "harvest document" approved by CAL FIRE may also serve as a compliance agreement. An approved harvest plan without a free-from survey, but with approved SOD mitigation covering known hosts will allow transport of host material from the regulated area. Approved plans with an incorporated free-from survey may act as a compliance agreement for a one-year period from the date of a documented negative result survey, or one year from the date of a negative reply from CAL FIREA to samples of symptomatic hosts.

Free-from Protocol. A *P. ramorum* "free-from" survey is a survey of land with host trees or shrubs that is done to determine if *P. ramorum* is present in the area in which a commercial operation will be conducted. All survey results are good for one year, unless symptomatic hosts are observed during that year. Transects would be run designed to cover representative areas of known SOD hosts. Transect width is variable to allow for adequate inspection. The official sampler must look for symptoms on all hosts along transects (also as approaching site, etc.). CAL FIREA's sampling protocol is to be used to confirm *P. ramorum* in the laboratory. Since the survey is to determine presence or absence, if many symptomatic trees/shrubs are found, the survey may be stopped to wait for lab results. However, if *P. ramorum* is not found, the survey will need to be completed for the entire area.

The State of California Enforcement Rules to Prevent Spread of SOD

The restrictions established by the California Enforcement Rules to Prevent Spread of SOD are summarized in Table 12 (December 2005, DEIR Table VII.6.4.4). There are no applicable state regulations if host material from JDSF remains within the regulated area. Therefore, the following table lists regulations applicable for host material moving from the regulated area, but remaining within California.

Table 12. Summary Of Sudden Oak Death Woody Material Rules Under State Regulations.

Regulated articles and commodities may move from the regulated area to other parts of California if accompanied by a compliance agreement affirming the articles or commodities meet the restrictions outlines in the CAL FIREA regulations. Compliance agreements are issued by the local Agricultural Commissioner. Approved THPs may serve as an equivalent substitute. Compliance agreements are valid for one year. A "free-from" survey with negative findings can act as a compliance agreement.
If **regulated stems (logs and firewood) are debarked,** a compliance agreement is not needed and material is free to move.
If host **stems (logs and firewood) are not debarked,** a compliance agreement is needed affirming the articles have been appropriately treated.

Host material less than 4" in diameter (green waste and some special forest products, except fruits, berries and acorns). Host material from within the regulated area and smaller than four inches in diameter may move anywhere within the regulated counties. For shipment beyond the regulated counties, the site must be either surveyed and determined "free-from" and accompanied by a permit/compliance agreement, or debarked. The compliance agreement will be issued by the responsible agency (CAL FIRE or County) having jurisdiction. It is recommended that materials be taken to an approved treatment or disposal facility (i.e., cogeneration plant or compost facility), if available. Under special arrangement, infected host material may be allowed to move to an approved cogeneration facility if transported and handled according to specifics of a compliance agreement. Host material smaller than four inches in diameter, including chipped and shredded host material, shall be safeguarded during transport (such as in secured plastic bags, closed containers, or covered by a tarpaulin in such a manner that precludes the escape of any material), and otherwise handled as specified in the compliance agreement.

Restrictions on firewood and logs (host woody material greater than 4" in diameter). Firewood and logs may move from the regulated counties if accompanied by a permit/compliance agreement. The permit will be issued by the responsible agency having jurisdiction if the regulated articles have been grown on a site surveyed and determined "free-from." Regulated stems, moving as logs or firewood, do not need a compliance agreement if debarked.

Firewood sales on State forest lands. Firewood sales for host material will not be permitted in areas with confirmed cases of sudden oak death (*P. ramorum*). Personnel setting up firewood sales must know how to recognize symptoms of *P. ramorum*. They should use the "free-from" protocol to determine if *P. ramorum* is present in the proposed firewood sale area. If *P. ramorum* is not detected in the "free-from" survey, the operation is set up as usual with no further regulation for a period of one year. For firewood permits, a provision will be added to the permit explaining the current regulations, and that compliance is required.

On State Forest lands, where the public is required to have a permit to collect firewood, CAL FIRE shall use this public contact to educate the person(s) about sudden oak death by providing a Pest Alert or other information on sudden oak death along with the firewood permit.

For Timber Harvesting Plans. If host material is to be moved intrastate from the regulated area, one of three procedures shall be followed:

1. A survey to determine the area is "free-from" *P. ramorum* is completed by Registered Professional Foresters (RPFs) or other official sampler. Symptoms of P*. ramorum* will be surveyed for during the timber cruise or pre-sale layout done to develop the Timber Harvesting Plan. If no *P. ramorum* is detected, the survey design and results may be incorporated into the

plan. If the one-year free-from period expires prior to or during timber operations, a new free-from survey must be conducted and amended to the plan. Or,

2. If a free-from survey results in positive SOD finds, mitigation measures shall be written into the plan. At a minimum, mitigations shall include current regulations. In support of 14 CCR 917.9, the RPF is encouraged to add additional measures or Best Management Practices to limit the spread or build-up. Or,
3. In lieu of a free-from survey, the RPF may assume that all known SOD hosts found on the plan area are infected, and required and appropriate mitigation measures shall be incorporated.

FPR Compliance. Pursuant to 14 CCR 917.9(a) for commercial harvest subject to the California Forest Practice Rules, and within the declared Zone of Infestation, the plans must identify feasible measures to mitigate adverse infestation or infection impacts during timber operations (PRC 4527).

Federal (APHIS) Enforcement Rules to Prevent Spread of SOD. Regulated articles may be transported interstate from the regulated area only if accompanied by a certificate/compliance agreement which verifies the regulated articles have been treated according to measures in the federal register. Acceptable treatments are:

1. Wood products such as firewood, logs, or lumber must be free of bark.
2. Soil (nursery industry) that has not been in contact with SOD-infected hosts and is free of duff, or soil which has been heat-treated at 180F for 30 minutes.
3. Wreaths, garlands, and greenery dipped for one hour in water held at 160F. Bay leaves used in wreaths also may be vacuum/heat treated.
4. Green waste may move to energy generation facilities under limited permits issued by the local Agricultural Commissioner.

Pitch Canker:

JDSF staff will incorporate the most current best management practices as identified by the California Pitch Canker Task Force for controlling the distribution and spread of Pitch Canker. The following measures are the most current as of December 1, 2006.

Management practices to be applied should pitch canker be identified on JDSF lands:

a. The timely removal and disposal of trees dying from pitch canker may help prevent the buildup of destructive beetles which can attack other trees, and can carry the pitch canker pathogen to uninfected trees. The disposal of pitch canker diseased material should be done on-site so as not to spread the disease to uninfested areas. Limbs and small pieces of wood may be left on-site or they may be chipped or burned. Logs cut from pitch canker diseased trees may be split for firewood for local use, but infected logs shall first have the stem cankered sections bucked from them. The remaining wood should be seasoned beneath a tightly sealed, clear plastic tarp to prevent the buildup of destructive insects. California Department of Forestry and Fire Protection Tree Note #3, Controlling Bark Beetles in Wood Residue and Firewood, provides specific guidelines for placing tarps over and around firewood. Do not stack pine firewood next to living pine trees or transport it to uninfested areas (Sanford, 1996).

b. The distribution of the disease is discontinuous; thus, there are infested as well as uninfested areas within the Zone of Infestation (at the time this document was prepared, pitch canker was not known to occur on JDSF). The Pitch Canker Task Force of the California Forest Pest Council and CAL FIRE have ongoing monitoring underway for the disease. JDSF staff should report any symptomatic Bishop pines to the Task Force for determination of presence of pitch canker. CAL FIRE and the Mendocino County Agricultural Commissioner shall be notified immediately in the event that pitch canker is found on JDSF.

c. Directions for Registered Professional Foresters and Licensed Timber Operators:

- Know when you are working within an infested area.
- The California Department of Forestry and Fire Protection (CAL FIRE) has the authority to impose conditions on the commercial harvest of trees from timberland within the Zone of Infestation. Such actions are to be carried out on a case-by-case basis and depend upon the harvest operation's potential to contribute to disease spread. For all timber operations regulated by the Department, the Department must be informed if pitch canker is present within the operating area.
- Do not transport infected or contaminated material to areas that are free of the disease.
- When cutting or pruning a diseased tree, clean tools with a disinfectant before using them in uninfested areas. Lysol® is an effective sterilizer. Make sure that clients and co-workers are aware of these guidelines (Pitch Canker Task Force, 2000a).

d. Directions for Firewood Cutters:

- JDSF personnel should be kept informed whether pitch canker is determined to be present on the Forest. Any suspect areas shall be avoided for firewood harvest until an official determination is made as to presence or not of the disease. At time of firewood permit issuance, JDSF personnel shall direct firewood cutters to disease free areas of the Forest. Information on pitch canker disease recognition and regulations shall be provided with the collection permit in the event pitch canker becomes present on the Forest.
- Tools and machinery that are to cut trees with pitch canker disease WILL BECOME CONTAMINATED with the pitch canker fungus. There is little chance of spreading pitch canker if contaminated tools are only used on dead trees or on trees that are not pines. However, if contaminated tools or machinery will be used on living pines, the tools should be cleaned and sterilized before use on uninfected trees or in uninfested areas. Lysol® is a suitable sterilizer for this purpose. A logical alternative to repeated cleaning of equipment is to reserve one set of equipment for use only in infested areas, and another set for use only in uninfested areas.
- Do not transport pine firewood out of infested counties (Mendocino County is an infested county). Sell pine firewood locally using local use guidelines (Pitch Canker Task Force, 2000a).

e. Directions for Other Forest Product Harvesters:

- JDSF personnel, at time of collecting permit issuance shall direct collectors to disease-free areas of the Forest. Information on pitch canker disease recognition and regulations shall be provided with the collection permit.
- Collectors shall not be permitted to remove pine products from trees infested with pitch canker disease.

f. Directions for Reforestation in Areas Affected by Pitch Canker:

- Material for replanting should be as local in origin as possible to retain the genetic integrity of the local population (Pitch Canker Task Force, 2000b).
- Option 1. The preferred strategy for reestablishing Bishop pine would be to allow natural regeneration to occur. Site improvement to encourage regeneration may be required where a dense overstory precludes the development of a seedling stand. Where natural regeneration does occur, it can be expected that pitch canker will eventually infect some or most of the young trees. However, the trees will vary in their susceptibility and some may sustain little or no damage. This is the least intrusive approach to reforestation, with the possibility that a level of

pitch canker resistance will be attained that eventually provides the desired density of mature trees (Pitch Canker Task Force, 2000b).

- Option 2. If option one is acceptable in principle but there is insufficient seed to produce a stand, locally collected seed could be introduced. By collecting seed from asymptomatic trees, there is more likelihood that some are resistant, and a certain percentage of the progeny will carry this trait as well. It is thought that a small percentage of resistant individuals may be sufficient to establish a stand. To diversify the seed source, it is recommended that seed be gathered from: (1) multiple trees, at least 100 meters apart where possible, (2) trees of differing ages, and (3) different heights within the same tree. Trees that have been planted should be avoided, as they may be non-local in origin. In addition, trees with evidence of disease, especially western gall rust, should not be used as a seed source (Pitch Canker Task Force, 2000b).

- Option 3. The least desirable measure for maintaining Bishop pine presence is to transplant known resistant seedlings from a reputable source. The potential loss of genetic integrity could result in a nonnative stand (Pitch Canker Task Force, 2000b).

Data and Information Management

Data and information management are addressed to a substantial extent in Chapter 4 Research and Demonstration.

Two independent forest resources inventory efforts continue to be maintained at JDSF. The Continuous Forest Inventory (CFI) consists of 142 permanently monumented plots with individually tagged trees. The plots were established in 1959 and have been measured at five-year intervals since they were established. This information has been periodically collected for more than 40 years, and has been extensively reviewed and utilized by researchers and professionals. The primary purpose of the CFI is to provide information on changes in resource conditions over time for planning, monitoring and adaptive management purposes. The CFI inventory system has changed several times over its almost 50-year life span, and continues to evolve in response to changing priorities and advances in forest inventory techniques and knowledge. The Forest Resources Inventory (FRI) consists of periodic installation of a large number of temporary plots (5,000 plots in 2005). The primary purpose of the FRI is to provide detailed information on resource conditions across the Forest at one point in time. The two inventory systems complement each other and provide periodic detailed point-in-time resource conditions at a high level of detail as well as changes in resource conditions over time. The inventory system at JDSF was designed to provide maximum information at the optimal cost of sampling effort.

The CFI and FRI inventory systems on JDSF provide a rich legacy database of resource conditions for research and application. In an effort to further improve on the resource inventories at JDSF in the face of expanding scope of data needs for other resources than trees, CAL FIRE is developing a contract with independent third-party experts to provide a review of forest inventory approaches on JDSF, as well as the other Demonstration State Forests.

Budget and Staffing

Recent Augmentations

The authorized levels of State Forest staff and budget were increased beginning with the 06/07 fiscal year. This added a few of the needed resources, one forester, a wildlife biologist, and a heavy equipment operator. Since timber harvest revenues have been significantly less than authorized budget levels, State Forest expenditures have been below the authorized levels. Spending will increase to the authorized levels commensurate with increased harvest revenues deposited into the Forest Resources Improvement Fund. As they become available, the increased funds will provide added resources for funding for road management, research and demonstration, timber stand improvement, and general operating expenses.

Additional Staffing Benefits

In assessing needs for the coming decade, greater biological expertise appears to be a high priority. Expertise in fisheries would augment the current wildlife biologist position. Additional expertise in geology, botany, hydrology, and ecology would also be of value. It is recognized that existing staff can be trained to perform many of these functions at a significant level, depending upon individual aptitude, education, and training. Additional staff dedicated to public education and recreation is also needed.

As general administration complexity increases, additional staffing in finance, personnel, contracting, and grant processes would be beneficial, increasing the effectiveness of the state forest program.

Research Funds

A significant portion of the research funds allocated to the state forest system are administered by Sacramento headquarters staff. A substantial increase in the level of available funding would be of value, considering the state and regional need for forest management research.

Property Configuration

The ability to conduct meaningful research and demonstration work in the context of forest management makes it desirable to control entire watersheds, thus reducing the potential for manmade influences or natural influences that cannot be examined or are beyond the control of management.

Purchase of In-holdings

It would be beneficial for the Forest boundaries to extend to natural watershed divides, and to incorporate existing in-holdings. Currently, the Forest is fairly contiguous, with a few minor in-holdings and adjacent properties that narrow the Forest boundaries. The principal adjacent properties considered most desirable for incorporation into the Forest include the McGuire Ranch (currently owned by Soper-Wheeler Company and The Conservation Fund) in the Upper South Fork Noyo area, and a string of 40-acre parcels located in James Creek (currently owned by Coastal Ridges LLC).

Expansion through Acquisition

Expansion of the Forest to take in the upper watershed areas of James Creek and the North Fork Big River (Coastal Ridges LLC) would round out the Forest to the east, and incorporate some ecosystems that are currently absent from JDSF (e.g. large boulder out-crop, natural prairie, oak woodland, Douglas fir forest). A lesser priority area would include the upper watershed area of the Little North Fork Big River (The Conservation Fund). The principal value in adding the Little North Fork Big River area is proximity to the Mendocino Woodlands Outdoor Center for public educational and demonstrational purposes.

Of the areas identified, only the previous owners of the Coastal Ridges LLC property have been approached by the State to discuss potential acquisition. The other landowners have not been approached, nor have they come forward with a proposal. Their desires are unknown at this time.

Boundary Line Adjustments and Trades

Other minor property boundary changes could conceivably be accomplished by adjusting boundaries with adjoining timber companies to move boundaries to ridge-lines. These areas include Riley Ridge (between SF Noyo and Noyo River), Three Chop Ridge (between Big River and Noyo River), and various locations along the southern boundary of the Forest. Some of these boundary adjustments could be accomplished through land and timber trades with adjacent owners.

A boundary line adjustment or purchase with particularly beneficial potential is Three Chop Ridge, incorporating the Three Chop Ridge Road to its intersection with Highway 20. This would provide the state with control of a major fire suppression ridge and provide a significantly shorter and safer route to Highway 20 for public and administrative traffic between parts of JDSF, the main Noyo River drainage, the San Francisco Boys and Girls Club, and the Camp Noyo Boy Scouts Camp. Much of this traffic currently uses JDSF Road 200, which is a viable candidate for decommissioning, due to its somewhat hazardous and potentially damaging inner gorge location.

Chapter 4. Research and Demonstration

Introduction

Jackson Demonstration State Forest is the largest publicly owned forest in California with a research and demonstration mandate. JDSF was acquired for the purpose of demonstration of economical forest management. During the process leading to the development of this management plan, the Board of Forestry and Fire Protection made it clear that they wanted JDSF to focus first and foremost on this research and demonstration mission. This is reflected in the number one goal this plan establishes for JDSF:

> Improve the amount and quality of information concerning economic forest and timber management, forest ecosystem processes, watershed processes, performance of forest protection measures that are available to the general public, forest landowners, resource professionals, timber operators, the timber industry, and researchers.

The Management Plan also designates two Major Demonstration, Experiment, and Education Areas, one on the east side of the Forest and one on the west, to provide the public and researchers access to a wide range of forest management examples within a relatively small area. It also provides for three Riparian Restoration Demonstration Areas, where research and demonstration will focus on the effectiveness and costs of difference approaches to riparian area protection and restoration. These important areas are designated on Map Figure 5.

Research, demonstration, and data collection conducted over the past 50 years within the state forest system has focused largely upon timber-related issues and, in terms of JDSF, watershed effects (e.g., Caspar Creek Watershed Study). Common subjects have included silvicultural systems, growth and yield, timber yarding practices, timber and log inventory, and sediment and stream-flow.

Within the past 15 years, the scope of forest research has expanded to include biological resources found within the forest environment. Evidence of this can be found in numerous publications associated with the Caspar Creek Watershed Study (see, e.g., the US Forest Service Caspar Creek website: http://www.fs.fed.us/psw/ef/caspar_creek/). For specific examples, consider the following topics of JDSF-related research presented at the 2004 Redwood Region Forest Science Symposium:

- Clonal spread in second-growth stands of coast redwood;
- Streamside temperatures within the coast redwood zone;
- Effects of timber harvest on fog drip and stream flow;
- Trends in streamflow and suspended sediment after logging;
- Rainfall interception in a coastal redwood forest;
- Role of fire in coast redwood forests;
- Salmonid communities of South Fork Caspar Creek;
- Modeling coast redwood variable retention regimes;
- Whiskey Springs redwood thinning study: a 29-year status;
- Erosion rates over millennial and decadal timescales;
- Significance of suspended organic sediments to turbidity, sediment flux, and fish-feeding behavior;
- Stand dynamics of coast redwood/tanoak forests following tanoak decline.

The primary goal of JDSF during the planning period will be to improve the amount and quality of research and demonstration information on forest management and forest biophysical processes to the public, small forest landowners, resource professionals, timber operators, the timber industry, and researchers. This goal can be met by conducting demonstrations and investigations through consultation and cooperation with universities and colleges, Federal agencies, and other public and private

researchers. Increased funding and staffing should be pursued to accelerate the expansion of knowledge through additional demonstration and research efforts and establishment of a Forest Learning and Interpretive Center on JDSF.

Jackson Demonstration State Forest is committed to providing innovative demonstrations, experiments and education. The number of acres and breadth of age classes and seral stages contained within JDSF will allow for large landscape level research and demonstrations to complement stand and individual project level work. JDSF will demonstrate the full range of intensity of forest management while maintaining a diversity of stand conditions for future research not yet known. JDSF explicitly acknowledges that forest management is a much broader concept than the growth and yield of merchantable timber. Special concern areas such as riparian and older forest corridors, unusual plant communities, ecological processes, wildlife use of habitat corridors or structural elements, and individual species are all worthy topics for examination within the research and demonstration program.

There remains a great deal of uncertainty in the regulation of forest management activities to maintain maximum sustained production, and in the level of mitigation necessary to protect and enhance watersheds and wildlife habitats. Regulatory standards are often established in a forum that combines and balances scientific knowledge, landowner rights and desires, and legal constraints. There is a growing need to determine the environmental effects and costs of regulatory standards as applied or proposed for application in the field. The State Forest should remain available to assist landowners and regulatory agencies in this effort. It can be desirable to test a range of variables or conditions, such as buffer widths and even-aged unit sizes to be able to make scientifically valid comparisons of the effects of various management options. CAL FIRE will work with the Board, and State and Federal regulatory agencies in order to establish a mechanism or process by which the system of State Forests can be a testing ground for various levels of regulation and mitigation. This may require the Department to seek limited exemption from certain regulatory or standard mitigation requirements. Designating specific areas as experimental forest under CEQA or the Forest Practice Act might be one exemption method used. This process will remain sufficiently constrained to maintain public confidence in the overall management of the Forest.

The research and demonstration, timber management and recreation programs of the State forest will be integrated to the degree that current operational timber management practices can be used to effectively demonstrate Best Management Practices and a variety of silvicultural systems, including alternative treatments and innovative experimental practices. Recreational use of JDSF offers the State an opportunity to introduce the public to timberland management through casual encounter, guided trails, roadside displays, etc. Jackson Demonstration State Forest will seek out and apply new and emerging management practices in order to expand our knowledge of forest management practices and their effect on the ecosystem. In order to achieve this objective, State Forest staff will maintain an ongoing exchange of ideas and information with forest landowners through advisory groups, publications, symposia, workshops, and professional contacts.

Many of the projects and studies done on the state forest have excellent demonstration potential. Many of the project sites are visited numerous times each year by tour groups. These sites include uneven-aged silvicultural study areas such as the Railroad Gulch Silvicultural Study and the Caspar Creek Cutting Trials; the in-stream large woody debris placement studies on Parlin Fork, Hare Creek, and Caspar Creek; as well as all of the operational timber sale areas where selection cutting has been done. Even and uneven-aged silviculture has been successfully combined with investigations of watershed processes and rehabilitation and fisheries demonstration in the Caspar Creek Watershed Study. Both the North and South Forks of Caspar Creek are used frequently for demonstrating these subjects to a wide range of clientele. Vegetation management is done extensively on the State Forest and has been successfully demonstrated in its various stages to many groups. Young stand management using precommercial thinning techniques and mature stand stocking control using commercial thinning can be viewed in many of the past timber sale areas for demonstrational purposes. A range of age-classes has developed on the Forest, which constitutes a valuable demonstration opportunity.

JDSF staff currently includes three full-time positions dedicated to research and demonstration (Forester II, Forester I, and Forestry Assistant II). A research coordinator and a biometrician are located at CAL FIRE's Sacramento headquarters.

Planning for Future Research and Demonstration

Key Areas of Increasing Effort

The Department intends to manage the state forest system as a demonstration of sustainable forest management, while creating and maintaining a diverse forest laboratory available for research on a vast array of subjects. Informational needs associated with forest management are very large and changing. At JDSF, this dynamic situation underscores the importance of maintenance or creation of a varied forested landscape, while being mindful of the need to remain relevant to the informational needs associated with management of private timberlands. For these reasons, the following become key factors in a long-term research plan:

- Increasing quantification of the forest
- Creation of a varied landscape while managing in accordance with approved management plans.
- Detailed documentation and quantification of changes due to management activity.
- Continued and increasing monitoring of various aspects of the forest environment to enable assessment of trends and conditions. Efforts will be made to move away from qualitative assessments to scientifically defensible tests of individual practice effectiveness. This adaptive management feedback loop will provide a mechanism to alter existing and proposed management practices where necessary.
- Conduct of specific research designed to answer critical questions identified by the Board and the Demonstration State Forest Advisory Group or other advisory bodies that may be established.

Increasing resource allocation to each of these activities over time will be key to the ultimate effectiveness of the state forest system. CAL FIRE's intent is to accomplish this through internal funding, grants, and cooperative arrangements with various partners.

Experimental Design – Replications and Controls

As a research and demonstration forest, JDSF is in the unique position of preparing for the eventuality of unknown future research projects with objectives that are likely to be substantially different from those of today. The research and demonstration program staff will participate in the forest management planning process to help keep options open and maintain a wide range of conditions in the field for future research installations.

A significant objective during the planning period will be to create and maintain a system of replicated diverse stand structures and potential control areas throughout the Forest. This system is planned to be able to accommodate a wide range of experimental designs that require replication of treatments.

This system of replicated stand structure will include a flexible strategy for creating control areas. Some stands may be set aside temporarily, or for longer periods, if needed, as controls to assess baseline change over time, and may be established as components of specific research proposals. The assignment of areas and specific locations of experimental controls will be a dynamic process as stand development evolves over time or as different research projects are initiated and completed. When a

particular timber stand has fulfilled its function as a control, it will become available for treatment and another area within the watershed may be designated as a new control.

Watershed-level Research

The forested environment is composed of an interacting set of biological and physical resources and processes. Future management should create conditions that facilitate needed research into these interacting factors. For example, forested watersheds possess essential habitats and habitat elements for both terrestrial and aquatic species. The interactions and dependencies between these resources combine with management activities to create complex forest management challenges. State forest management should enable an increasing level of research at the watershed level or similar scale. Increasing paired watershed studies, combining detailed examinations of habitats and forest management treatments, should be a goal within the state forest system.

Testing and Comparing Management Goals and Intensity

Developing information on the effects of common or anticipated practices conducted at varying levels of intensity is a key aspect of forest management research. The North Fork phase of the Caspar Creek Watershed Study embodies this philosophy. In this study area, an attempt was made to create effects that could be quantified and evaluated. Watershed studies can serve this purpose by applying differing types of management at varying levels of intensity. For example, one watershed may be managed to simulate a very high level of timber production, another may be managed at a lesser intensity designed to foster both timber and other resource values, and a third may be held as a control. This approach also can serve to compare and contrast management by the various owner behavior groups characteristic of the private sector.

Anticipating Change

Forest management is a long-term enterprise. Generally speaking, forest stand and ownership-wide development is placed on a trajectory that requires many decades to reach a desired condition. However, ownership patterns and management objectives may undergo more rapid change in response to changes in economics and social values.

The state forest system should be capable of periodically assessing these changes, and attempt to anticipate the necessary forest management response. This focuses the need for continuation of state forest advisory structures, as well as periodic review of management direction by the Board. The changing climate of forest management should be a matter of periodic discussion by the various advisory entities, and can serve as an important source of counsel and advice on management direction and research needs.

Advisory Committees

With potentially conflicting demands for research and demonstration, a process for identification of needs, prioritization, and allocation of funding is necessary. The Department has an existing Demonstration State Forest Advisory Group (DSFAG), which advises on State Forest Programs throughout the state. The Board of Forestry and Fire Protection has indicated that it will be re-establishing its Committee on Research, which has been dormant for some time. This latter entity has broad responsibilities with respect to review of ongoing research programs; advising the Board on research needs, priorities, and policy; playing a leading role in improving the coordination and cooperation of the various public and private entities engaged in forest research; and recommending a system of collection, maintenance, and

dissemination of forestry research project information. Additionally, the Department and Board are now establishing a new advisory body specifically focused on JDSF, as discussed previously.

These advisory bodies would assist and provide recommendations in regard to the long-term research goals and actions under the management plan, as well in regard to proposed significant management activities. They will provide overview and assist in the identification and prioritization of research and demonstration projects in order to provide appropriate representation for the public, timberland owners, resource professionals, educational institutions, state and local government, and state forest management staff.

Past research topic suggestions and recommendations from various entities are contained in Appendix III (Research and Demonstration Program).

Increase Research Capability

In order to maximize effectiveness in dealing with the key areas of a long-term research plan (see bullets above), the capability of state forest staff should be expanded to include expertise in a broad range of environmental fields. This expansion would provide greater capability to anticipate, facilitate, coordinate, and conduct research within the state forest system (see the tiered research, demonstration, and monitoring plan within this chapter for an indication of preferred expertise that could be added to the state forest system). In one step in this direction, a wildlife biologist position was added to the Forest in the 2006/07 fiscal year.

Cooperatives

The most efficient use of resources is frequently found through cooperative arrangements. These include research cooperatives with landowners and universities, and agreements with other agencies. The Caspar Creek Watershed Study is an example of an agreement with another agency, the USFS Pacific Southwest Experiment Station, Redwood Sciences Laboratory. The CACTOS and GSPACE cooperatives are examples of industry/university research coops in which CAL FIRE has participated. CALFORNET, a new concept of a joint effort by CAL FIRE and the three forestry universities in the State is another example of cooperation. This effort is attempting to coordinate research and demonstration projects between CAL FIRE and the university forests to maximize the effectiveness of available funds.

Additional efforts must be made to coordinate with other state and federal agencies. Particular efforts should be made to cooperate with fisheries and marine scientists at and near Jackson Demonstration State Forest. The pursuit of cooperative funding to leverage existing funds from CAL FIRE should be made where feasible.

Expand Forest Size and Forest Types Represented

To enhance capability to conduct effective forest management research, consideration should be given to expanding JDSF and the other state forests to enable research at the larger watershed or large stand level. In addition, consideration should be given to increasing the number of state forests in order to represent all of the major forest types within the various forest regions subject to regulation by the Board of Forestry and Fire Protection.

Research and Demonstration Needs

Competitive Research Grants

Beginning in fiscal year 1999, funds have been allocated from the Forest Resource Improvement Fund (FRIF) to support expanded research within the State Forest system. This money is available to researchers and others through a competitive grants program that is administered by the CAL FIRE Sacramento State Forest staff. A request for proposals (RFP) will be issued by the Department no more frequently than annually and will skip a year when available funds are insufficient to justify it. CAL FIRE, in conjunction with subject area experts, will review the proposals. CAL FIRE staff will implement a scoring system based upon criteria listed in the RFP. Proposals will be ranked, allowing extra points for certified small businesses or any other special consideration required by law. The top proposals are awarded until the funds are exhausted. Frequently, projects are multi-year and some flexibility exists to maximize the number of projects funded. A fund reserve shall be kept for miscellaneous projects that occur outside the RFP process. Contracts for approved projects are developed in Sacramento. State Forest staff will administer most contracts.

Future Funding Levels

Sacramento staff has responsibility for the coordination of research state-wide. They also have the responsibility to administer a competitive grant program available for State Forest research. The current authorized level of funding available for State Forest System research is about $1 million per year, including about $180,000 specifically earmarked for JDSF. Although authorized, this level of funds has not actually been available due to revenue constraints. Strong interest shown by both the numbers of individuals applying for research funding in the past, and by individuals and organizations inquiring about potential research results, indicates the need to increase funding levels substantially. An increase in annual funding to match the level of demand for forest research would be beneficial. When opportunities arise, staff will attempt to find funds for research proposals.

Research Scoping Criteria

State Forest staff has formulated a series of questions designed to establish the relevancy and priority for proposals suggested by staff or received from other sources.

- Is the research project consistent with the legislative mandate and with the policy set by the State Board of Forestry and Fire Protection?
- Is the research project consistent with the recommendations of Department and Board advisory bodies?
- How does the relative importance and urgency of the research project rank in the list of issues that should be addressed during the plan period?
- What are the expected applications and benefits of the research project versus the projected costs of implementation both short term and long term?
- How does the research project affect other programs on the State Forest and other projects or demonstrations with other cooperators?
- How well does the research project address multiple resource sustainability and environmental concern issues that may be associated with the treatments?
- How well does the research program address problems related to long term trends?

State Forest Identified Research Priorities

Using the process identified above, the Forest staff has identified a number of research priorities for the planning period that will be considered together with priorities identified by other sources. These include:

- Quantitative assessment of the effectiveness of the delineated upland and riparian corridors in providing habitat and expanding the forest occupancy for identified species of concern.
- Carbon sequestration as a management option, including the economic and social benefits in mitigating the greenhouse effects.
- Research on forest ecology, forest biological processes, and measurement of ecological health.
- Develop partnerships and fund research giving priority to information gaps such as below-ground carbon cycles, fog drip utilization by tree and understory plants, methods to hasten development of older forest structure, and climatic tolerances of species.
- Social science research on the structures, functions, processes, success, and failures of advisory entities associated with the management of JDSF.
- Research on the short-term and long-term costs and effectiveness of various forest resource protection measures.
- Fisheries studies that include channel habitat, population dynamics, and off site conditions.
- Young stand management that includes stocking level and precommercial thinning studies.
- Riparian zone wildlife habitat relationship studies that include topics such as stream buffer enhancement and maintenance, and relationships between forest cover and wildlife.
- Watershed management that includes sediment yield, stream discharge, sediment sources, road abandonment, watershed rehabilitation, and harvest reentry studies.
- Upland zone wildlife habitat relationships including modeling, forest fragmentation, edge effects, connectivity, forest corridors and population trends.
- Investigation of optimal element and spatial configurations of structural elements retained during timber harvesting activities.
- Approaches to accelerate or enhance development of older forest or late seral forest characteristics in second-growth stands.
- Role of basal hollows in improving habitat including methods to create these structures without fire.
- Silvicultural systems that include even and uneven-aged management systems.
- Vegetation management that includes control of invasive weed species, competition in plantations, and prescribed fire.
- Public education on forest resources, technologies and issues.
- Forest growth model development that includes gathering data for and improving existing models (e.g., CRYPTOS).
- Forest data systems development for creating, improving and maintaining a data bank on existing and new data that includes both database and GIS data layers.
- Examinations of a range of plant habitat and community interactions.

On-Going Current Research and Demonstration Projects

A number of ongoing research and demonstration projects that will require action during the planning period are listed and briefly described below.

Caspar Creek Watershed Project

This long-term watershed project was initiated in 1962 to monitor the effects of timber management upon various watershed processes. A new South Fork phase was initiated in 1999. The Caspar Creek Watershed study is monitored continuously. JDSF is responsible for infrastructure maintenance including roads, trails, field data collection sites, fish ladders, and the periodic cleaning out of the sediment behind the North Fork and South Fork Caspar gauging weirs.

Caspar Creek Cutting Trials (Control Area)

This unmanaged five-acre stand of second-growth was initially measured for timber stand characteristics, i.e. stocking level, in 1959. It has been periodically re-measured and was last measured in 2006. It should

be scheduled for another measurement in 2016 to assess the stands relationship to culmination of mean annual increment.

Caspar Creek Precommercial Thinning Study

This young stand of third-growth redwood was precommercially thinned to various stocking levels in 1980. The area has been measured periodically since that time, with the most recent measurement in 1998. This area should be measured again in 2008 or 2009.

Middle Fork Caspar Creek Advanced Regeneration Study

This mature second-growth stand was initially harvested in the 1960s. The second entry removed most of the overstory leaving suppressed trees as advanced regeneration. Plots were established in 1987 to monitor the growth of these trees and to compare with plots where these trees were cut to provide for new sprouting. A remeasurement is scheduled for this planning period.

Whiskey Springs Commercial Thinning Study

This stand of second-growth redwood was commercially thinned to several redwood stocking levels in 1970. The most recent measurement occurred in 2005-2007. Portions of this study may be manipulated for use in other studies investigating redwood-stocking levels. This stand should be scheduled for measurement again in 2015.

Hare Creek Sprout Stocking Study

This demonstration of stand development from a regeneration harvest started in 1986 has had two remeasurements since the installation, the last done in 1998. One remeasurement should be done in 2008.

Railroad Gulch Selection Silviculture Study

This demonstration of various selection cutting methods and levels was initiated in 1984 and was re-measured in 2003. Focused silvicultural analyses are currently being conducted by UC Berkeley. An analysis of the data, silvicultural prescription, and second entry timing will occur during the plan period.

Parlin Fork LWD Study

This demonstration of artificially loading stream channel sections with large woody debris to improve fish habitat was initiated in 1996. The most recent measurement occurred in 2006. Periodic remeasurements may be done during the plan period.

Hare Creek/Caspar Creek LWD Study

This demonstration is similar to the Parlin Fork LWD study in testing techniques to improve fish habitat. The main channel in each had LWD placed in 1999. The most recent measurement of the large woody debris occurred in 2006. Periodic remeasurement of wood debris in the channel and juvenile fish populations will occur during the plan period.

Asymmetrical Coast Redwood Growth Model Study

This study was initiated in 1986 to develop a process based coast redwood growth model and a mechanism to thin a stand to optimize stand growth and yield. Remeasurement of the thinned stand using the developed specifications was completed in 2006. Analysis of the data is complete.

A Long Term Precommercial Thinning Study in Coast Redwood

The study established in 2001 is a long term precommercial thinning trial in the coast redwood type which tests 1) a range of stocking levels; 2) the growth response over a range of environmental and management activities including broadcast burning, herbicide application, slope, aspect, age and site; and 3) the optimal stand age for conducting the PCT treatment. The study will also provide data which may be used to expand the CRYPTOS growth model for ages from zero to 20 years. The first remeasurement will occur during the plan period.

Road Surface Erosion Study

This is a pilot study measuring road surface erosion by David Tomberlin, National Marine Fisheries Service and JDSF. Initiated in 2004, it includes the manufacture and installation of ten collection devices on JDSF that capture water from ditch relief culvert outlets. JDSF is collecting data on coarse sediment, suspended sediment, and water quality. Initial findings have been evaluated and presented at a professional forestry conference.

Demonstration

Creating opportunities for demonstration of various silvicultural systems, forest structures, and wildlife habitats will be a significant focus of effort. Two demonstration areas, one on the west and one on the east side of the Forest, are proposed. Planning specific demonstrational features and development of these areas, with input from the public and the new JDSF advisory body, will occur during the planning period.

Timber stands that contain various habitat conditions can be both valuable demonstrational areas and provide opportunities for research on both riparian and upland species and associated effects of management actions. Topics relevant to sustainable wildlife habitat such as forest fragmentation, landscape connectivity and edge effects have a high priority for research in the planning period. Information needed for landscape connectivity assessment for example, includes species movement, response to patch structure, gap crossing ability, and dispersal distance, most of which is unknown for most vertebrate species.

All currently recognized silvicultural systems will potentially be available for demonstrational and operational purposes. Uneven-aged management is of great interest to non-industrial forestland owners, and a large land allocation on the State Forest will be devoted to silviculture systems which produce these kinds of stands. To a lesser extent, stand structures exhibiting even-aged silviculture systems such as clear-cutting, seed or structure tree and shelterwood will also be created and maintained, subject to the limitation specified in Chapter 3. All of these sites are transient in their ability to convey certain demonstrational qualities, so management efforts also have to emphasize maintaining all these kinds of stand conditions in different locations over time. It is also important to retain stands that have similar characteristics to other forest stands in other ownerships in the region so that relevant management techniques can be demonstrated. The effectiveness of demonstrational areas depends in part on the completeness of the information that is available to interested clientele.

Information packets may be developed and maintained which focus on the demonstrational qualities of a particular site. These packets are often used as one type of information transfer medium on tours and similar events. Keeping the information packets current requires periodic records updating relating to

management actions and stand development. Particular sites may warrant permanent informational or interpretive displays. Sites that are relatively secure in terms of potential vandalism and have high demonstrational value have a higher priority, i.e. The Railroad Gulch Silvicultural Study area. This site is adjacent to the Woodlands Outdoor Education Center and a permanent interpretive display may receive a high amount of use. A proposal will be made to the California Department of Parks and Recreation to jointly develop areas for forest demonstration that are adjacent to the Woodlands Center and to the Pygmy Forest Reserve.

Tours

As in the past, tours are given by request to a wide range of groups each year. Tours have been given to school classes ranging from kindergarten to college emphasizing natural resource education, ecology, and forest management. Other tours have been given to professional organizations such as The Society of American Foresters and to policy-making bodies such as the Board of Forestry and Fire Protection. Other clientele include visiting research scientists from across the world who are interested in specific research activities being done on JDSF. Other organizations such as the Western Research Forest Managers group who meet annually at one research forest have been hosted on JDSF. Timber industry foresters have been given tours on the forest so that management techniques that are used on the Forest can be passed along to the private sector. Both small non-industrial and industrial landowners and land managers have toured various sites within JDSF to examine stand treatment, forest development, and various recovery efforts.

As part of future activities, a regularly scheduled program of tours - 3 to 4 per year - is planned to show, explain and interpret the changing landscape and type of management that is being done on JDSF. It is our intent to enhance the public view of JDSF as an open house. This series of tours, each of which could be focused on different aspects of management or research, would complement the requested tours. Such scheduled tours will be well advertised with an agenda and handouts to supplement the discussion at various stops.

State Forest Data Bank

Developing a State Forest data bank for documentation of management activities will be a priority task during this plan period. Current computer technologies permit efficient electronic storage and retrieval of all types of resource information including graphics. A formal procedure for input of all types of research and operational data into the bank will be developed during this planning period. Researchers and forest staff will be able to access all information that has been documented and reported on through one system in a timely and efficient manner. Proper development of the data bank and its use will also be a tremendous asset in the monitoring and adaptive management part of the forest program. The system will help to prevent duplication of data collection and accelerate the process of progressing to the next step in specific research areas. This central data bank also minimizes the chance of data loss and serves as one form of institutional memory, especially important with long-term projects such as the Caspar Watershed study, which has a 100-year planning horizon.

Important components to consider in the development of this databank include a database of important statistical data associated with various management actions such as timing, before and after timber stand attributes or other associated resource information. Another is a database link between raw data and the associated reports that provide the data analysis and conclusions about management actions and studies. The photo coverage described above is an important element of the databank. A spatial link can be provided in the form of GIS coverage on all management areas and actions. This GIS environment is an excellent platform to tie all these resources together and will be an important component for continued development during this period. This will require the services of a dedicated GIS specialist on staff in coordination with state forest staff.

As part of a complete documentation of activities, a consistent and organized effort towards building a photographic record of state forest activities and forest development is needed. An attempt will be made to establish and maintain a set of photo points. The advent of digital photography and digital storage allows the relatively easy electronic storage of photos which can then be made available over the internet as part of the public education and technology transfer components of the program.

Internet Web Site

The exponential increase of Internet use as an information tool by all clientele groups makes it an important technology transfer and public relations medium. In coordination with the Unit and Sacramento, the current internet web pages which describe the State Forest system will be expanded to include forest descriptions and statistics in much greater detail. Access to publications is currently available on www.demoforests.net. This web site is being updated with materials from JDSF and is the first phase of the data bank. Over the planning period, additional types of publications will be made available for viewing and download. GIS information on many types of forest attributes will become available for viewing using free viewer programs such as ArcExplorer. Links to other related or affiliated organizations will be made part of the web site. Periodic updates to the page will be done as management activities change the status of forest conditions.

Publications

The Jackson Demonstration State Forest newsletter is a state forest publication designed to quickly transfer information regarding management, recreation, and research activities on the Forest. It is written, formatted, and reviewed by CAL FIRE Forest and Unit staff as a publication of the Mendocino Unit. It is currently printed using the Department of Corrections print shop facilities. This format started in the early eighties with almost fifty issues having been published and sent to a mailing list of over 400. It is the intent to publish a minimum of two newsletters per year. This will allow the timely transfer of information about current events and activities on the state forest. The Demonstration State Forests newsletter is a system-wide vehicle for outreach and is published out of the Sacramento office with contributions from the forests. These publications are available on-line.

The State Forests Research and Demonstration Newsletter, initiated in the spring of 2003, is produced by the State Forest Research Coordinator in Sacramento. It covers research and demonstration projects from all of California's state forests. The goal is to keep the public informed of the on-going commitment CAL FIRE has to increasing our knowledge-base and research data, and to share the findings these projects have produced with foresters, research scientists and the public. These publications are available on-line.

The California Forestry Note has been the CAL FIRE publication for state forest activities since 1960 (originally called State Forest Notes). More recently, the California Forestry Report series was created for more lengthy publications. Most research projects should produce at least one California Forestry Note or Report (see below). Reprints from other peer-reviewed publications may also be available. Sacramento staff serves as the editor and publisher of these series with technical assistance from State Forest staff. Research projects such as the Caspar Watershed Study, Caspar Cutting Trials, Railroad Gulch Silvicultural Study, Redwood Sprout Study, and Hare Creek Sprout Study have been reported on in this series. These publications are available on-line.

Forestry Reports are oriented towards a professional or research audience. The writing is more technical and lengthy than that found in the California Forestry Note. Generally, at least one of the authors is a State employee. Four reports were edited and published by Sacramento staff in 2004 and 2005. These publications are available on-line.

Most research contracts contain a report requirement. These reports are often summarized in a State Forest publication or are further developed by the researcher for submittal to professional journals. All

reports submitted since 2001 are available on-line. Earlier reports will be added to the Internet web site during the plan period.

Numerous professional journals offer the possibility of technology transfer to a wider audience than might be contacted through the internal CAL FIRE publications. The primary researcher may desire to submit an article that reports on research done on JDSF to a peer reviewed journal. This will be encouraged as long as it does not abridge the right of CAL FIRE to publish research results in a CAL FIRE publication. CAL FIRE may also submit research reports to professional journals in addition to publication internally.

Symposiums

Symposiums which cover a range of topics relevant to resource management in the coast redwood region will be planned for every five years to report on the results and status both from JDSF research and related external research. Smaller information transfer sessions will be conducted as an interim process to transfer information on a timely basis. Two major conferences and one update session have been presented within the last decade. The first was the Coast Redwood Ecology Conference that was presented in 1996 at Humboldt State University in Arcata. Over 600 participants from all over the world attended the 3-day conference in which speakers presented on a wide variety of subjects regarding coast redwood management and ecology from many different organizations. The second conference followed in 1998 and was focused on the results of the second phase of the Caspar Watershed Study. This phase was designed to address the issue of cumulative watershed effects given the set of management activities applied to the watershed. This one-day conference was presented at the Mendocino College in Ukiah and attended by over 500 participants from all over the country. A one-day field tour of the watershed study area was given in conjunction with the symposium. A one-day information transfer session was presented in the spring of 2000 that focused on results from a number of recent research and monitoring studies. JDSF also participates in symposiums sponsored by other organizations such as the 2004 Redwood Region Science Symposium coordinated by the University of California Center for Forestry. In fact, 31% of the presentations and 26% of the posters at that event were associated with research from JDSF.

Proceedings will be developed from every conference that the State Forest sponsors. Interim results from several of the major research projects on JDSF were published in the proceedings resulting from the last two conferences. These included reports from multiple sub-studies of the Caspar Watershed Study, the Railroad Gulch Silvicultural Study, the Whiskey Springs Commercial thinning Study, and the Caspar Creek Precommercial thinning Study.

New Research, Interpretive, and Education Facilities

The Department has for some time been interested in expanding its facilities and capabilities for supporting research, providing interpretive opportunities, and being able to offer educational programs such as classes. Until recently, much of this expansion was considered in the context of the site of the existing modest Forest Learning Center facility at Camp 20. This building, completed in 2003, serves as a dormitory facility for visiting researchers and as an informal meeting place for groups that appreciate a facility half-way between Highway 101 and the Coast.

Recently, as a part of ongoing discussions regarding the redevelopment of the former Georgia-Pacific mill site on the Fort Bragg waterfront, the City of Fort Bragg has invited the Department and the Board to join them in the exploration of the creation of what is being called the Noyo Center for Science and Education.” This new Center could evolve into providing exactly the kind of facility the Department has envisioned for providing research, interpretation, and education. JDSF and the Department will actively join the City in the consideration of this concept.

Additional funding and staffing would be required to accomplish any of the three items discussed in this section.

Forest Learning Center

The construction of a Forest Learning Center is planned for implementation during the coming decade. The desired facility will include a conference center, classrooms, resource and research library, Internet access, State Forest Data Bank access, research lab, video conferencing, and administrative offices as part of the complex. The research library will be created from existing libraries on the state forest and will be updated gradually over the planning period with literature on all subjects relevant to the effective management of the state forest. This activity will be part of the Education Forester responsibilities in conjunction with other forest staff.

There will also be institutional network access to other research facilities and research forests nationwide, including Soquel Demonstration State Forest, U. C. Berkeley's Blodgett Forest, California Polytechnic State University's Swanton Pacific Forest, and Humboldt State University's School Forest. This Center will provide the resources to do needed research in a productive and cost efficient manner. Group education sessions can be held simultaneously, taking advantage of the latest research results. This facility will be built on the State Forest in an area representative of the coast redwood/Douglas-fir ecosystem. Alternatively, there may be potential for the Forest Learning Center to cooperate or partner with the Noyo Center for Science and Education.

Access from Highway 20, as well as high speed Internet access, will be important considerations in determining where this facility will be located. The location of the Forest Learning Center should allow for the expansion of facilities over time, and may include space for the possible siting of a new State Forest headquarters as well. The Forest Learning Center will be located and designed in accordance with the CEQA process to not significantly affect day or night time views from campgrounds or residential areas. The operations of the State Forest and activities of the Forest Learning Center need to be closely connected. A long distance between facilities may impair the potential to integrate forest operations with the research and demonstration program.

JDSF Interpretive Center

The construction of a JDSF Interpretive Center will be planned for completion in conjunction with the Forestry Learning Center. This facility may be built near the historic schoolhouse located in the Camp 20 area. This site is adjacent to Highway 20. This location will be capable of serving the many thousands of forest visitors traveling through the State Forest each year. An opportunity will be provided for the public to learn about forest ecology, forest management, and the unique mission of the State Forest. Alternatively, there is potential for the Interpretive Center to cooperate or partner with the Noyo Center for Science and Education.

The Interpretative Center will provide museum space for early logging and prehistoric artifacts found on the State Forest as well as up-to-date displays of JDSF research and demonstration programs. Forest visitors will be able to obtain camping permits, maps, trail brochures, wildlife and vegetation lists, and firewood and mushroom collection permits. Other resources available to the public may include a bibliography of State Forest research, natural history books relevant to coast redwood ecosystems, and updated schedules of proposed tours and seminars. This Center will also include a classroom space for approximately 30 students, rest rooms, and outdoor picnic facilities. The State Forest would seek to develop a memorandum of understanding (MOU) with local school districts, Mendocino Woodlands, and State Parks to provide a comprehensive interpretative program for school-aged children and forest visitors on forest management and ecology issues. This MOU will include program space for CAL FIRE's Project Learning Tree, and will seek to develop a close working relationship with the Forestry Institute for Teachers and other educational programs.

Public and Professional Education

Forestry education is a vital component of the research and demonstration program. A JDSF Forest Learning Center in conjunction with the Interpretative Center at Camp 20 will provide the structure to facilitate a comprehensive education program. Alternatively, there is potential for the public and professional education function to cooperate or partner with the Noyo Center for Science and Education.

The clientele for this component of the program will encompass all grade levels of school up through postgraduate, forest landowners, resource professionals, and the public. Developing and using demonstration areas will be an important component of this program. A volunteer docent will help staff the interpretative center/museum that will have books relating to various resources found on the Forest. Tours can start from here, accessing the middle and eastern part of the Forest. Another effort will be in developing forest demonstration trails that serve both natural resource interpretive purposes and demonstrations of active forest management. A MOU with local school districts, the Mendocino Woodlands Center for Outdoor Education, and State Parks will help school-aged children and forest visitors develop a better understanding of a healthy managed forest. Personnel dedicated to public education would lead this outreach effort. All of these initiatives are examples where the demonstration and recreation programs can complement one another to maximize their potential benefits.

Mitigations and Monitoring for Research Projects

The varied nature of proposed research projects precludes applying specific mitigation measures to each proposed project. Rather, each project will need scoping and further assessment to determine the applicable mitigations needed.

Impact assessment and mitigation are stated in general terms where the specific details of a particular activity are not known, and cannot be known at this time. This is particularly true for our Program EIR that must forecast the impacts of actions resulting from policy decisions. Most often, programmatic or policy-level mitigation is either included in the DFMP or is provided as part of the accompanying EIR. Individual project level mitigation may be deferred to a subsequent impact assessment where the scope or site-specific details of the action are currently speculative, not fully known, or not analyzed to a sufficient degree in the EIR. In these cases, additional CEQA review is required once the activity is fully defined in terms of scope, location and other factors. This review, where necessary for identification of additional mitigation, will occur in the development of Timber Harvesting Plans, EIRs, or negative declarations that tier off of the EIR.

Chapter 5. Monitoring and Adaptive Management

Monitoring denotes the process used to evaluate progress toward the stated goals in the management plan for JDSF. Adaptive management denotes the management strategies that will be implemented if analysis of monitoring results indicate that resource conditions begin to deviate from the desired trajectory. This chapter describes the monitoring and adaptive management approach that will be used on JDSF in the implementation of this management plan. This chapter also provides a brief account of past and current monitoring activities.

The JDSF Approach

The scientific literature commonly recognizes five categories of monitoring: inventory and baseline assessments, trend monitoring, implementation monitoring, effectiveness monitoring, and validation monitoring. This management plan focuses on practical implementation of proven, practical monitoring strategies that can be sustained given limited budget and personnel. Monitoring in this manner is an important objective in demonstrating applicable forest management methods. Consequently, this plan adopts a simpler approach to monitoring, consisting of defining monitoring goals, parameters and data collection, and analysis and adaptive management. The five categories of monitoring above are all represented in the JDSF approach, albeit in a more aggregated fashion.

Monitoring goals describe the desired future conditions we try to achieve on the Forest, or the forest structure we are trying to achieve. These goals are summarized in the implementation guide below, and described in more detail in Chapter 3 of this document. The desired future conditions may well become constantly moving targets, as societal preferences, biological conditions, and scientific knowledge change with time. This plan will be updated to reflect such changes.

Parameters are the variables that will be measured under the monitoring program. To a large extent, defining monitoring parameters equates to formulating the hypotheses or questions necessary to be able to collect relevant data and evaluate whether we are on track to achieving desired forest conditions.

The final step, analysis and adaptive management, refers to the process of evaluating the data and reaching results and conclusions regarding forest conditions and trends over time. Analyses can range from data summaries coupled with professional judgment in the case of high levels of uncertainty and lack of data, to formal statistical tests of hypotheses addressing issues of sampling variation where such data is available. The conclusions from the analysis stage form the basis for adaptive management strategies.

Resources available for monitoring are limited, whereas the potential parameters that could be monitored are infinite. Since we cannot monitor everything, this management plan focuses on ecosystem vital signs–parameters that are statistically robust, inexpensive to obtain, and are key to providing reliable early warning signals of changes in the structure and function of the Forest. In addition, monitoring goals are ranked into two priority categories. This approach will enable managers to determine which goals will be addressed in any given year, given budget and personnel limitations at that time. This monitoring strategy may not keep track of all important parameters at all times. Due to its flexibility however, it enables the State Forest to sustain an uninterrupted program of tracking forest conditions over time, detect major changes, and adapt management practices in response.

The collection of baseline data within the Forest boundaries is important for some monitoring needs. By extending certain monitoring activities outside the Forest to address larger issues, we may most efficiently use limited resources. For example, botanical surveys along transects from the coast to the dry interior and across different ownership classes would provide data for multiple purposes. This approach would provide baseline data within the forest for adaptive management uses and research data for contrasting biodiversity by ownership class and ecotype. To efficiently allocate limited resources and fulfill our

research and demonstration mission, we will consider other questions and objectives when developing data collection strategies for monitoring.

The timing of monitoring data collection and adaptive management analysis varies by topic. The list below summarizes the frequency of certain activities.

Continuous

- Pest and invasive weed infestation monitoring
- Forest operations
- Heritage resources (training, JDSF database, post fire, road segments)
- Management plan updates (separate from 5-year review)
- Rare plants and animals using survey and the California Natural Diversity Database
- Climate data
- Forest protection and security
- Forms of recreational use

Periodic

- Road and drainage features, more frequent in winter
- Forest inventories
- Short-term harvest schedule, and long-term plans
- Species abundance and health
- Botanical surveys for timber harvesting plans and other large projects
- Floristic surveys in some areas to gain a better understanding of the relationships between the local plants, their distribution, and their habitats.
- Research installations

Annual

- Active road inspections
- Recreational and minor forest product collection trends
- Production of forest products
- Vegetative changes due to management activities

A process for evaluating monitoring information in the context of the management plan will occur to coincide with the 5-year review of the plan by the Board. Advisory entities will be used to provide recommendations on monitoring approaches and to assist, where appropriate, with the interpretation and evaluation of monitoring information before the Board review.

Implementation Guide

The rest of this chapter will describe the specific application of the JDSF monitoring and adaptive management approach to the full range of resources on the Forest, covering both ongoing and planned future monitoring efforts. This implementation guide is intended primarily as a field manual for the forest manager, to guide in implementation of the JDSF monitoring approach on the ground. It is therefore organized in a series of steps, listing monitoring priorities for each resource, followed by parameters and data to be collected, and finally analysis approaches and adaptive management strategies.

Forest Resources

Maintain a wide range of seral stages. Increase late seral (CWHR 5 and 6) forest conditions. Make progress toward the attainment of the forest structure goals (see Table 7 in Chapter 3).

Non-declining inventory levels. Harvest less than growth over any rolling 10-year period. Harvest no more than 35 million board feet (MMBF) per year (expected annual harvest to range from 20-25 MMBF/year) averaged over the first 10 years of management plan implementation, and harvest no more than LTSY during any decade of the planning period used to calculate LTSY.

Reduce invasive weed species such as eucalyptus in favor of native vegetation. Increase conifer stocking on the east end of the Forest.

Achieve maximum sustained production of high quality forest products while maintaining, recruiting, or increasing other public trust resources.

Parameters and Data Collection, all goals:

Monitoring of many forest resources is tied to forest inventory measurements. Several inventory efforts are currently ongoing and will continue to be implemented. A forest resource inventory (FRI) is conducted periodically as a part of the Forest's stand based forest inventory and vegetation typing system, and a continuous forest inventory (CFI) is periodically measured to assess growth and other changes. In this inventory process, timber as well as forest structure parameters are measured in detail. The following parameters are measured at regular intervals:

Table 13. Inventory Measurement Parameters.

Parameter	Unit	How Derived
Diameter	Tree	Measured
Species	Tree	Measured
Height	Tree	Measured
Health	Tree	Estimated
Crown length	Tree	Measured
Five-year increment diameter growth	Tree	Measured
Canopy position	Tree	Estimated
Canopy closure	Stand	Measured
Species mix	Stand	Measured
Average stand diameter	Stand	Calculated
Dominant understory vegetation	Stand	Estimated
Last treatment implemented	Stand	Recorded
Forest type / seral stage	Stand	Measured
Site quality	Stand	Measured
Connectivity of different forest types	Planning watershed, Forest	Calculated
Amount of edge, patch size, forest interior	Planning watershed, Forest	Calculated
Visual quality	Planning watershed, Forest	Calculated
Reforestation	Project	Measured
Release and thinning	Project	Measured
Timber harvest	Project	Measured

The continuous forest inventory (CFI) system has been measured at five to 10-year intervals since 1959, and provides a high quality historical record of forest growth and structure characteristics over a 45-year period. Forest-wide growth, stocking and structure characteristics will continue to be measured under the continuous forest inventory system.

Intensive pre- and post-harvest inventories will be conducted periodically on THPs to enable evaluation of the effects of silvicultural methods. These inventories will enable analysis of the effects of treatments such as structure retention.

Forest vegetation types are mapped for the whole Forest. The vegetation map is based on remotely sensed imagery (aerial photography) combined with ground truthing. It will be updated based on management treatments that occur, and new vegetation maps will be developed periodically, along with records of stand management.

Research projects will continue to contribute a wealth of data evidence to help characterize past, present and future conditions on the Forest. Research data will be captured in a comprehensive data base. All data will be made available to researchers and the public via the State Forest website and other means.

Analysis:

Analyses include standard statistics estimated from the Forest Resource Inventory (FRI) and CFI data include stand tables and stock tables, species distribution, and forest structure characteristics, including CWHR. The State Forest Data Bank, a data base that integrates existing forest inventory data, provides the ability to conduct ad hoc queries on any forest-related variable. GIS data will be linked to the data base to provide spatial reference. The forest structure characteristics data permit estimating seral stage and wildlife habitat values using for example the California Wildlife Habitat Relationships system.

Adaptive Management:

Implement silvicultural methods to create a mix of seral stages. Implement silvicultural methods aimed at cultivating late seral conditions in selected managed stands.

Reduce or increase annual harvest levels to achieve the desired five-year rolling average harvest levels and non-decreasing inventory levels.

Implement silvicultural methods that increase conifer site occupancy and selectively remove hardwood species where they are over-abundant.

Implement the guidelines from the JDSF Option A plan.

Sediment Sources

Hillslope conditions - mitigate road and crossing problem sites.

Parameters and data collection:

As part of the Road Management Plan for JDSF, CAL FIRE will survey all of the roads and crossings on JDSF over a 3-year period, identify problem sites, develop priorities for treating problems (inventory/baseline monitoring), and begin treating problems as expeditiously as budgets allow. The procedures for the road and crossing inventory are described in detail in Appendix IV. The inventory will include permanent, seasonal, temporary and abandoned roads and crossings. Once complete, the inventory will be regularly updated with information from continued road inspections, maintenance and monitoring.

Active roads and crossings will be inspected at least once annually to ensure that drainage facilities and structures are properly functioning (effectiveness monitoring). This monitoring will use a rapid ad hoc inspection procedure and will be a part of daily activities. More intensive inspection will occur every two years.

The analysis phase will consist of qualitative evaluation of problem areas using professional judgment. Adaptive management approaches include treatment of problem sites and road maintenance. This is described in more detail in the Road Management Plan.

Hillslope monitoring – minimize erosion impacts resulting from forest management operations.

Parameters and Data Collection:

Parameters and data collection will include the following items for completed THPs (inventory/baseline, implementation, effectiveness monitoring): 1) inspection of all watercourse crossings, road segments, and landings, 2) map the location of rilling/gullying on road surfaces, landings, and watercourse crossing fills that are contributing significant amounts of sediment to watercourses, 3) map the location of mass failures (including cutbank/fillslope sloughing) associated with roads, crossings and landings, or within harvesting units observed during the completion of the other items described in this section, 4) map the location of road drainage structures (including watercourse crossings—existing and abandoned or temporary crossings) contributing significant amounts of sediment to watercourses, 5) when altered significantly by management, measurement of WLPZ overstory canopy for Class I and Class II watercourses, and 6) record information on the causes of the erosion features described above, proposed improvements needed, and a timeline to make these improvements. Information will be recorded as to whether the erosion feature was the result of the current timber operation (validation monitoring). THPs will have over-wintered 1-4 years.

Analysis will include examining relationships between forest management operations and documented erosion. Adaptive management solutions will be site specific, based on established practices and professional judgment.

Minimize landslides associated with roads, landings and harvest units.

Parameters and Data Collection:

Parameters and data collection will consist of identifying landslides associated with roads, landings or harvest units by both direct observations in the field augmented with aerial photographs. These observations will be complemented with records of silvicultural prescriptions applied to the surrounding area in the past.

The analysis portion of the monitoring process will be separated into two classes of landslides: those associated with roads and landings and those that are not. As a part of the road inventory, all unstable areas observed along roads or landings will be identified following an approved inventory methodology. Mitigations will be based upon reviews by appropriate professionals, which may include RPFs, CEGs, LTOs, and maintenance crews. In-unit landslides that are not associated with roads or landings will be inventoried when encountered. On-going research by CGS certified engineering geologists involving mapping landslides associated with clearcuts may be expanded to address landslides in areas with other silvicultural prescriptions. Specific tasks may include but are not limited to: 1) compilation of data on road-related landslides, 2) compilation of landslide frequency, type, size, slope, relative activity, sediment delivery to a watercourse and relationship to past and current forest practices on slopes with similar characteristics, 3) Based upon the best available information, develop a more detailed map of landslides and relative landslide potential, 4) compare relative landslide potential map with field maps of landslides that fail, 5) compare field mapped landslides to areas of predicted low stability modeled by various computer models. Sets of aerial photographs for JDSF from the 1940s to the present will be used to aid in achieving the adaptive management goal to develop silvicultural prescriptions and road and landing construction techniques that minimize the risk of triggering landsliding.

The adaptive management solution to achieving this goal is development and application of silvicultural prescriptions and road and landing construction techniques designed to minimize the risk of shallow landsliding.

Instream Conditions and Fisheries

Stream channel conditions - maintain or improve aquatic and riparian habitat conditions and minimize sediment delivery to watercourses.

Parameters and Data Collection:

Surveys of stream channel conditions will be implemented for a limited number of streams on JDSF. These surveys will establish and/or contribute to a comprehensive set of baseline information. The data collected through these surveys will also be used to monitor long-term trends in channel morphology, habitat quality and woody debris, and to evaluate the effectiveness of prescriptions designed to maintain or improve aquatic and riparian habitat conditions and minimize sediment delivery to watercourses. The goals of this work are (1) to assess and monitor the quality and quantity of habitat available for the freshwater life history stages of coho salmon and steelhead, and (2) assess and monitor the trends and effects of sediment input and transport in JDSF's stream channels. If possible, the surveys will use protocols consistent with those used in previous JDSF stream channel surveys. Methods will also be consistent with the current survey methods for woody debris and channel conditions in Caspar Creek and elsewhere on the Forest. The reaches sampled will be carefully documented and described so that they can be relocated and resurveyed. Parameters sampled will vary depending on the stream reach evaluated, but may include:

- LWD frequency by size class, with information on condition and placement
- Pool dimensions (including pool volume, residual pool depth, and useable rearing/holding/overwintering habitat)
- Pool frequency
- Gravel permeability, embeddedness and size distribution (including overall d50 of sampled reaches)
- Channel dimensions (measured using transects)
- Longitudinal profiles and cross sections
- Bank conditions and entrenchment
- Benthic macroinvertebrates

For analysis, data collected for these parameters will be evaluated against benchmarks such as those provided from the literature, relevant agencies, and the FEIR. Trends will be analyzed, including the examination of correlation and causation between changes in parameters and land management activities.

The adaptive management solution relative to this goal consists of developing and implementing a set of management prescriptions designed to maintain or improve aquatic and riparian habitat conditions and minimize sediment delivery to watercourses.

Minimize potential cumulative watershed effects resulting from forest management activities.

Parameters and Data Collection:

Parameters and data collection are defined by the research protocol in the ongoing Caspar Creek watershed study, the only long-term hydrologic record (44 years) from watersheds located in second-growth conifer forests. On August 17, 1999, CAL FIRE and the USFS-PSW signed a Memorandum of Understanding (MOU) agreeing to a long-term philosophy of cooperation for conducting watershed research at Caspar Creek. It was agreed that for 100 years, the two agencies will continue to endeavor to: 1) measure streamflow at the North and South Fork weirs, 2) measure rainfall at two locations in the watershed, 3) maintain sub-watersheds H and I in the North Fork as untreated controls, 4) measure suspended sediment at the North and South Fork weirs and H and I sub-watersheds, and 5) maintain a

2.5 acre headwater swale in the North Fork as an untreated control for comparisons of pipeflow and subsurface hydrology with treated headwater swales.

Analysis approaches and adaptive management solutions will continue to evolve as a part of the Caspar Creek watershed study. Research projects are likely to continue to be the major source of both. Findings from the Caspar Creek watershed study and other research will be applied in the management of the Forest, as appropriate.

Stream temperature - maintain or improve current stream temperature regimes.

Parameters and Data Collection:

CAL FIRE has intensively monitored summer water temperatures in JDSF streams since 1993. Annual summer stream temperature monitoring is scheduled to continue. Stream temperature data currently reported for each location include: (1) hourly water temperature, (2) maximum 4-week moving average temperature and date of occurrence, and (3) maximum 7-day moving average temperature and date of occurrence.

Analysis will include the comparison of data collected for these parameters with benchmarks such as those provided from the literature, relevant agencies, and the FEIR. JDSF also will conduct trend analysis, including the examination of correlation and causation between changes in temperature, land management activities, and changes in stream canopy. Adaptive management solutions will consist of modifying forest management prescriptions and manipulating vegetation canopy cover as needed.

Maintain or improve current fish and amphibian populations on the Forest.

Parameters and Data Collection:

Since 1962 DFG has maintained a weir and coho salmon egg-taking station in JDSF, located on the South Fork Noyo River near the confluence with the North Fork of the South Fork Noyo River. Each year DFG attempts to count all of the returning coho at the weir.

The U.S. Forest Service's Redwood Sciences Laboratory conducted yearly electrofishing surveys in the North and South Forks of Caspar Creek between 1986 and 1995. The surveys documented density, biomass, and distribution of fish and amphibians by habitat type during the early summer.

DFG traps and counts downstream juvenile migrant salmonids in mainstem Caspar Creek approximately 1 mi (1.6 km) downstream from the confluence with South Fork Caspar Creek. The downstream migrant trap has been operated annually since 1987 from March through June.

Since 1986 DFG has monitored the density of juvenile salmonids at two locations in mainstem Caspar Creek.

In summer and fall of 1995, 1996, and 1997 streams in JDSF were surveyed to identify the upstream extent of salmonids and document the species present. These surveys also documented the location of potential barriers to salmonid migration. Data were collected on large woody debris loading and fine sediment in stream gravels in Hare Creek.

CAL FIRE and DFG have periodically documented habitat type, fish biomass and density, amount of fine sediment, stream shading, and large woody debris loading in five reaches in the South Fork of Caspar Creek since 1992.

CAL FIRE will continue to work with its various partners to collect or to expand the collection of the above types of data.

When planning for timber harvest, selected large woody debris within stream segments will be inventoried to determine relationship to potential target levels.

Analysis will consist of summarizing available data and assessing fish populations. Adaptive management solutions are complex and need further work, but the same management strategies as used for stream temperature will apply.

Wildlife Resources

Many of the monitoring and adaptive management strategies for wildlife resources are described in detail for individual species in Chapter 3. This discussion covers overall strategies for a larger group of species.

Protect or improve current populations and habitat.

Parameters and Data Collection:

Raptors – CAL FIRE currently monitors selected Northern Spotted Owl activity centers on JDSF. CAL FIRE began surveys for the northern spotted owl on JDSF in 1989, with survey efforts increasing in the early 1990s. Banding of individual owls began in 1990 and continued intermittently.

CAL FIRE conducts northern goshawk surveys when suitable habitat is present within timber harvesting plans or other project areas. JDSF will develop and implement a training program to assist personnel in raptor identification, nest sites, and survey techniques on an as needed basis.

JDSF will conduct an annual aerial survey for osprey, depending upon the availability of a CAL FIRE helicopter and survey THP areas for osprey and other raptor species of concern (inventory/baseline monitoring). JDSF will conduct ground-based surveys (Northern Spotted Owl) using established or generally accepted protocols prior to project implementation. The survey will include suitable habitat within the project area and the largest disturbance buffer potentially established for proposed management activities.

Marbled murrelet - the U.S. Forest Service's Redwood Sciences Laboratory conducted the first survey for marbled murrelets on JDSF in 1988. No surveys took place between 1989 and 1992. Annual marbled murrelet surveys began in 1992 and have continued. Marbled murrelet surveys since 1992 have generally been conducted in accordance with established survey protocols for this species. Survey efforts have focused on potential suitable habitat within or near project areas (primarily old-growth groves; potentially, large, old individual trees with necessary structural characteristics) at various locations throughout JDSF.

Aquatic and riparian ecosystem dependent species of concern - current stream survey projects will continue (see previous section).

Snag and cavity dependent species of concern - snag and down log occurrence, density and size data is collected as part of JDSF forest resource inventories. CAL FIRE will supplement plot data with additional plots where necessary to provide a special habitat element assessment at the scale of a 40-160 acre drainage area.

Analysis will focus on species specific data trends, population and habitat models. Adaptive management strategies include modifying the timing, location and nature of management activities. These are described in more detail in Chapter 3 for individual species.

Plant Resources

Protect and restore the diversity of plant species across the Forest.

Parameters and Data Collection:

CAL FIRE will develop and implement a training program to assist personnel in sensitive plant identification and habitat requirements on an as needed basis. A qualified botanist and/or trained forest personnel will conduct surveys based on the DFG Guidelines for Assessing the Effects of Proposed Projects on Rare, Threatened, and Endangered Plants and Plant Communities (DFG 2000) within project areas and areas of influence to assess plant occurrence as necessary (inventory/baseline monitoring). Surveys will include suitable habitat within the proposed project area and any suitable habitat off-site that may be affected by project implementation. Off-site areas include but are not limited to areas where hydrologic conditions could be altered through project implementation.

Survey summaries will form the basis for botanists' or foresters' professional judgment about possible adaptive management strategies. These strategies may include modifying the nature and location of management prescriptions.

Recreation Resources

Improve the utility of the Forest as a recreation destination.

Parameters and Data Collection:

Visitor-use surveys will be conducted in the near future and at least every 10 years to ensure that the recreation facilities and opportunities provided meet users' needs. Adjacent landowners, including neighboring property owners, will be included in future studies on recreational uses in the JDSF as well as forest visitors, recreation user groups (e.g., local mountain biking groups), and people camping in the forest. The initial phase of the surveys will be informal focus groups with the known types of recreational users to get direction on the main areas of current use and how to engage these groups in the design, implementation, and stewardship of a more extensive recreational facilities system.

JDSF will monitor environmental impacts of visitors to the Forest (including those incurred as a result of mushroom harvesting) by maintaining law enforcement reports and compiling annual summaries of maintenance projects associated with recreational facilities and activities.

Analysis of recreation data and adaptive management strategies will include the following:

Descriptions of significant nuisances will be recorded, compiled and reviewed annually, including, but not limited to, vandalism, littering, and noise. Additional restrictions will be implemented as needed.

Annual estimates of public use in visitor-days using camping permits, surveys and other information will be compiled and presented in the JDSF Annual Report. Information compiled will include where people have come from and how long they have used the State Forest, as well as identifying high-use weekends and preferred campsites. Use trends will be evaluated every five years to aid in determining if the opportunities provided meet the current demand as well as assisting in the design of visitor-use surveys.

A web site or specific link for Recreation on JDSF will be considered for future development. The web site could include the number of hits on various recreation topics and will provide information as well as an avenue for public comments. The web site would be updated and public comments reviewed. A review of the overall design would be conducted annually. Comments from the web site would be summarized and included in the five-year recreational trend review.

Minor Forest Products

Achieve a sustainable public use of the Forest and all its resources.

Parameters and Data Collection:

Staff will continue to monitor the collection of minor forest products on an annual basis. Permits are recorded and quantified annually. In the woods, staff will periodically check for valid permits and compliance with permit conditions and other Forest use restrictions.

Analysis of the data consists of simple summaries of quantity harvested of each minor forest product. Professional judgment will be used to devise adaptive management strategies to possibly limit harvest activities to sustainable levels. Law enforcement procedures will be adapted as needed to address trends in improper or illegal removal of minor forest products.

Heritage Resources

In its role as a demonstration forest, JDSF seeks to develop methods of enhancing and improving its heritage resource management program, and to prevent degradation or gradual depletion of resources such as that which can occur as a result of road maintenance practices and recreational activities.

Parameters and Data Collection:

CAL FIRE will establish a systematic monitoring program to evaluate the effectiveness of site protection practices during timber harvest operations. CAL FIRE archaeology staff should participate in completion inspections as time allows, to evaluate the effectiveness of site protection measures at the conclusion of project operations. A second alternative will be for JDSF staff to prepare a brief report specifically addressing observations on the effectiveness of site protection measures. When inadequacies are identified, appropriate remedial actions can then be developed and implemented.

The current heritage resource management program at JDSF has been largely successful in protecting sites during timber harvest operations. Some damage may have resulted from activities such as road maintenance, fires, and recreational activities (Betts 1999). Another potential impact is the depletion of surface artifacts. At some sites, the surface evidence is less than when these sites were originally documented, but the cause of this depletion is not known. Illicit artifact collection has been identified as a problem on the forest (Levulett and Bingham 1978). While sites are systematically inspected as part of project operations, there is no program in place to document non-project related impacts. During timber harvest operations, CAL FIRE Foresters examine sites during active inspections and at the completion inspection. The Forester is required to check the site protection measures, but would only notify the archaeology staff if a major problem was encountered.

Analysis and Adaptive Management Strategies:

CAL FIRE will develop a strategy to manage archaeological sites that are bisected by roads, or in close proximity to other projects and recreational sites, in order to mitigate impacts to sites caused by public use and regular road grading and maintenance activities. This plan should be developed by the Forest Manager in consultation with CAL FIRE archaeological staff. This plan should include procedures for identifying sites that could be impacted during road maintenance activities, stipulate protection measures for sites that could be impacted during these operations, and specify mitigation measures when impacts can not be avoided. Recognition should be given to the operational limitations and individual circumstances in which specific maintenance activities are carried out. Procedures should be developed in which impacts to sites can be evaluated on a case-by-case basis. Until this plan can be developed and implemented, road maintenance activities should be carefully monitored in the vicinity of all archaeological sites to prevent site damage. Ground fires with potential to damage sites will be excluded from site areas when possible.

Validation Monitoring

In addition to the JDSF approach to monitoring and adaptive management described above, JDSF supports numerous research projects that have provided valuable insights into possible cause-and-effect relationships between forest management activities and ecosystem structure. Validation monitoring as part of an experimental design can incorporate a variety of additional data sets to support JDSF's monitoring efforts. Some of these studies include:

The research program carried out jointly by the USFS and CAL FIRE at Caspar Creek includes a variety of elements designed to evaluate hydrologic, erosion, and sediment impacts associated with road building and logging:

- Continuous measurement of streamflow and suspended sediment at two gauged weirs in the North and South Forks of Caspar Creek since 1962.
- Annual measurement of sediment accumulation in the weir basins at the North and South Fork stream gages.
- Measurement of precipitation at 2 gages in the North Fork, one in the South Fork and one at Fort Bragg. The gages are equipped with event recorders to record time and rainfall amount in increments of 0.01 inches.
- Measurement of discharge and sediment load at six sub-watersheds in the North Fork from October-April, in addition to the North and South Fork gages. Bedload is measured only during large storms.
- Measurement of channel morphology in selected reaches, every three to five years, after exceptionally high flows. This includes cross sections, pool inventories, and V* (volume of fine sediment in pools).
- Measurement of LWD loading in the North Fork.
- A study of tree blowdown in riparian buffer strips and its effect on the supply of LWD to streams.
- A study of soil pipe flow and soil pore water pressure.

The USFS Redwood Sciences Laboratory and CAL FIRE have jointly drafted a long-term research plan for the Caspar Watershed study. The proposed research plan includes a long-term study of recovery following logging in the North Fork, and continued monitoring of factors related to sediment transport and hydrology at the North Fork and South Fork weirs.

In addition to the research program at Caspar Creek, validation monitoring has included:

- Habitat inventories and field inspections by DFG have indicated that habitat for juvenile steelhead and coho salmon in many JDSF streams would benefit from the addition of LWD to the channel. In fall 1996 CDF, in cooperation with DFG, placed LWD in a reach of Parlin Creek and is now monitoring the effects of LWD addition on pool depth, complexity and frequency. The study was extended in the summer of 1999 to include placement of woody debris in Hare and Caspar Creeks and monitoring of effects. As part of an experiment on the effects of enhancing large woody debris (LWD) in JDSF streams, DFG is monitoring habitat for juvenile salmonids at sites in Parlin, Hare and Caspar Creeks.

- The National Marine Fisheries Service (NMFS) in cooperation with the California Department of Fish and Game (DFG) has been conducting a study on straying and homing rates for coho salmon in the Noyo River drainage using mark and recapture techniques. The purposes were: 1) to estimate straying and homing rates for coho salmon; 2) to estimate rates of movement of juveniles within and between drainages; 3) to improve estimation methods for returning adults; and 4) to identify the nature and degree of interaction between naturally-produced and hatchery adults on spawning grounds. The study includes downstream migrant trapping of juvenile coho salmon at two locations in the South Fork Noyo River basin within JDSF, and carcass counts and redd mapping at numerous locations in the basin.

Funding

All monitoring activities will be reviewed annually to coincide with a report on monitoring presented in the JDSF annual report. The funding of monitoring activities will be accomplished via timber sales where appropriate, grants, and agreements. The annual JDSF and statewide budgets for research, demonstration, and monitoring are other sources for funding. A proposal for acquiring monitoring funds shall be submitted to Sacramento following the annual review. It will include a prioritized list of monitoring activities with their costs. Allocation of funds will be balanced against research and demonstration needs and the monitoring needs of other state forests. Planned future monitoring activities to a large extent can be folded into other research or operations projects such as resource inventories.

Glossary

Terms and abbreviations are used in this document as they are defined in Article 2 of the Forest Practice Act, and in the Forest Practice Rules, 14 CCR 895 and 895.1, unless a different definition is given here, or unless the context clearly implies a different meaning.

Acronyms and Abbreviations

ADFFMP	Administrative Draft Final Forest Management Plan
ACHP	Advisory Council on Historic Preservation
ACOE	U.S. Army Corps of Engineers
ADA	Americans with Disabilities Act
AGL	Above Ground Level
AMZ	Aquatic Management Zone
APZ	Aquatic Protection Zone
BF	Board Feet
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BMP	Best Management Practices
Board	California Board of Forestry and Fire Protection
BOF	California Board of Forestry and Fire Protectio
BVI	Blade-Vortex Interaction
CAA	Confidential Archaeological Addendum
CAC	Citizen Advisory Committee
CalEPPC	California Exotic Pest Plant Council
CAL FIRE	California Department of Forestry and Fire Protection
Caltrans	California Department of Transportation
CARB	California Air Resources Board
CARIDAP	California Archaeological Resource Identification and Data Acquisition Program
CCR	California Code of Regulations
CDF	California Department of Forestry and Fire Protection
CDFA	California Department of Food and Agriculture
CDFG	California Department of Fish and Game
CDMG	California Division of Mines and Geology
CDPR	California Department of Pesticide Regulations
CDWR	California Department of Water Resources
CEG	Certified Engineering Geologist
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFI	Continuous Forest Inventory
cfs	cubic feet per second
CGS	California Geological Survey
(C)MAI	(Culmination of) Mean Annual Increment
CNDDB	California Natural Diversity Database
CNEL	Community Noise Equivalent Level
CNPS	California Native Plant Society
CO	Carbon Monoxide
CO2	Carbon Dioxide
CRYPTOS	Cooperative Redwood Yield Project Timber Output Simulator, a computer program that can model stand growth in redwood forests, including the effects of partial harvests.
CWE	Cumulative Watershed Effects
CWHR	California Wildlife Habitat Relationship
dB	Decibels

dBA	A-weighted Decibels
DBH	Diameter at Breast Height
DEIR	Draft Environmental Impact Report
Department	California Department of Forestry and Fire Protection
DFMP	Draft Forest Management Plan (JDSF)
DFG, CDFG	California Department of Fish and Game
DO	Dissolved Oxygen
DPR	Department of Parks and Recreation
ECC	Emergency Command Center
ECP	Erosion Control Plan
EDD	California Employment Development Department
EEZ	Equipment Exclusion Zone
EIR	Environmental Impact Report
ELZ	Equipment Limitation Zone
EO	Executive Order
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FAC	Food and Agricultural Code
FEMAT	Federal Ecosystem Management Assessment Team
FESA	Federal Endangered Species Act
FFB	Flatheaded Fir Borer
FL	Forest Lands
FMP	Jackson Demonstration State Forest Management Plan
FPA	Forest Practice Act
FPRs	Forest Practice Rules
FRIF	Forest Resource Improvement Fund
FSEIS	Final Supplemental Environmental Impact Statement
FWCA	Fish and Wildlife Coordination Act
GIS	Geographic Information System
GPS	Global Positioning System
GWDR	General Wastewater Discharge Requirement
HCP	Habitat Conservation Plan
HTC	Hawthorne Timber Company
IFI	Intensive Forest Inventory
IPM	Integrated Pest Management
IWM	Integrated Weed Management
JDSF	Jackson Demonstration State Forest
JDSFMP	Jackson Demonstration State Forest Management Plan
LCP	Local Coastal Program
Ldn	day-night average noise level
Leq	Energy-Equivalent Noise Level
LSFC	Late Seral Forest Characteristics
LSFS	Late Succession Forest Stands
LTO	Licensed Timber Operator
LTSY	Long-Term Sustained Yield
LWD	Large Woody Debris
MAMU	Marbled Murrelet
MBF	Thousand Board Feet
MCAC	Mendocino County Agricultural Commissioner
MCAQMD	Mendocino County Air Quality Management District
MMBF	Million Board Feet
MOU	Memorandum of Understanding
MSP	Maximum Sustained Production
MTA	Mendocino Transit Authority
MWATs	Maximum Weekly Average Temperatures
MWSTA	Mendocino Woodlands Special Treatment Area
NCAQMD	North Coast Air Quality Management District

NCRWQCB	North Coast Regional Water Quality Control Board
NCWAP	North Coast Watershed Assessment Program
NF	North Fork
NMFS	National Marine Fisheries Service
NO_2	Nitrogen Dioxide
NOAA	National Oceanic and Atmospheric Administration
NOGO	Northern Goshawk
NOI	Notice of Intent
NOx	Nitrogen Oxides (ozone precursor)
NRHP	National Register of Historic Places
NSO	Northern Spotted Owl
O_3	Ozone
OFSZ	Older Forest Structure Zone
OHP	Office of Historical Preservation
OHV	Off Highway Vehicle
PALCO	The Pacific Lumber Company
PCT	Precommercial Thinning
PFA	Post Fledging Area
PM	Particulate Matter
PM10	Particulate Matter, less than 10 microns
PRC	Public Resources Code
PS	Public Service
PW	Planning Watersheds
QMD	Quadratic Mean Diameter
RDEIR	Recirculated Draft Environmental Impact Report
RL	Range Lands
RMR	Remote Residential
RMZ	Riparian Management Zone
ROG	Reactive Organic Gases (ozone precursor)
RPF	Registered Professional Forester
RR	Rural Residential
RTV	Red Tree Vole
RWQCB	California Regional Water Quality Control Board, North Coast Region
SB	Senate Bill
SCA	Special Concern Areas
SF	South Fork
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
SOD	Sudden Oak Death
SPCC	Spill Pollution Control and Countermeasure Plan
STA	Special Treatment Area
State Parks	California Department of Parks and Recreation
SW	Solid Waste Landfill
SWRCB	State Water Resources Control Board
SYP	Sustained Yield Plan
TMDL	Total Daily Maximum Load
THP	Timber Harvesting Plan
TPZ	Timber Production Zone
UC	University of California
USDA	United States Department of Agriculture
USDA-APHIS	USDA-Animal and Plant Health Inspection Service
USFWS	US Fish and Wildlife Service
VOC	Volatile Organic Compounds
WDRs	Waste Discharge Requirements
WLPZ	Watercourse and Lake Protection Zone

Definitions

abandon – means to permanently remove a road from the Forest road system, generally by removing watercourse crossings and installing permanent drainage features which do not require long-term maintenance. The term may be prefixed with a modifier, such as “formally,” “properly,” or “proactively,” to distinguish it from mere neglect and lack of maintenance. It may include re-contouring, pulling up fills and sidecast, mulching, or revegetation. This is in contrast to how the word is used in the Forest Practice Rules, where a temporary road may be “abandoned” with the intention of re-opening it at some later date. Where THPs prepared to implement this management plan refer to abandonment of temporary roads, the meaning will likely be as used in the Rules.

adaptive management – means a dynamic management planning approach that recognizes that changes in the management environment will occur during the life of a management plan, and that provides a system to assess the effects of change and to modify management activities in response.

chain – a distance of 66 feet, a unit of measure used in land surveying.

conservation camp – a state prison facility operated jointly by the Department of Corrections and the Department of Forestry and Fire Protection to house inmate work crews that are employed in fire suppression and other projects supporting government agencies.

landscape – means a spatial scale that approximates the entire State Forest.

late seral, late successional – means having biological characteristics and functions similar to old-growth forests.

mean annual increment - (MAI) means the average annual growth rate of a forest stand, determined by dividing stand volume (including partial harvests) by stand age. Culmination of mean annual increment (CMAI) occurs at the age when MAI is greatest, and determines the optimal rotation age for maximizing long term yields in evenaged management.

merchantable species – means commercial conifer timber species being purchased by local sawmills. These include redwood, Douglas-fir, grand fir, western hemlock, sitka spruce, and bishop pine.

old-growth tree – means a live tree, regardless of age, size, or species, that was present in the original stand before the first historic logging on JDSF (1860).

public road – State Forest roads are not considered “public roads” as used in the Forest Practice Rules.

rotation age – means the age of an even-aged stand at which a regeneration harvest is scheduled.

site class, site index – depends on the context. When used in relation to stocking regulations, it means one of the site classes or indexes listed in 14 CCR 1060. When used in relation to growth modeling, it usually refers to the site system developed by Krumland and Wensel for the CRYPTOS growth simulator.

special concern area – means an area which, because of some identified attribute, is managed differently than the surrounding area.

Unit – means the Mendocino Unit, the administrative subdivision of CAL FIRE of which JDSF is a part.

whitewoods – means commercial conifer species other than redwood, and may or may not include Douglas-fir, as indicated by the context.

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Appendix I. Legislation, Policy and Regulations

This appendix brings together in one place for convenient reference the legislation, regulations and Board of Forestry and Fire Protection policies that pertain to State Forests.

Public Resources Code

708. For the purpose of disseminating information relating to its activities, powers, duties, or functions, the department, with the approval of the Department of General Services, may issue publications, construct and maintain exhibits, and perform such acts and carry on such functions as in the opinion of the director will best tend to disseminate such information. Such publications may be distributed free of charge to public libraries and to other state departments and state officers. The department may exchange copies with contemporary publications. All money received by the department from the sale of publications shall be paid into the State Treasury to the credit of the General Fund.

740. The board shall represent the state's interest in the acquisition and management of state forests as provided by law and in federal land matters pertaining to forestry, and the protection of the state's interests in forest resources on private lands, and shall determine, establish, and maintain an adequate forest policy. General policies for guidance of the department shall be determined by the board.

4332. Whenever it is necessary in the interests of public peace or safety, the director, with the consent of the Governor, may order closed to camping, hunting, trapping, or the use of firearms, any area in any state park or state forest. The director shall post and enforce such closure order in such area.

4333. Any order which is issued pursuant to Section 4332 shall be published twice in at least one newspaper of general circulation in any county that is affected by the order. The publication shall be separated by a period of not less than one week and not more than two weeks. The order shall also be posted in such public places in each county as the director may direct, and along roads and trails which pass through such areas declared to be closed to camping or entry.

4631. It is hereby declared to be in the interest of the welfare of the people of this state and their industries and other activities involving the use of wood, lumber, poles, piling, and other forest products, that desirable cutover forest lands, including those having young and old timber growth, be made fully productive and that the holding and reforestation of such lands is a necessary measure predicated on waning supplies of original old-growth timber. It is further declared to be the policy of the state to acquire by purchase, exchange, lease, or grant all of the following:

(a) Such cutover lands, the reforestation of which is not assured under private ownership, to reforest such lands during periods of unemployment and at other times.

(b) Liquidating forest lands primarily suitable for timber production which may be acquired under precutting agreements.

(c) Demonstration forests of 2,000 acres or less adapted to furnish local needs of investigation, demonstration, and education in those timber counties where the ownership pattern is such that management of small areas is an important problem.

(d) One area, not to exceed approximately 40,000 acres, in each of the following forest districts, Coast Range Pine and Fir District, North Sierra Pine District and the South Sierra Pine District, for the purpose of demonstration of economical forest management. These areas shall not include virgin timber except that which is incidental to areas previously harvested.

4631.5. It is further declared to be in the interest of the welfare of the people of this state that the state do all of the following:

(a) Retain the existing land base of state forests in timber production for research and demonstration purposes.

(b) Cooperate with local governments in mitigating the impacts on school enrollment of geothermal development which occurs in proximity to state-owned forest lands.

4635. Unless the context otherwise requires, the definitions in this article govern the construction of this chapter.

4636. "Continuous production" means such management as will approach a balance between depletion and growth.

4637. "Forest land" means lands primarily suited to growing timber and other forest products.

4638. "Forest products" includes sawlogs, pilings, poles, split products, pulpwood, bolts, bark and other products.

4639. "Management" means the handling of forest crop and forest soil so as to achieve maximum sustained production of high quality forest products while giving consideration to values relating to recreation, watershed, wildlife, range and forage, fisheries, and aesthetic enjoyment.

4640. "Protection" means protection of forest trees against damage by fire, insects, disease, and trespass.

4641. "Purchase area" means an area of forest land within which forest lands of sufficient acreage may be available and can be consolidated to make state forest units.

4642. "Reforestation" includes reforestation by natural means from seed and artificially by seeding or planting.

4643. "State forest" means forest land owned or to be owned by the state.

4645. The department, in accordance with plans approved by the board, may engage in the management, protection, and reforestation of state forests.

4646. The director, acting in accordance with policies adopted by the board, shall administer this chapter. He may exercise all powers necessary to accomplish its purposes and intent.

4647. The department shall prepare a map setting forth the boundaries of purchase areas, and it shall prepare data relating to the forest conditions within these areas. In the preparation of the map and data the department shall be guided by, but not limited to, a report prepared and submitted to the Legislature by the California Forestry Study Committee provided for in Chapter 1086, Statutes of 1943. The department shall make the necessary surveys, examinations, appraisals, inventories, and title searches and obtain other pertinent data and information bearing on tracts of forest land offered for sale for state forest purposes.

4648. Acquisition of forest land pursuant to this chapter shall be made only upon the approval of the director. Approval by the director shall be based on satisfactory evidence presented to him by the board as to the suitability and desirability of lands under consideration for purchase for state forest purposes. This suitability and desirability shall be predicated on, but not limited to, the following factors:

(a) That the lands are suited primarily to timber growing.

(b) That the lands represent growing capacities not below the average for the timber region.

(c) That they are favorably situated for multiple use and economical administration, management, and utilization.

The director shall not approve the acquisition of any lands pursuant to this chapter unless he receives a resolution recommending such action adopted by the board of supervisors of the county in which such lands are situated following a public hearing held by the board of supervisors on the proposed acquisition. Notice of the hearing shall be published pursuant to Section 6066 of the Government Code. The holding of a hearing shall be optional to the board of supervisors for areas of 2,000 acres or less. Upon approval of a purchase by the director, the department may negotiate for and consummate the purchase of the lands.

4649. Whenever it is deemed advisable and advantageous, the board may enter into an agreement with the Department of Corrections, or the Youth Authority for employment of inmates of these institutions in work on state forests.

4650. (a) With the approval of the Director of General Services, the director may make sales of forest products from state forests that do not exceed ten thousand dollars ($10,000) in value without advertising for bids. With the approval of the Director of General Services, the director may also make sales that do not exceed 100,000 board feet of dead, dying, downed, diseased, or defective trees, trees harvested in connection therewith for thinning purposes or other forest improvement work, or any combination thereof, without advertising for bids.

(b) Any sale of forest products in excess of ten thousand dollars ($10,000) in value, or in excess of 100,000 board feet with respect to dead, dying, downed, diseased, or defective trees, trees harvested in connection therewith for thinning purposes or other forest improvement work, or any combination thereof, shall be upon competitive bids. Advertising for bids shall be the same as is generally in use for the sale of state property.

4650.1. (a) Notwithstanding any other provision of law, timber from state forests shall not be sold to any California division of a primary manufacturer, or to any person for resale to a primary manufacturer, who does either of the following:

(1) Uses that timber at any plant not located within the United States unless it is sawn on four sides to dimensions not greater than 4 inches by 12 inches.

(2) Within one year prior to the bid date and one year after the termination of the contract, sells unprocessed timber which is harvested from private timberlands and is exported into foreign commerce from this state.

(b) Any purchaser of timber from state forests who makes use of timber in violation of paragraph (1) of subdivision (a) is prohibited from purchasing state forest timber for a period of five years and may have his or her license suspended for a period of up to one year.

(c) The department may adopt appropriate regulations to prevent the substitution of timber from state forests for timber exported from private timberlands.

(d) For purposes of this section, "unprocessed timber" means trees, or portions of trees or other roundwood not processed to standards and specifications suitable for end product use, but does not include timber processed into any of the following:

(1) Lumber or construction timbers, except Western Red Cedar, meeting current American Lumber Standards Grades or Pacific Lumber Inspection Bureau Export R or N list grades, sawn on four sides, not intended for remanufacture.

(2) Lumber, construction timbers, or cants for remanufacture, except Western Red Cedar, meeting current American Lumber Standards Grades or Pacific Lumber Inspection Bureau Export R or N list clear grades, sawn on four sides, not to exceed 12 inches in thickness.

(3) Lumber, construction timbers, or cants for remanufacture, except Western Red Cedar, that do not meet the grades referred to in paragraph (2) and are sawn on four sides, with wane less than 1/4 of any face, not exceeding 83/4 inches in thickness.

(4) Chips, pulp, or pulp products.

(5) Veneer or plywood.

(6) Poles, posts, or piling cut or treated with preservatives for use as such.

(7) Shakes or shingles.

(8) Aspen or other pulpwood bolts, not exceeding 100 inches in length, exported for processing into pulp.

(9) Pulp logs or cull logs processed at domestic pulp mills, domestic chip plants, or other domestic operations for the purpose of conversion of the logs into chips.

4651. The management of state forests and the cutting and sale of timber and other forest products from state forests shall conform to regulations prepared by the director and approved by the board. These regulations shall be in conformity with forest management practices designed to achieve maximum sustained production of high-quality forest products while giving consideration to values relating to recreation, watershed, wildlife, range and forage, fisheries, and aesthetic enjoyment. The sale of timber and other forest products is limited to raw materials only.

4652. Receipts from the sales of forest products shall be deposited monthly with the State Treasurer in the Forest Resources Improvement Fund. The Controller shall keep a record of accounts of such receipts separately.

4653. State-owned lands classified by the department and approved by the board as not suited to the growing of forest products, or necessary to the management of the forest, shall be sold according to state laws.

4654. There shall be paid to each county in which lands acquired for state forest purposes are situated, out of funds hereafter made available for such purpose, an amount equivalent to taxes levied by the county on similar land similarly situated in the county in the same manner as provided in the Revenue and Taxation Code for secured property tax payments as long as the state continues to own the land. Such payments shall be based only upon the value of the forest lands used for purposes of continuous commercial forest production and not upon value of such forest land used for any other purposes, including any improvements on such lands. Determination of what constitutes similar land similarly situated shall be made by a committee consisting of the county assessor of the county in which the land is located, a representative of the State Board of Equalization and a representative of the department. The money received by any county pursuant to this section may be expended by it for any proper state purpose not prohibited by the State Constitution.

4655. Tax-deeded lands classified as forest lands, pursuant to Chapter 4.3 (commencing with Section 3534), Part 6, Division 1 of the Revenue and Taxation Code, may be acquired for the state forest purposes through the usual procedure governing the sale of tax-deeded lands.

4656. This chapter does not interfere with the reasonable use of state forests for hunting, fishing, recreation and camping, except as otherwise provided by law.

The use of state forest lands for grazing and mining purposes shall be permitted pursuant to regulations established by the board in accordance with Chapter 3. 5 (commencing with Section 11340) of Part 1 of Division 3 of Title 2 of the Government Code. The use and development of water facilities for irrigation and power shall be permitted as provided by law.

4656.1. The board may establish rules and regulations, in accordance with Chapter 3.5 (commencing with Section 11340) of Part 1 of Division 3 of Title 2 of the Government Code, for the preservation, protection, and use of state forests and for the promotion and protection of public health and safety within state forests.

4656.2. The department shall protect the state forests from damage and preserve the peace therein.

4656.3. Any person who violates the rules and regulations pertaining to the state forests established by the board is guilty of a misdemeanor and upon conviction shall be punished by a fine not exceeding one thousand dollars ($1,000).

4657. Insofar as the provisions of this chapter may be in conflict with any other provision of this division, the provision of this chapter shall control.

4658. The Mountain Home Tract Forest in Tulare County shall be developed and maintained, pursuant to this chapter, as a multiple-use forest, primarily for public hunting, fishing, and recreation. In future acquisitions and exchanges of land, as provided by law, the acreage in state ownership shall not be reduced below 4,000 acres.

4660. It is hereby declared to be the policy of the state to establish and preserve an intensively managed, multifaceted research forest which is representative of forest activities as a living forest in Santa Cruz County within northern California's coastal redwood belt. The coast redwoods, as the dominant tree species in this area, are a valuable natural resource and are unique in North America for their beauty, abundance, diversity, and public accessibility, and their extreme beauty and economic value requires special measures for their protection for the use, enjoyment, and education of the public.

It is the intent of the Legislature, in establishing the Soquel Demonstration State Forest, to provide an environment that will do all of the following:

(a) Provide watershed protection for local communities and base-line monitoring and studies of the hazards, risks, and benefits of forest operations and watersheds to urban areas.

(b) Provide public education and examples illustrating compatible rural land uses, including sustained yield timber production, as well as the historic development of timbering and forestry machinery, within the context of local community protection and nearby pressures.

(c) Provide a resource for the public, environmental groups, elected officials, environmental planners, the educational community, and the media as an open environment for the inspection and study of environmental education, forestry practices, and effects thereof.

(d) Protect old-growth redwood trees.

4661. The department may permit a limited amount of commercial timber operations on the property within the Soquel Demonstration State Forest in order to provide funds for the maintenance and operation of the state forest and to allow fulfillment of the objectives of Section 4660. Income from the state forest property shall sustain all costs of operation and provide income for research and educational purposes.

4662. The department is responsible for the establishment and development of the Soquel Demonstration State Forest and for ongoing maintenance and operations. The director shall appoint an advisory committee to assist the department in planning future management of the forest. The advisory committee shall include representatives of the Santa Cruz County Board of Supervisors, the Department of Parks and Recreation, the State Board of Forestry and Fire Protection, the Forest of Nisene Marks Advisory Committee, and the Department of Fish and Game.

4663. The department, in coordination with the advisory committee, shall adopt by January 1, 1989, a general plan for the state forest which reflects the long-range development and management plans to provide for the optimum use and enjoyment of the living forest, as provided in Section 4660, as well as the protection of its quality and the watershed within the Santa Cruz area. The general plan shall be approved by the advisory committee prior to adoption by the department.

4664. The duties and authority of the department pursuant to this article shall only arise if the state acquires the property comprising the Soquel Demonstration State Forest.

4799.13. (a) There is hereby created in the State Treasury, the Forest Resources Improvement Fund. The money in the Forest Resources Improvement Fund may only be expended, upon appropriation by the Legislature, for the following purposes: (1) Forest improvement programs and related administrative costs pursuant to Chapter 1 (commencing with Section 4790). (2) Urban forestry programs and related administrative costs pursuant to Chapter 2 (commencing with Section 4799.06). (3) Wood energy programs pursuant to Chapter 4 (commencing with Section 4799.14). (4) Reimbursing the General Fund for the cost of operation of the state forests administered by the director pursuant to Section 4646. (5) Cost of operations associated with management of lands held in trust by the state and operated as demonstration state forests by the department pursuant to Section 4646, if those lands are managed so that they produce revenue that offsets, within a reasonable period of time, any costs to the state of managing those lands. (6) Forest pest research and management, technical transfer, and outreach. (7) State nurseries programs pursuant to Article 2 (commencing with Section 4681) of Chapter 10 of Part 2. (8) Costs associated with administration of the Z'Berg-Nejedly Forest Practice of 1973 (Chapter 8 (commencing with Section 4511) of Part 2). (b) The Forest Resources Improvement Fund shall be the depository for all revenue derived from the repayment of loans made or interest received pursuant to Chapter 1 (commencing with Section 4790), and the receipts from the sale of forest products, as defined in Section 4638, from the state forests. Ten percent of the net state forest receipts from the sale of forest products, after the General Fund is reimbursed for costs of operating the state forests, is available, upon appropriation by the Legislature, for urban forestry programs pursuant to Chapter 2 (commencing with Section 4799.06) of this part. (c) The director may accept grants and donations of equipment, seedlings, labor, materials, or funds from any source for the purpose of supporting or facilitating activities undertaken pursuant to this part. Any funds received shall be deposited by the director in the Forest Resources Improvement Fund. None of these funds received prior to the effective date of the act adding paragraphs (7) and (8) to subdivision (a) are available for the purposes of paragraph (7) or (8) of subdivision (a). (d) Each proposed expenditure by the department of money from the Forest Resources Improvement Fund shall be included as a separate item and scheduled individually in the Budget Bill for each fiscal year for consideration by the Legislature. These appropriations shall be subject to all of the limitations contained in the Budget Bill and to all other fiscal procedures prescribed by law with respect to the expenditure of state funds.

5820. This chapter shall be known and may be cited as the Mendocino Woodlands Outdoor Center Act.

5821. The Legislature finds that there is need for a program to enable the children of the state to better comprehend the outdoors, particularly the social and economic importance of the study, conservation, protection, and utilization of natural resources. The Legislature further finds that the location and facilities of the Mendocino Woodlands Outdoor Center are especially well suited to serve primarily as an outdoor

education center under the control and management of the Department of Parks and Recreation, as a unit of the state park system.

5822. The Legislature hereby declares its intent that the Mendocino Woodlands Outdoor Center, consisting of land and facilities deeded to the State of California by the United States of America for public park, recreational, and conservation purposes, shall hereafter be maintained, provided, and operated for the benefit of the people of the state, primarily as an outdoor environmental education facility.

5823. As used in this chapter, unless the context clearly requires a different meaning: (a) "Department" means the Department of Parks and Recreation. (b) "Center" means the Mendocino Woodlands Outdoor Center, consisting of 720 acres, more or less, of state-owned land and improvements located within the east half of the Northeast Quarter and the east half of the Southeast Quarter of Section 13 of the east half and southwest quarter of the Northeast Quarter and the east half and southwest quarter of the Southeast Quarter of Section 24 of T. 17 N, R. 17 W., M.D.B.M.; the north half and southwest quarter of the Northwest Quarter and the north half of the Northeast Quarter of Section 18 of, and the west half of the Northwest Quarter of Section 30 of, T. 17 N., R. 16 W., M.D.B.M. (c) "Area" means the Mendocino Woodlands Special Treatment Area within the Jackson State Forest, consisting of 2,550 acres, more or less, of state-owned lands lying within the south half of Section 12 of; the Northwest Quarter, the west half of the Northeast Quarter, the west half of the Southeast Quarter, and the Southwest Quarter of Section 13 of, the Northeast, Southeast, and Southwest Quarters of Section 14 of, the northeast quarter of the Northeast Quarter of Section 22 of, the north half of Section 23 of, the Northwest Quarter, the northwest quarter of the Northeast Quarter, and the northeast quarter of the Southwest Quarter of Section 24 of, T. 17 N., R. 17 W., M.D.B.M.; and the Southwest Quarter of Section 7 of the southeast quarter of the Northwest Quarter, the south half of the Northeast Quarter, the northwest, northeast, and southwest quarters of the Southeast Quarter and the Southwest Quarter of Section 18 of, and the Northwest Quarter and the west half of the Southwest Quarter of Section 19 of, T. 17 N., R. 16 W., M.D.B.M.

5824. Jurisdiction and control of the center, consisting of 720 acres, more or less, and all the improvements thereon as described in subdivision (b) of Section 5823 is hereby transferred to the department from the Department of Conservation, and shall be administered as a unit of the state park system; except that access shall be provided through the center to the area, as described in subdivision (c) of Section 5823, for purposes of cutting timber under the authority of the State Forester exercised pursuant to Article 3 (commencing with Section 4645) of Chapter 9 of Part 2 of Division 4, in a manner acceptable to the State Forester. It is the intent of the Legislature that title in the aforementioned lands and facilities shall continue to vest in the State of California; and if for any reason their use for the purposes of this chapter be deemed by the department no longer to be in the public interest, then they shall be restored through future legislation to the jurisdiction and control of the Department of Conservation.

5825. The department shall prepare a plan for the protection and management of the center and shall submit the plan to the Legislature, for its consideration, no later than January 15, 1977. The plan shall include, but need not be limited to, the following considerations. (a) Means of ensuring the health, safety and comfort of center users while, at the same time, ensuring that the natural and rustic aspects of the center and its facilities are preserved. (b) The need for providing additional, all-weather lodging, dining and instructional facilities suitable for use by schoolchildren. (c) The protection and utilization of those resources of the center useful for outdoor study. (d) The suitability of the center for public uses, other than outdoor education, appropriate to the state park system. (e) The suitability of the continued use of the center by cultural, social, and youth organizations similar to those which have used the center prior to the effective date of this chapter. (f) The relationship of the center to the Jackson State Forest, Jughandle Creek, Pygmy Forest Park project, Big River project, Mendocino Headlands Park project, and other adjacent or nearby recreational, scientific, or scenic resources, so as to assure optimum public access, use, and enjoyment of such sites and resources. (g) The advisability of transferring or acquiring additional lands so as to ensure the administrative efficiency of the center. (h) The organizational and funding requirements of programs proposed to be undertaken at the center in accordance with this chapter. (i) Estimated utilization rates and the nature and level of fees necessary to make the center program essentially self-sustaining.

5826. The department shall consult with the Department of Education, and may cooperate with individuals and agencies having jurisdiction or expertise in matters pertaining to the outdoor education programs contemplated in this chapter.

5827. The department may enter into operating agreements with any qualified, nonprofit entity for the provision of any program or service contemplated in this chapter. Prior to entering into any such agreement, the department shall submit a copy of the proposed agreement to the Legislative Analyst for his review and recommendations, which shall not, however, be binding. Failure of the Legislative Analyst to respond within 30 days after submission of a proposed agreement shall be deemed to constitute approval by the Legislative Analyst of the proposed agreement.

5828. The department is encouraged to establish an advisory committee of persons interested and knowledgeable in the operation and nature of the center, and in the formulation and conduct of outdoor environmental education programs, to assist it in formulating the plan and actions contemplated in this chapter.

5829. Prior to authorizing the sale and cutting of timber from the area described in subdivision (c) of Section 5823, the State Forester shall solicit and consider the recommendations of the Department of Parks and Recreation with respect to the prevention of unnecessary or unreasonable interruption or loss of facilities or resources essential to center operations.

California Code of Regulations

Chapter 9. State Forests-Use and Sales*

*Formerly Subchapter 8, 9, and 9.1 of Chapter 2, Division 2, Title 14, Cal. Adm. Code.

Subchapter 1. Recreational Use

Article 1. Abbreviations and Definitions

§ 1400. Abbreviations.

The following abbreviations are applicable throughout this Chapter.
(a) B&M Baseline and Meridian reference lines running in true EW and NS directions used in U. S. General Land Survey
(b) CAC: California Administrative Code.
(c) cm: Centimeter(s)
(d) E: true cardinal direction East
(e) ha: hectare(s)
(f) M: meter(s)
(g) MD: Mount Diablo (used in combination with B&M
(h) N: true cardinal direction North
(i) PRC: Public Resources Code
(j) R : Range : a row of townships, six miles in width, between two successive meridian lines of the U. S. General Land Survey
(k) S: true cardinal direction South
(l) Sec.: Section
(m) T: Township: a tier of ranges, six miles in length between two successive standard parallels as used in the U. S. General Land Survey
(n) W: true cardinal direction West
Note: Authority cited: Section 4656.1, Public Resources Code. Reference: Section 4656.1, Public Resources Code.

§ 1400.5. Definitions.

The following definitions are applicable throughout Chapter 9 unless the context clearly requires otherwise.
(a) "Affiliate" means the purchaser's subsidiary, parent company, joint venture partner, entity, being a portion of the conglomerate of which the purchaser is a unit, or other entity under the purchaser's indirect control.
(b) "Board" means the California State Board of Forestry and Fire Protection.
(c) "Campfire" means a fire used by one or more persons while camping, picnicking, recreating or working on state forest land, to provide any one or combination of the following: heat for cooking, heat for personal warmth, light and for ceremonial or aesthetic purposes. "Campfire" includes open fires and those fires contained within fireplaces and enclosed stoves with flues or chimneys, stoves using pressurized liquid or gaseous fluids, portable barbecue pits and braziers or space heating devices which are used outside any structure, trailer house or living accommodations mounted on a motor vehicle.
(d) "Camping" or camp means erecting a tent or shelter or arranging bedding or both, for the purpose of, or in such a way as will permit remaining overnight; or occupying an established campsite with a camper vehicle or camping equipment for the purpose of reserving the use of such campsite. The term also includes parking a camper vehicle or trailer and spending the night within, or within close proximity of said camper vehicle or trailer.

(e) “Designated camping area” means a location designated by the state forest manager as a camping area and marked by authorized signs to that effect. Unless otherwise delineated by fences or signs, a “designated camping area” shall include only the area developed for camping and provided with fireplaces or tables or both, and shall not include any adjacent areas not so developed for camping.
(f) “Department” means the California Department of Forestry.
(g) “Director” means the Director of Forestry.
(h) “person” means and includes natural persons, firms, co-partnerships, corporations, clubs, and all associations or combinations of persons whenever acting for themselves, by agent, servant, or employee.
(i) “Purchaser” means that person, company or entity who was the successful bidder, buyer, transferee or successor of state timber.
(j) “State forest” or forest means any portion of the state forest system administered by the Director.
(k) “State forest licensee” means any person authorized by a state forest manager or the superiors thereof, to engage in any of the following activities within a state forest:
(1) operate concessions serving the public.
(2) plant, protect, harvest or remove timber, or other forest products or minerals.
(3) conduct experiments or otherwise engage in research or educational activity.
(4) Or any other activity not listed above with written permission of the Director.
(l) “State forest manager” means the state forest officer appointed by the Director to supervise the management and administration of a state forest or in the state forest manager’s absence, the person designated by a state forest manager to act during his or her absence.
(m) “State forest officer” means employees of the Department of Forestry as designated by the Director, or such other persons as may be designated by the Director.
(n) “State timber” means any or all trees, logs or wood products from state-owned forests, which have not received primary manufacture to a size sawn on 4 sides to dimensions of 4 inches by 12 inches (10.2 cm by 30.5 cm), or less.
(o) “Substitution” means the replacing of state timber for unprocessed timber which, directly or indirectly, was exported to a foreign country from private lands owned or controlled by the purchaser within California in an area 200 miles (321.8km) or less from the nearest boundary line of the state timber sale area from which state timber was removed. The distance will be determined via the shortest route of either public roads, railroads, or water route customarily used to transport forest products.
Note: Authority cited: Section 4656.1, Public Resources Code. Reference: Section 4656.1, Public Resources Code.

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ARTICLE 2. Camping Area Use

§ 1401. Camping Area.
Camping in state forests is restricted to designated camping areas. No person shall camp outside of a designated camping area unless that person or someone in attendance has in their possession a valid state forest campfire and special use permit. Failure to comply with the terms and conditions set forth on said permit shall render it invalid for purposes of this Section.

§ 1402. Campfire Permits.
(a) No person shall prepare, ignite, maintain or use a campfire in any place other than a designated camping area unless that person or someone in attendance has in their possession a valid state forest campfire and special use permit. Failure to comply with the terms and conditions set forth on said permit shall render it invalid for purposes of this Section.
(b) No person shall prepare or ignite a campfire which is or will be unreasonably large and/or dangerous to the surrounding land, or maintain such a fire after having been ordered by a state forest officer to reduce or extinguish it.
(c) No person shall leave a campfire ignited, maintained or used by that person unattended.

§ 1403. Occupancy Time Limits.
No person shall camp within any one state forest more than 14 days in any single visitation. Consistent with Section 4455 of Title 14, California Code of Regulation, General Occupancy by the same persons, equipment, or vehicles of any camping facility is limited to a total of 30 days in any calendar year in that

State Forest. Exceptions may be granted by the state forest manager to persons engaged in official state business.
Note: Authority cited: Section 4656.1, Public Resources Code. Reference: Sections 4643, 4645, 4646 and 46546.2, Public Resources Code.

§ 1404. Reservations.
Individual campsites may not be reserved. The term “reserved” includes, but is not limited to, calling or writing in advance to obtain a campsite, a person occupying one or more campsites temporarily until another party arrives, placing camping equipment in a campsite prior to actual occupancy by another party, or other means of obtaining a campsite for a person or persons not actually present in the state forest.

§ 1405. Conduct.
No person shall use threatening, abusive, boisterous, insulting or indecent language or make any indecent gesture in a state forest at such times and in such locations as to disturb other persons; nor shall any person conduct or participate in a disorderly assemblage. Clothing sufficient to conform to common standards of decency shall be worn at all times when the wearer is subject to public view.

§ 1406. Assembly.
No person shall conduct a public assembly or demonstration except on permission of the state forest manager upon finding that the time, place and manner of such activity would not substantially interfere with the use of the state forest by the general public in the applicable area.
Note: Authority cited: Section 4656.1, Public Resources Code. Reference: Sections 4656.1 and 4656.2, Public Resources Code.

ARTICLE 3. GENERAL RESTRICTIONS

§ 1410. Nuisance.
No person shall erect any structure on or allow a campsite occupied by that person to become littered with refuse.

§ 1411. Equipment.
No person shall occupy a site with camping equipment or vehicles prohibited by the state forest manager.

§ 1412. Noise.
No person shall create noise which disturbs others in sleeping quarters or in campgrounds within a state forest between the hours of 11 p.m. and 6 a.m. daily. No person shall, at any time, use electronic equipment (other than that used in forest operations) including electrical speakers, radios, phonographs, or televisions which produces a sound that can be heard at more than 100 feet from the source.
Note: Authority cited: Section 4656.1, Public Resources Code. Reference: Sections 4656.1 and 4656.2, Public Resources Code.

§ 1413. Weapons.
(a) No person shall discharge any firearm, air or gas weapon, or bow and arrow in the vicinity of camps, residence sites, recreation grounds and areas, and over lakes or other bodies of water adjacent to or within such areas, whereby any person is exposed to injury as a result of such discharge.
(b) Without limiting the foregoing, no person shall discharge any of the above named weapons or any other weapon while within 150 yards (137.20 m) of any designated camping area.

§ 1414. Soliciting.
No person shall sell or offer for sale any goods or services within a state forest unless licensed by the state forest manager.
Note: Authority cited: Section 44656.1, Public Resources Code. Reference: Sections 4656.1 and 4656.2, Public Resources Code.

§ 1415. Firewood.
Campers, picnickers and other recreational users may gather dead wood lying on the ground for use within the state forest. No person shall remove firewood or other forest products from any state forests without the written consent of the state forest manager.

§ 1416. Defacing Plants.
(a) No person shall cut or deface live trees, or remove shrubs, plants or portions thereof, or destroy, deface or remove forest products of any description.
(b) Annual fruits of native plants such as gooseberries, elderberries and blackberries may be picked and empty conifer cones may be taken for non-commercial use.
(c) This section shall not apply to state forest licensees when acting within the scope of their authorization.

§ 1417. Geological Features.
No person shall destroy, disturb, mutilate or remove earth, sand, gravel, oil, minerals, rocks or features of caves. This Section shall not apply to state forest licensees when acting within the scope of their authorization.

§ 1418. Horticulture.
In order to control soil erosion, conserve water and preserve the natural condition of state forests, no person shall plant, tend or harvest within a state forest any herbs, flowers, vegetables, or fruits except as permitted by Section 1416(b). This section shall not apply to state forest licensees when acting within the scope of their authorization.

§ 1419. Improvements.
No person shall mutilate, deface, damage or remove any table, bench, building, sign, marker, monument, fence barrier, fountain, faucet, gate, lock, water storage tank or other structure, facility, equipment or property within a state forest.

§ 1420. Unauthorized Signs.
No person shall cut, carve, paint, post or otherwise affix in a state forest any bill, advertisement or inscription on any tree, natural geologic formation, fence, wall, building, monument or other property whether improved or unimproved. This section shall not apply to state forest licensees when acting within the scope of their authorization.

§ 1421. Rubbish.
(a) No person shall leave, deposit, drop or scatter bottles, broken glass, ashes, waste paper, cans or other rubbish in a state forest except in a receptacle designated for that purpose.
(b) Without limiting the foregoing, no person shall vacate campsite without removing all of the above-mentioned refuse thereon and depositing it in a receptacle designed for that purpose.

§ 1422. Polluting Waters.
No person shall deposit, permit to pass into, or willingly allow ay substance in any spring, stream, lake or other waters within a state forest which will tend to cause said waters to become unfit for human consumption, deleterious to fish and plant life, or which will destroy the aesthetic qualities of the waters. This section includes, but is not limited to, the washing of clothing or other materials, and the disposal of body or other wastes.

§ 1423. Animal Waste.
Persons keeping dogs, cats, or other animals within designated camping areas are responsible for removing and burying any and all droppings of said animal, and failure to do so within a reasonable time, or upon order of a state forest officer, shall constitute a violation of this Section.

§ 1424. Pets.
(a) No person shall bring a dog, cat or other animal into a designated camping area unless is it confined, or in a vehicle, or upon a leash not longer than 6 feet (1.83 m), or otherwise under physical restrictive control at al times.

(b) No person shall keep within a state forest a dog or other animal which is noisy, vicious, dangerous or disturbing to other persons after having been ordered by a state forest officer to remove said animal from the state forest.

§ 1425, Horses.
(a) No person shall bring saddle, pack or draft animals into a designated camping area unless it has been developed to accommodate them and is posted accordingly.
(b) No horse or other animal shall be hitched to any tree, shrub or structure in such a way that it may cause damage thereto.
(c) Persons bringing animals into a state forest are responsible for providing them with feed, and no person shall allow any saddle, pack or draft animal to graze on any portion of the state forest not specifically designated by the state forest manager as suitable for grazing purposes.

§ 1426. Smoking.
Smoking on state forest land covered with flammable vegetation or ground litter while traveling on foot, cycle or domestic animal is prohibited between April 1 and December 1 of any year, and in areas posted against smoking. Smoking is permitted in the following locations: Within improved campground, inside vehicles on improved roads, in places of habitation, and while stopped in an area of at least 3 feet (0.91 m) in diameter cleared of flammable vegetation and ground litter, provided however when smoking within a 3 foot (0.91 m) clearing that all glowing substances are extinguished and discarded within the cleared area.

§ 1427. Archeological Features.
No person shall collect or remove any object or thing of archeological or historical interest or value, nor shall any person injure, disfigure, deface or destroy the physical site, location or context in which the object or thing of archeological or historical interest or value is found.
Note: Authority cited: Section 4656.1, Public Resources Code. Reference: Sections 4656.1, 4656.2 and 4656.3, Public Resources Code.

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ARTICLE 4. VEHICLES

§ 1430. Parking Time Limits.
The state forest manager may by order establish limits of time for the parking, storage, or leaving of vehicles, including trailers, in a state forest and in units or portions thereof. No person shall so park, store or leave a vehicle or trailer in contravention of such orders when such time limits have been posted in the area affected. Nothing herein shall be construed in derogation of other state forest regulations.

§ 1431. Cross-Country Travel Prohibited.
Motor vehicles shall be operated only on roads and in parking areas constructed for motor vehicle use. Trail bikes, motorcycles, jeeps, pickups, and other passenger-carrying motor vehicles shall not be operated on any road or trail posted as closed to the public or to such use.

§ 1432. Speed Limits.
History
1. Repealer filed 2-1-83; effective thirtieth day thereafter (Register 83, No.6).

§ 1433. Vehicles In Camping Areas.
No person shall drive any motorbike, motorcycle or other motor vehicle on any roads within designated camping areas for any purpose other than access to, or egress from the area.

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ARTICLE 5. Restricted Use Areas

§ 1435. Areas Closed to Hunting, Trapping, and the Use of Firearms.
The following areas are closed to hunting, trapping, and the use of firearms.

(a) Area in Tulare County.

The area approximately 440 acres (178.068 ha), more or less, located in Tulare County and described as follows: lying north, south, east and west of Balch Park being those parts of Sec. 36, T19S, R 30E, Sec. 31, T19S, R31E, Sec. 6T20S, R31E, and Sec. 1 and 2, T20S, R30E, that are bounded as follows: from the intersection of the north line of said Sec. 1 with the Balch Park road northerly along this road to its junction with the Lace Meadow road; thence easterly along said Lace Meadow road to its intersection with the north line of the SE ¼ of Sec. 36, T19S, R30E; thence east along said line to the Summit road; thence southerly along the Summit road to its junction with the Balch Park road; thence southwesterly along the Balch Park road to its junction with the Bear Creek road; thence southwesterly along the Bear Creek road to its intersection with the south line of Sec. 2 to the old Coburn Mill road; thence along the Coburn Mill road to its intersection with the north line of the SE ¼ of Sec. 2 to the quarter corner between Sec. 1 and 2; thence along the west and north lines of the SE ¼ of the NW ¼ of Sec. 1 to the SW corner of the Balch Park property; and thence easterly and northeasterly, thence easterly, thence northerly, thence westerly, thence southerly, and finally westerly along the boundaries between Balch Park and the Mountain Home State forest to the point of beginning. All townships are described from the MDB&M.

(b) Area in Mendocino County:

The areas located in Mendocino County and described as follows:

(1) Mendocino Woodlands area, approximately 3,000 acres (1214.100 ha), more or less. That portion of Mendocino Woodlands area laying south and east of the Little Lake Mendocino (city) road, and south of Jackson State Forest road 740, being all of Sec. 13 and portions of Secs. 1, 11, 12, 14, 15, 22, 23, and 24 of T17N, R17W, and portions of Secs. 7, 18, 19 and 30 of T17N, R16W, all MDB&M.

(2) Parlin Fork Conservation Camp area, approximately 1,500 acres (607.500 ha), more or less. The E ½ of Sec. 32, T18N, R16W, MDB&M. All of Secs. 33, T18N, R16W, MDB&M. That portion of Sec. 4, T17N, R;16W, MDB&M, lying north of state highway 20.

(3) Chamberlain Creek Conservation Camp area, approximately 1,020 acres (412.794 ha), more or less. All of Sec. 5, T17N, R15W, MDB&M; N ½ of Sec. 8, T17N, R15W, MDB&M: N ½ of Sec. 9, T17N, R15W, MDB&M.

§ 1436. Areas Closed to Hunting and the Use of Firearms.

The following area is closed to hunting and the use of firearms:

(a) Area in Shasta County.

The area of approximately 320 acres (129.504 ha), being a portion of the Latour State Forest immediately surrounding the Latour Forest Headquarters and Forest Fire Station. Said lands being located in Shasta County and being described as follows: lying south and east of Mc Mullen Mountain being the SE ¼ of Sec. 1 and the NE ¼ of Sec. 12, T32N, R2E, MDB&M.

§ 1437. Fire Hazard

History

1. Repealer filed 2-1-83; effective thirtieth day thereafter (Register 83, No. 6).

§ 1438. Temporary Restricted Use.

To insure the safety and health of persons, to avoid interference in development, construction, research and timber management, or to provide for the security, safeguarding and preservation of property within a state forest and portions thereof, a state forest manager or the period of time not to exceed 1 year.

(a) Notices prescribing the prohibited activity shall be posted in such locations as will reasonably bring them to the attention of the public.

(b) No person shall, while in the restricted area, engage in the activity so prohibited.

§ 1439. Temporary Restricted Use.

To insure the safety and health of persons, to avoid interference in development, construction, research and timber management, or to provide for the security, safeguarding and preservation of property within a state forest and portions thereof, a state forest manager or the superiors thereof may order any portions of a state forest closed to public use or entry for a period of time not to exceed 1 year.

(a A copy of the order shall be posted at the state forest headquarters and may specify such reasonable classes of persons who may enter the closed area in the conduct of such proper activities or official duties as the forest manager or the superiors thereof may prescribe.

(b) Notices designating the area closed to entry shall be posted in such locations as will reasonably bring them to the attention of the public. Such notice may specify the period or periods of closure.
(c) During this period when an area is closed to public entry, only persons specifically authorized by the order of closure may enter or remain within the area so closed.
This section shall not be construed in derogation of any other state forest regulation.

Subchapter 3. Geothermal Development

Article 1. Purpose

§ 1500. Purpose.

History
1. Repealer of subchapter 3, article 1 (section 1500) and section filed 11-7-96; operative 1-1-97 (Register 96, No. 45).

Article 2. Specific Provisions

§ 1501. General Requirements.
History
1. Repealer of subchapter 3, article 2 (sections 1501 through 1503) and section filed 11-7-96; operative 1-1-97 (register 96 No. 45).

§ 1502. Special Requirements.
History'
1. Repealer filed 11-7-96; operative 1-1-97 (Register 96, No. 45).

§ 1503. Consent of Permits or Leases.
1. Repealer filed 11-7-96; operative 1-1-97 (Register 96, No. 45).

Subchapter 4. Timber Sales

§ 1510. Harvesting and Management.
The harvesting of forest products from state forests and management of state forests shall follow management plans developed for each forest by the Director, and approved by the Board.
Note: Authority cited: Section 4656.1, Public Resources Code. Reference: Sections 4656, 4651, and 4656.1, Public Resources Code.

§ 1511. Timber Sales.
When selling timber from state forests as authorized by PRC 4650-4651, the Director shall comply with the requirements of the Department of General Services and Department of Finance pertaining to the sale of state property. Such timber sales shall be conducted and administered by the Director following procedures promulgated in the State Administrative Manual (SAM) for contracting and sale of state property.
Note: Authority cited: Section 4656.1, Public Resources Code. Reference: Sections 4651 and 4656.1, Public Resources Code.

§ 1515. Bids Solicitation.

The Director, when selling or soliciting bids for sale of timber form state forests, shall condition the sale upon agreement of the purchaser that said timber will not be substituted for timber exported from private lands under control of the bidder, or affiliate.

§ 1516. Non-Substitution Agreement.
Every purchaser of timber from state forests shall execute an agreement with the Director that said timber will not be substituted for timber exported from the purchaser's private land.

§ 1517. Notice of Removal.
The purchaser, before removal of timber from state forests, shall give written notice to the Director of any or all locations where said timber will be processed. Said notice shall be required for all of said timber until such time as the timber has been sawn to dimensions of 4 inches by 12 inches (10.2 cm by 30.5 cm) or less.

§ 1518. Transfer Requirement.
Upon transfer of state timber not receiving primary manufacture, the purchaser shall require the transferee to agree to the same substitution restrictions as are imposed on purchaser. Within 5 days of said transfer, a copy of the agreement, together with location of intended processing of said timber, shall be delivered by purchaser to the Director.

§ 1519. Preservation of Records.
Purchaser shall preserve for a period of 3 years, after conclusion of removal of timber from the state forest, all records pertaining to the use and disposition of the state timber and, upon request of the Director, make said records available for inspection by the Director.

§ 1520. Violation.
History
1. Repealer filed 2-1-83; effective thirtieth day thereafter (Register 83, No. 6).

§ 1521. Notice of Violation and Review.
If the Director determines that a purchaser has violated any provision of these regulations, a Notice of Violation shall be sent certified mail to purchaser with the further statement that purchaser shall be prohibited from purchasing state timber for a period of 5 years from the date of violation and said notice will designate the period of suspension of the timber operator permit, if any, not exceeding a period of 6 months from the date of notice. Within 30 days of said notice, purchaser may make written appeal to the Director for review. The Director, upon his or her option, may act on the appeal either by open hearing or submission of written documents and proof. A decision of the Director is final.

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Board of Forestry and Fire Protection Policies

CHAPTER 0310 - BOARD POWERS AND RESPONSIBILITIES

GENERAL POWERS AND RESPONSIBILITIES 0311
Included within the function of the Board of Forestry and Fire Protection is the power and responsibility to:
D. Represent the State's interest in the acquisition and management of State forests;

COOPERATIVE AGREEMENTS, NURSERY, INSECT CONTROL, LAND GIFTS 0315
Board powers and responsibilities include:
C. Recommend and, if necessary, set conditions for accepting gifts of land for the State Forest System;

STATE FORESTS 0316
Board powers and duties regarding State forests include:
A. Determine approval of Department of Forestry forest management plans in State forests;
B. Recommend and promulgate resolutions for acquisition of State forest properties if it is deemed appropriate;
C. Determine approval of State forest land sales due to unsuitability for forest purposes;
D. Establish rules for the preservation, protection, and use of State forests.

LAND AVAILABILITY 0334.3

In order to maintain timber growing land in California as a permanent source of current and future timber supply, the Board has found that it is in the public interest:

> B. To manage all prime timberland on State forests to investigate and demonstrate management for optimum long-run timber production. Where such forest lands contain or adjoin areas of high recreation value in State or other ownership, timber growing and harvesting practices may be modified in order to minimize conflicts between other land uses and to demonstrate the costs and effectiveness of such practices.

CHAPTER 0350 - FOREST MANAGEMENT POLICIES

STATE FORESTS 0351

GENERAL 0351.1

California's State forest system has been in existence since 1946 when the first large forest properties were acquired. Sections 4631-4658 of the Public Resources Code provide the authority for acquisition, administration, and operation of State forests by the Department. Most of these statutes were enacted in 1945 following recommendations of the Forestry Study Committee established by the Legislature in 1943. There are now seven State forests totaling 68,654 acres as shown below:

STATE FORESTS IN CALIFORNIA - 1982

State Forest	County	Area (Acres)	Date Acquired
Jackson	Mendocino	50,505*	1947-51, 1968
Latour	Shasta	9,013	1946
Mountain Home	Tulare	4, 562	1946
Boggs Mountain	Lake	3,454	1949, 1972
Las Posadas	Napa	796	1929 (gift)
Mount Zion	Amador	164	1932 (gift)
Ellen Pickett	Trinity	100	1939 (gift)

** Mapping accuracy has been improved since this acreage was calculated. The more accurate acreage for Jackson is 48,652 acres.*

Jackson, Latour, Mountain Home, and Boggs Mountain State Forests are commercial timberland areas managed by professional foresters who conduct programs in timber management, recreation, demonstration, and investigation in conformance with detailed management plans. Las Posadas, Mount Zion, and Ellen Pickett State Forests were acquired as gifts to the State and are relatively noncommercial in nature. These smaller forests are used primarily for administrative and recreational purposes and are managed by local Department of Forestry personnel incidental to other responsibilities. Deed restrictions preclude some uses on these forests.

A large acreage of potentially productive timberland in California is not producing a satisfactory growth of young timber. To attain proper management of private timberlands in California, there is a need to investigate, develop, and demonstrate new and improved forest management methods to timberland owners and the public. The State forests serve this purpose while contributing to the economic stability of local communities by providing high yields of forest products which sustain local employment and tax bases. Outdoor recreation is an important public benefit of the state forests.

The significance of the State forest program in demonstrating improved practices will increase as the demand for forest products increases and as public interest in forest management practices intensifies. Demonstrations of the compatibility and conflicts involved in multiple use of forest land are essential as population and development pressures increase on California's forest lands.

The State forests require a stable land base to facilitate long range planning necessary in forest land management. There is an urgent need to preserve the integrity of the existing State forests to assure their continued management according to legislative intent contained in PRC Section 4631. Reduction of private and public inholdings through purchase or exchange is needed to allow more efficient management of the existing State forests. Additional small demonstration forests (under 2,000 acres) adapted to meeting local requirements for investigation, demonstration, and education are needed in those counties where management of small timber ownerships is inadequate and no demonstration forests exist. There may be lands already in State ownership that could partially meet this need.

In consideration of the above facts, the Board of Forestry and Fire Protection has adopted the following policies to guide the Department of Forestry in administering the State forest program and managing the State forests.

PROGRAM PURPOSE AND LAND USE PRIORITIES 0351.2

The primary purpose of the State forest program is to conduct innovative demonstrations, experiments, and education in forest management. All State forests land uses should serve this purpose in some way. In addition:

A. Timber production will be the primary land use on Jackson, Latour, and Boggs Mountain State Forests. Timber production will be subordinate to recreation on Mountain Home State Forest;

B. Recreation is recognized as a secondary but compatible land use on Jackson, Latour, and Boggs Mountain State Forests. Recreation is a primary use on Mountain Home State Forest as prescribed by Section 4658, Public Resources Code:

C. State forest lands may be used for Department administrative sites when such use will benefit State forest programs or protection;

D. Special uses primarily benefiting non-forestry and/or private interests will have low priority. Such uses that conflict with State forest objectives are discouraged.

DEMONSTRATIONS AND EXPERIMENTS 0351.3

The Board, consistent with PRC Section 4631, recognizes and reaffirms that the primary purpose of State forests is to conduct demonstrations, investigations, and education in forest management. The Board wishes to emphasize and expand demonstrational, experimental, and educational activities on the State forests. Accordingly, in the operation of State forests, the Department will:

A. Conduct a balanced program of demonstrations and investigations in silviculture, mensuration, logging methods, economics, hydrology, protection, and recreation; directed to the needs of the general public, small forest landowners, timber operators and the timber industry.

B. Continue and develop procedures to assure dissemination of information obtained on State forests to forest landowners, (especially small owners), timber operators, and the general public.

C. Integrate the Department's Service Forestry Program with State forest demonstration activities to more effectively reach small forest landowners and the general public.

D. Conduct periodic field tours to exhibit State forest activities and accomplishments to forest industry, small forest landowners, relevant public agencies, and the general public. Field tours should be initiated by the Department and conducted at such times and places to encourage general public attendance.

E. Seek special funding as needed from the Legislature to support specific research projects on State forests.

F. Consult with and solicit the cooperation of the State universities and colleges, U.S. Forest Service, and other public and private agencies in conducting studies requiring special knowledge. Enter into cooperative agreements with other public and private agencies for investigating forest management problems of mutual interest. It is particularly of mutual benefit to make the State forests available to educational institutions, and other agencies for research projects.

G. Cooperate with the Department of Parks and Recreation in establishing forest management demonstration areas compatible with recreation for educational purposes adjacent to the Mendocino Woodlands Outdoor Center on Jackson State Forest.

TIMBER MANAGEMENT 0351.4

Purposes and policies for timber management on state forests are established in PRC Sections 4631 and 4651. The Board has further established the following policies pertaining to management and harvest of timber on State forests:

A. The Department will conduct regular periodic timber sales on Jackson, Latour, Boggs Mountain, and Mountain Home State Forests. Harvesting may be deferred in accordance with an approved management plan;

B. A rotation age, cutting cycle, and an allowable annual cut will be established for each State forest from which timber is harvested. Timber harvesting schedules should be projected at least five years into the future;

C. Allowable cut levels must be derived from pertinent current inventory and growth data;

D. State forest timberlands will be managed on the sustained yield principle, defined as management which will achieve and maintain continuous timber production consistent with environmental constraints;

E. State forest timber stands should be harvested on the basis of maximizing mean annual increment of high quality forest products. This should not preclude intermediate cuts designed to increase total yield and reduce losses from mortality;

F. Timber production and harvesting should provide for coordination with other State forest uses. Silvicultural practices should be compatible with recreation, soil, water, wildlife, and fishery values, and aesthetic enjoyment;

G. Economically and ecologically justifiable intensified forest management practices to increase total fiber production and timber quality will be pursued on the State forests. These practices will be designed and carried out for maximum applicability (or demonstration values) to private lands. Financing to conduct such intensive silvicultural practices should be actively sought by the Department;

H. Timber sales should have demonstrational value and include experimental and educational aspects whenever possible.

RECREATION ON STATE FORESTS 0351.5

A. Recreation is recognized as a secondary, but usually compatible use, on Jackson, Latour, and Boggs Mountain State Forests. Recreation is a primary use on Mountain Home State Forest as prescribed by section 4658, Public Resources Code.

B. The recreation program on State forests will make camping and day use facilities available to the general public, offer a degree of control and protection to the forests, and demonstrate that recreational use and timber management can be compatible land uses.

C. Campgrounds, picnic areas, and trails will be developed on State forests, as funds become available, but only consistent with the recreational carrying capacity as determined in the management plan.

D. Recreation improvements will generally be rustic in character with sanitary facilities and water sources which meet public health requirements. Special attention should be given to maintaining safe and sanitary conditions in all recreation sites utilized by the public.

E. Recreation use will be integrated with timber management activities to demonstrate how these uses can be compatible. The presence of recreationists on the State forests presents a unique opportunity to explain timber management to the general public.

F. The State forests will remain open for public hunting and fishing in accordance with State Fish and Game regulations except for specified closures required for public safety and forest protection as authorized by law.

SPECIAL USES OF STATE FORESTS 0351.6

Special uses of State forests will be permitted only when there is a clear benefit to the State and when such uses do not conflict with primary (uses) programs of timber management, demonstration, research, and recreation.

A. Use of State forests for mining, grazing, and commercial concessions is discouraged.

B. Although the state Lands commission has primary jurisdiction over geothermal resources on state forests, surface operations of geothermal developers will be strictly controlled by the department in accordance with regulations adopted by the Board contained in 14 CAC Section 1500-1503.

GRANTING TEMPORARY PERMITS FOR PASSAGE 0351.7

It is desirable to grant temporary permits for passage across State forests to forest products operators or other parties having need of them in the course of their operations where such permits do not interfere with the primary uses of State forests by the State. Applications for temporary permits for passage may be made to the Director who will be guided by the following principles in submitting applications to the Director of General services for approval.

A. Temporary permits for passage will be granted on a reciprocal basis where practicable.

B. The State will have free use of all lands and routes over which permits for passage have been granted.

C. The State will reserve the right to cross, recross, and parallel any such lands or routes with its own roads or utilities.

D. Temporary permits for passage will be limited to a minimum economical width but in no case shall exceed 60 feet except for needed cuts and fills.

E. The grantee of any temporary permits for passage will pay the State the current market value of timber necessarily cut or damaged in clearing and construction on State lands, provided that the price and volume will be determined by the Director, and such timber when paid for will belong to the operator.

F. Temporary permits for passage will be of such duration as to meet the reasonable needs of the grantee. Three years' non-use of any permit for passage for the purpose granted will constitute an abandonment forfeiture thereof unless the period of non-use is otherwise agreed upon.

G. The State will be reimbursed for any damage caused to State property in the construction and/or maintenance of such, provided that the grantee will hold the State harmless from any and all liability arising from the construction, maintenance and/or use of areas covered by such permits for passage.

H. Where it appears that benefit will result to the State, any charge for such permit for passage may be reduced accordingly.

I. All slash and snags on the area covered by a permit for passage will be disposed of by the grantee. The grantee will have the same responsibility for fire protection on any such area as is required by the Board for fire protection on a timber operating area.

PERMANENT EASEMENTS ACROSS STATE FOREST LANDS 0351.8

Permanent easements across State forest lands are sometimes necessary to allow adjacent owners access, use and development of their property. Granting of permanent easements across State forest lands can influence the development of subdivision or rural residential complexes which are not in harmony with State forest management activities.

The Board does not support or encourage residential development within State forest boundaries or on lands contiguous with State forest boundaries. The following guidelines will be followed by the Director in considering request for permanent easements:

A. Requests for permanent easements and widening of existing easements will be discouraged, but may be considered when no other routing through non-State forest land is physically possible or if such other routing presents substantial and unreasonable difficulties or environmental damage;

B. Requests for permanent easements will be submitted by the applicant in complete and understandable form with appropriate engineering data and plats as may be required by the Director. The applicant will prepare any required environmental documents and bear all administrative costs associated with processing his easement agreement;

C. Requests for permanent easements will be accompanied by a non-refundable deposit to cover administrative and engineering costs involved in studying the request. The deposit will be applied toward any fees charged if an easement agreement is consummated. This non-refundable deposit will be forfeited by the applicant if for any reason an easement agreement is not granted by the State. All fees may be waived where reciprocity is a consideration;

D. In those special cases where permanent easements are necessary for subdivision rural residential development, the easement will be accepted by the county as part of the public road system and developed to public road system standards;

E. To prevent proliferation of roads and easements, parcels with multi-ownerships will be required to share a common easement across State forest lands if at all feasible. This may involve substantial increases in planning, negotiation, engineering and cost to the original applicant;

F. To maintain control of easement use which could lead to subdivision rural residential development, an effort will be made to formalize by agreement, any prescriptive rights to State forest roads which adjacent owners may have acquired through uncontested use;

G. Permanent easement requests will be considered for only the minimum width and minimum development needed for the requested use;

H. A clause will be included in all permanent easement agreements guaranteeing the State all forest management options in areas adjoining privately developed lands without interference from the grantee;

I The Director will record all permanent easement agreements with the local county.

STATE FOREST LAND ACQUISITION POLICY 0351.9

A. The State forests should remain intact as management units without further diversion of productive area to non-forestry purposes. There should be no future transfers of commercial timberland from the state forests except where such transfers meet the program objectives of the State forests.

B. Private and public inholdings within the State forests should be reduced through acquisition or exchange. Irregular property lines should be rectified by acquisition or exchange, where desirable, to facilitate efficient management and to avoid conflicting land uses on adjacent areas. Inholdings and irregular property lines present an especially acute problem on Mountain Home State Forest which should

be resolved as soon as possible. Certain boundary line adjustments would also be desirable on Jackson and Latour State Forests.

C. Public Resources Code Section 4631(c) permits acquisition of "Demonstration forests of 2,000 acres or less adapted to furnish local needs of investigation, demonstration, and education in those timber counties where the ownership pattern is such that management of small areas is an important problem." Existing Department administrative sites involving significant timberland areas should be analyzed to determine if they could be utilized as demonstration state forests. Las Posadas, Mount Zion, and Ellen Pickett State Forests should be studied to determine if they contribute to the State forest program, or if they should be sold or exchanged for areas more suitable for State forest purposes.

STATE FOREST MANAGEMENT PLANS 0351.10

Management Plans for Boggs Mountain, Jackson, Latour, Mountain Home and Soquel Demonstrations State Forests shall be prepared by the Department, with appropriate public review, for approval by the Board. The Department shall present to the Board a thorough review of each existing plan at least every five years. All operations on the forests will conform to the management plans. Management plans should include, but not be limited to the following topics:

The following modification to existing Policy was approved at the Board's regularly scheduled meeting in San Bernardino on July 12, 2001:

"Management Plans for Boggs Mountain, Jackson, Latour, Mountain Home and Soquel Demonstration State Forests shall be prepared by the Department, with appropriate public review, for approval by the Board. The Department shall present to the Board a thorough review of each existing plan at least every five years. After each review, the Board may direct the Department either to continue management under the existing plan, to prepare amendments to the plan, or to prepare a new plan for public review and Board approval. The Department shall submit the requested amendments or plan to the Board within one year after each request. The Department shall continue management under existing plans with appropriate consideration for changes in law or regulation, until amendments or new plans are approved by the Board."

Appendix II. Special Concern Areas

The term Special Concern Area is used to denote geographically distinct areas that are in some way unique, are designated for specific management, or that are subject to management restrictions to protect sensitive resources. Restricting management in this manner helps to create or retain forest conditions consistent with the goals of the Forest. Map Figure 5 shows the approximate locations of the Special Concern Areas. The acreage figures provided here are the best current estimates, but are subject to change with refinement of information or changes in conditions over time.

Many Special Concern Areas overlap. Examples include the power line right-of-way crossing through the watercourse and lake protection zone or the uneven-aged management area; the overlap of pygmy forest and the Jughandle Reserve; or road and trail corridors within the Woodlands Special Treatment Area. The acreages shown below are those that are assigned to each Special Concern Area independently; thus, the total of all acres is more than the total Forest acreage affected by Special Concern Areas. The most restrictive limitations will be applied during implementation of the management plan. The research and demonstration mandate coupled with public trust resource protection has resulted in 23 Special Concern Areas on the Forest.

Older Forest Structure Zone- 6,803 acres

Area designated for management to connect specific old-growth groves, late seral development areas, watercourse protection zones, and upland forest to form a contiguous area of habitat with structural characteristics of older forest, such as large trees, snags, down logs, and a high degree or vertical and horizontal diversity. Where timber harvest is proposed adjacent to the Old Forest Structure Zone, a buffer will be applied. No even-aged silvicultural systems may be used within 300 feet, and only single tree selection may be used within the first 100 feet adjacent to these areas.

Cypress groups - 253 acres

Stands dominated by pygmy cypress that occur on sites with generally unproductive soils (i.e., sites that are considered non-timberland), but not considered to be true pygmy forest. These areas will not be harvested. Note that conifer stands containing cypress that occur on more productive sites may be subject to harvesting and are not included in this Special Concern Area.

Pygmy forest - 613 acres

A unique type of dwarf vegetation found on old marine terraces dominated by pygmy cypress and other specially-adapted species. This Special Concern Area includes nearly all of the Jughandle Reserve Special Concern Area, along with other pygmy forest stands in JDSF that occur outside of the Jughandle Reserve boundaries. These areas will not be harvested.

Jughandle Reserve - 247 acres

An administrative area designated to protect a tract of pygmy forest within JDSF and to manage recreational access to these lands in a manner compatible with human use in the adjacent Jughandle State Reserve. This Special Concern Area lies almost entirely within the pygmy forest Special Concern Area. There will be no harvesting within the pygmy forest area.

Eucalyptus infestation area

This is an area in the Caspar Creek planning watershed that includes eucalyptus species mixed with the native species (Douglas-fir, redwood, and other species), along with some Monterey pine. This is an area of special management concern because of the need to control eucalyptus to allow regeneration of

conifers in this stand and to prevent the spread of this exotic species on the Forest. JDSF intends to convert this area to native conifer species.

Inner gorges

Steep slopes adjacent to streams that are that are prone to mass wasting and have a high potential for sediment delivery to stream channels. These areas are subject to silvicultural limitations, such as no harvest or limited single tree selection, depending on the results of a site review during THP preparation.

Northern spotted owl nest areas

Buffers around known nest site locations that will be managed to minimize disturbance to these sites and enhance their value as nesting habitat for the northern spotted owl.

Osprey nest areas

Buffers around known nest site locations that will be managed to minimize disturbance to these sites and enhance their value as nesting habitat for osprey.

Watercourse and lake protection zones (WLPZ) - 7,440 acres

Areas designated for special management to protect aquatic and riparian resources, maintain terrestrial habitat connectivity for wildlife, and promote development of late-successional forest stand conditions. Silviculture is limited to no harvest or special uneven-aged regimes designed to promote development of late-successional forest stand conditions. WLPZ acres were estimated.

Woodlands Special Treatment Area - 2,511 acres

A special management area adjacent to the Mendocino Woodlands. Silvicultural activities, with limited exceptions, are focused on promoting late-successional forest conditions, maintaining aesthetic qualities, and limiting impacts on the operation of Mendocino Woodlands. (Note: the Railroad Gulch silvicultural study area is not included in this acreage).

Domestic water supplies - 195 acres

Designated areas for domestic water supply in JDSF that are sensitive to disturbance. Only a limited range of silviculture is allowed in these areas.

Buffers adjacent to non-timberland neighbors - 875 acres

Areas along the boundary of JDSF adjacent to non-industrial timberland owners where a buffer zone is designated to minimize impacts on neighbors. Only a limited range of silviculture is allowed in these areas.

Power line right-of-way - 89 acres

Operated by PG&E. The power line right-of-way runs through the Forest, generally parallel to Highway 20. The maintained clearing is not available for timber production.

State Park Special Treatment Areas - 415

Areas adjoining State Parks where the application of silvicultural systems must take the values of the parks into consideration.

Reserved old-growth groves - 459 acres

Includes the existing mapped old-growth grove reserves. These areas will not be harvested.

Late seral development areas – 2762 acres

Includes areas adjacent to three old-growth grove reserves, in addition to the upper Russian Gulch and lower Big River areas, which will be managed to develop late seral habitat conditions potentially suitable for the marbled murrelet. These areas will be managed to promote development of late seral stand conditions to help buffer the adjacent old-growth groves and to enhance the value of these areas for wildlife species that are associated with late seral forests. Where timber harvest is proposed near old-growth groves or late seral development areas, a buffer will be applied. No even-aged silvicultural systems may be used within 300 feet, and only single tree selection may be used within the first 100 feet adjacent to these areas.

Campground buffers - 133 acres

Areas immediately adjacent to campgrounds that are managed for public safety and aesthetic enjoyment. Even-aged silviculture is not allowed within the campground buffers.

Conservation camps - 43 acres

Areas occupied by the Parlin Fork and Chamberlain Creek conservation camps. These areas will not be managed for timber production.

Road and trail corridors – 4,790 acres

Buffer areas along trails and roads to maintain aesthetic qualities valued by the public. Only a limited range of silviculture is allowed in these areas.

Parlin Fork management area - 279 acres

An area adjacent to the Parlin Fork Conservation Camp that is used as a demonstration area for small woodland management.

Research areas - 1,680 acres

Areas set aside for various research studies.

Areas with a high relative landslide potential

Areas identified from CGS geology and geomorphology maps as having a high relative landslide potential using the best available data and assessment methodologies. These areas will be reviewed on the ground following the guidelines presented at the 1999 CLFA workshop. They are potentially subject to limitations on road construction, yarding methods, and silviculture and may need to be evaluated by a certified engineering geologist (CEG).

Mushroom Corners Management Area – 330 acres

The Mushroom Corners area partially overlaps the Caspar Experimental Watershed, Russian Gulch/Lower Big River a Late Seral Recruitment area, county roads with visual and recreation concerns, as well as proximity to State Parks and private land ownerships (see Figure 5). This area is particularly important to the mycological research community, in part due to its ease of access and presence and abundance of a diverse number of species.

Appendix III. Research and Demonstration Program

Proposed Research and Demonstration Priorities

The entities that have made recommendations for research and demonstration in the recent past are listed below along with priority items that they have identified.

Demonstration State Forest Advisory Group (2005-date)

In its February 2006 comment letter to the Board of Forestry and Fire Protection in response to the December 2006 Draft Management Plan and DEIR, the Demonstration State Forest Advisory Group recommended that JDSF "…should be demonstrating the most advanced silvicultural practices, cutting edge research, forward-thinking management for habitat protection, and watershed health." The Group made the following specific recommendations regarding areas of inquiry for research and demonstration:

- How can the conversion of working forests be slowed, in particular, what will make the best economic argument to forest landowners?
- What role does a demonstration state forest play in preventing fragmentation of the larger, landscape-scale forest and its function as wildlife habitat, watershed, source of income for a local community, and so on?
- What is the mutuality of revenue generation and demonstration of a working forest and how can this be communicated to the public?
- What environmental services does a state forest provide?
- How can working forests be compatible with and contribute to the quality of life goals of neighbors and communities?
- What are ways to inform and engage state forest neighbors and the interested public in stewardship, such as participatory or all-party monitoring?
- How can silvicultural practices address critical environmental needs while embracing opportunities such as carbon sequestration?
- What is the appropriate technology and level of infrastructure for the state forest, particularly road construction and maintenance?
- What are effective ways to demonstrate contemporary and emerging forest practices, inventory techniques, and so on to small-acreage, non-industrial forest landowners?
- What is the changing face of California demographics, what forest values do citizens hold, and how can the state forest provide this citizenry with relevant demonstrations and appropriate recreation opportunities?
- Are there externalities in environmental advocacy in California, in other words what are we exporting in terms of environmental impacts to those regions harvesting timber and producing products imported to California?

JDSF Citizen's Advisory Committee (1997-1998)

In 1997, former Director Richard Wilson appointed an advisory committee (CAC) to provide advice to the Department during preparation of a habitat conservation plan and management plan. The advisory committee made some specific recommendations to the Department regarding priorities for research and demonstration that included:

- Uneven-Aged Silviculture
- Determination of Necessary Habitat Elements to Retain Within Managed Stands
- Develop Alternatives to Herbicide Use
- Hardwood Growth and Utilization

- Effects of All-Aged Management Upon Fish And Wildlife
- Utilization of Wide Stream Buffers
- Creation of Marbled Murrelet Habitat
- Creation of a Fully Funded Scientific Monitoring System

Coast Redwood Forest Management Symposium, 1994

A poll of research needs was done during the Coast Redwood Forest Management / Silviculture Conference held in January 1994. This list was developed independent of ranking by clientele group and is as follows:

- Dynamics of Group Selection
- Management of Riparian / Aquatic Resources
- Growth Modeling of Redwood Forest Types - Young Tree
- Demonstration of Sustained Uneven-aged Forestry
- Spatial Dynamics of Stand Structure
- Documentation and Synthesis of Existing Information on Coast Redwood Forests
- Documented Demonstration of Management Alternatives and Activities at JDSF
- Habitat and Wildlife Relationships
- Long Term Landscape Level Studies on JDSF (including CWE studies)
- Coppice Management - Long and Short Options and Effects

State Board of Forestry and Fire Protection Committee on Research, 1987

In 1987, the State Board of Forestry and Fire Protection's Committee on Research issued a report that identified critical or urgent research needs in the following areas:

- Cumulative Watershed Effects
- Vegetation and Pest Management
- Landowner Rights and Responsibilities
- Riparian Zone Management
- Forest and Rangeland Fragmentation
- Forest and Rangeland Recreation
- Sediment Yield and Monitoring
- Uneven-Aged Silvicultural Systems
- Wildlife Habitat
- Forest and Rangeland Education
- Public Attitudes
- Multi-Resource Inventories and Database Development

The report stated that "Increased support for research work on these twelve critical and urgent problem areas is needed to meet existing statutory and regulatory requirements, pressures for additional regulation, economic impacts on rural areas, and the long-term resource needs of California's growing population."

U. C. Wildland Resource Center Workshops: UC Center for Forestry

In 1989, the University of California's Wildland Resources Center at Berkeley conducted three workshops to determine critical and urgent research needs and published Report 20 which identified the following:

- Provide Technology For Managing Channels and Aquatic Habitats

- Manage Non-point Pollution and Sediment In Streams
- Measure, Predict, and Deal With Cumulative Impacts of Multiple Harvests
- Produce Maps of Vegetative Cover and Types at a Resolution of 1 To 3 Acres
- Improve Methods For Inventorying, Managing Databases, and a Locational GIS
- Define Considerations to Practice Forestry in Populated, Rural-Residential Areas
- Enhance Continuing Education of Professional Managers of Forest Resources
- Complete Surveys of Soils and Related Vegetation and of Geologic Hazards
- Define Habitat Requirements For Wildlife and Practices to Enhance Populations
- Define Habitat Requirements For Fish and Forestry Practices Favoring Fisheries
- Provide For Management and Rehabilitation of Unstable Watersheds
- Improve Methods For Assuring Reliable Stocking and Growth of Plantations
- Provide Methods For Cost-Effective Management of Weeds
- Establish Efficacy and Safety of Herbicides

Report on Old Forest Restoration by silviculture experts at U.C. Berkeley, 2003

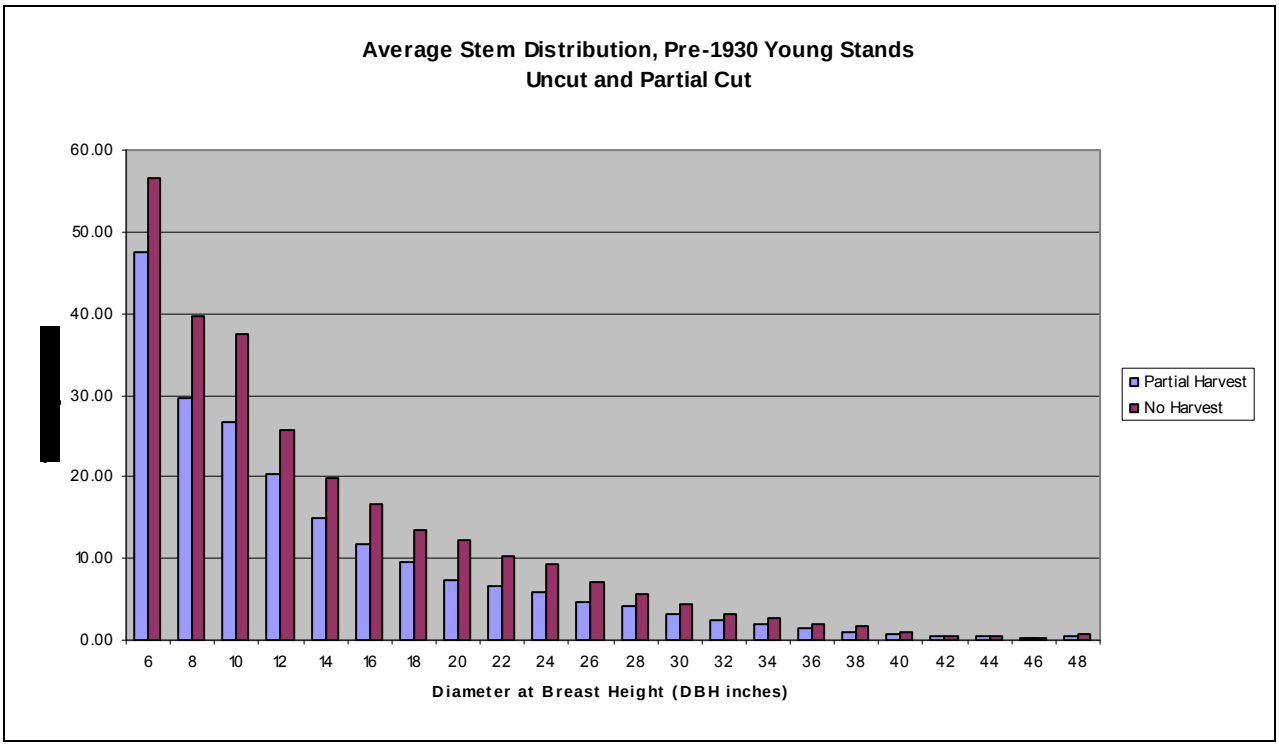
This is an unpublished report titled *Potential for old forest restoration and development of restoration tools in coast redwood: a literature review and synthesis* (Dagley and O'Hara 2003) that presents 9 research priorities. These are summarized below:

- Role of Fire
- The Spatial Structure of Redwood Clones
- Amount and Distribution of Leaf Area
- Old-Tree Growth Histories
- Redwood Sprouting Dynamics
- Variable Density Thinning Responses
- Gap Size Responses
- Aggregated Versus Dispersed Retention With Variable Retention
- Dead Wood Formation and Longevity

Older Forest Development and Management

The development of older forest structure characteristics on a stand and landscape context is a major component of this plan. The following tables and graphs are derived from research and inventory data on JDSF. They illustrate the feasibility of active management in more rapidly meeting certain structure targets.

This figure shows a comparison of the diameter distribution of uncut and partially cut stands on JDSF. This illustrates that active management can achieve similar results as a no-harvest approach. This comparison is an average across the Forest and does not account for factors such as site and initial density.

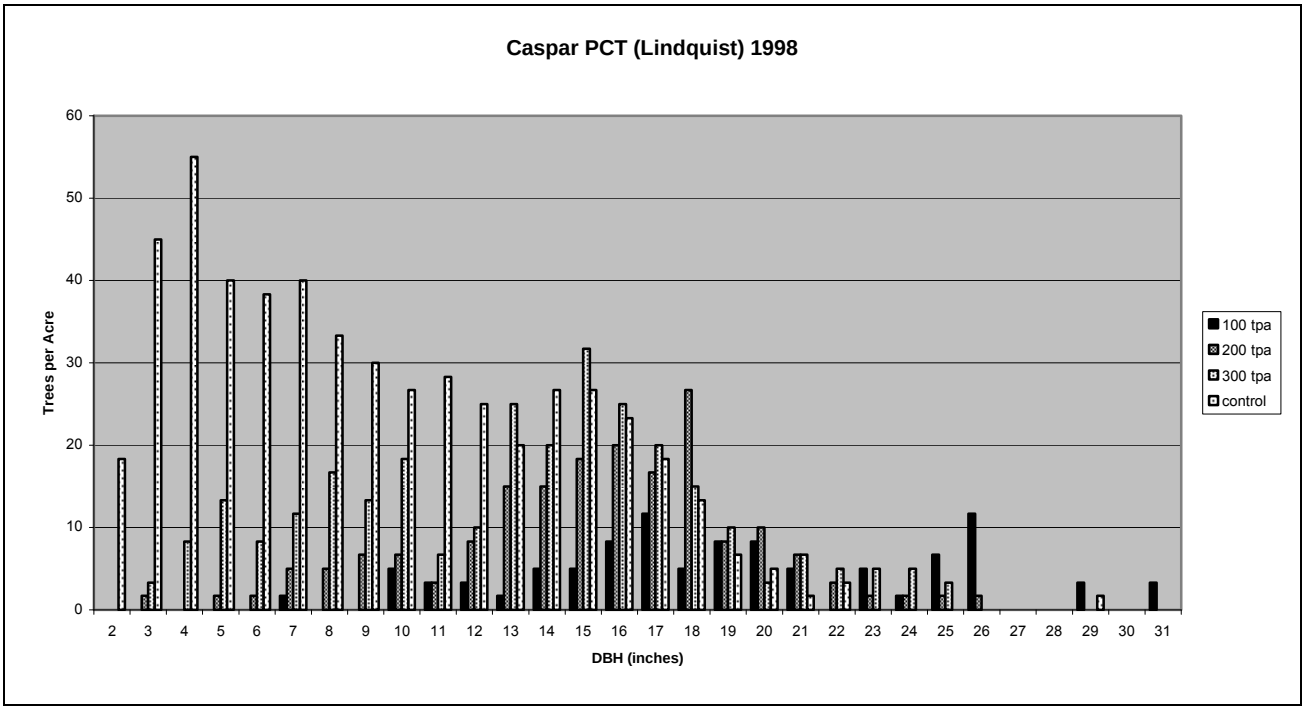


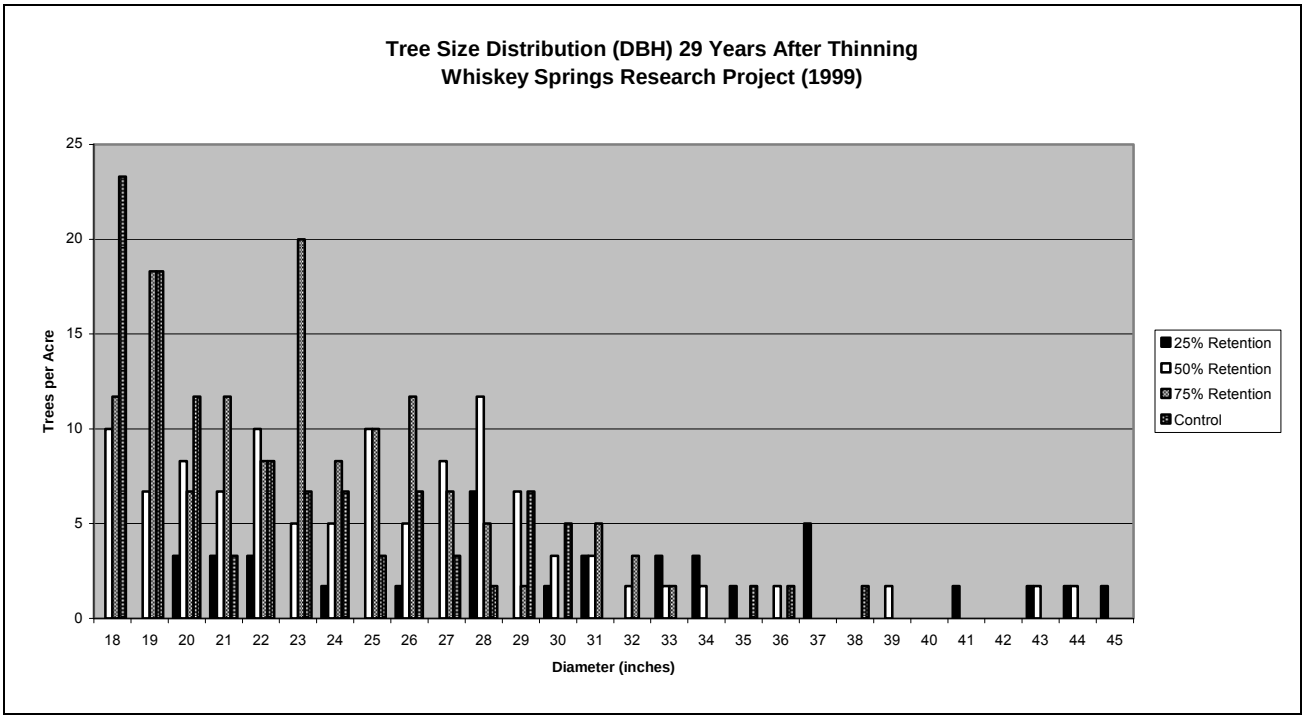
The following tables and their associate graphs show the diameter distributions from two levels-of-growing stock research studies. Both indicate the influence that stocking can have on speeding the development of large trees, which are required elements for other structural components in older stands such as basal hollows and nest platforms.

Caspar Creek Precommercial Thinning Study.
Diameter distribution in 1998, 17 years after thinning. Stand age approximately 39 years.

Diameter	Trees Per Acre			
Class (in.)	**100**	**200**	**300**	**UNCUT**
2				18.3
3		1.7	3.3	45.0
4			8.3	55.0
5		1.7	13.3	40.0
6		1.7	8.3	38.3
7	1.7	5.0	11.7	40.0
8		5.0	16.7	33.3
9		6.7	13.3	30.0
10	5.0	6.7	18.3	26.7
11	3.3	3.3	6.7	28.3
Subtotal	**10**	**32**	**100**	**355**
12	3.3	8.3	10.0	25.0
13	1.7	15.0	25.0	20.0
14	5.0	15.0	20.0	26.7
15	5.0	18.3	31.7	26.7
16	8.3	20.0	25.0	23.3
17	11.7	16.7	20.0	18.3
Subtotal	**35**	**93**	**132**	**140**
18	5.0	26.7	15.0	13.3
19	8.3	8.3	10.0	6.7
20	8.3	10.0	3.3	5.0
21	5.0	6.7	6.7	1.7
22		3.3	5.0	3.3
23	5.0	1.7	5.0	
Subtotal	**32**	**57**	**45**	**30**
24	1.7	1.7	5.0	
25	6.7	1.7	3.3	
26	11.7	1.7		
27				
28				
29	3.3			1.7
30				
31	3.3			
Subtotal	**27**	**5**	**8**	**2**
Total	**105**	**187**	**288**	**527**

Whiskey Springs Research Project Average number of trees per acre by diameter class for each treatment in 1999. Stand age approximately 80 years, 29 years after thinning.				
	Basal Area Retention			
Diameter Class (in.)	**25%**	**50%**	**75%**	**100%**
5	0.0	0.0	0.0	20.0
6	0.0	0.0	0.0	35.0
7	0.0	0.0	0.0	50.0
8	0.0	0.0	0.0	35.0
9	0.0	0.0	6.7	35.0
10	0.0	0.0	5.0	38.3
11	0.0	0.0	11.7	26.7
12	0.0	0.0	13.3	36.7
13	0.0	0.0	15.0	33.3
14	0.0	0.0	11.7	26.7
15	0.0	0.0	8.3	8.3
16	0.0	1.7	16.7	33.3
17	0.0	6.7	15.0	11.7
Subtotal	**0**	**8**	**103**	**390**
18	0.0	10.0	11.7	23.3
19	0.0	6.7	18.3	18.3
20	3.3	8.3	6.7	11.7
21	3.3	6.7	11.7	3.3
22	3.3	10.0	8.3	8.3
23	0.0	5.0	20.0	6.7
Subtotal	**10**	**47**	**77**	**72**
24	1.7	5.0	8.3	6.7
25	0.0	10.0	10.0	3.3
26	1.7	5.0	11.7	6.7
27	0.0	8.3	6.7	3.3
28	6.7	11.7	5.0	1.7
29	0.0	6.7	1.7	6.7
Subtotal	**10**	**47**	**43**	**28**
30	1.7	3.3	0.0	5.0
31	3.3	3.3	5.0	0.0
32	0.0	1.7	3.3	0.0
33	3.3	1.7	1.7	0.0
34	3.3	1.7	0.0	0.0
35	1.7	0.0	0.0	1.7
Subtotal	**13**	**12**	**10**	**7**
36	0.0	1.7	0.0	1.7
37	5.0	0.0	0.0	0.0
38	0.0	0.0	0.0	1.7
39	0.0	1.7	0.0	0.0
40	0.0	0.0	0.0	0.0
41	1.7	0.0	0.0	0.0
42	0.0	0.0	0.0	0.0
43	1.7	1.7	0.0	0.0
44	1.7	1.7	0.0	0.0
45	1.7	0.0	0.0	0.0
Subtotal	**12**	**7**	**0**	**3**
TOTAL	**45**	**121**	**233**	**500**


Caspar PCT (Lindquist) 1998
Trees per Acre
DBH (inches)
100 tpa
200 tpa
300 tpa
control


Tree Size Distribution (DBH) 29 Years After Thinning
Whiskey Springs Research Project (1999)
Trees per Acre
Diameter (inches)
25% Retention
50% Retention
75% Retention
Control

Active Research Projects

The Caspar Creek Watershed Study

This cooperative study with PSW – Redwood Sciences Lab started in 1962 and is now in the third phase of the study. This project began as a long-term cooperative investigation of the effects of logging and road construction on water quality, flood peaks and suspended sediment. This study added monitoring and assessing aquatic habitat and fish populations before and after harvesting in a cooperative effort with California Department of Fish and Game. The project study expanded in 1985 to evaluate the cumulative watershed effects of clearcuts that were skyline logged in the North Fork. Attributes assessed included total precipitation, soil moisture, groundwater, subsurface pipe flow, stream flow, suspended sediment, bedload movement, channel stabilization, large woody debris, and anadromous fish habitat. The third phase focuses now back on the South Fork Caspar – the former treated watershed in the first phase – where the effects of road abandonment and harvest reentry can be monitored and assessed. To that end, nine gauging stations are being installed in various tributaries in the South Fork to begin the necessary pre-treatment baseline data. A major conference reporting on the results of the second phase was presented in 1998 along with the following proceedings: Proceedings of the Conference on Coastal Watersheds: the Caspar Creek story, 1998 May 6; Ukiah, California. General Tech. Rep. PSW GTR-168. Albany, California: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture

The Caspar Creek Third Growth Precommercial Thinning Study

This study was sited on the 14 acre clearcut unit of the Caspar Cutting Trials in 198. A replicated design of five residual stocking levels (100, 150, 200, 250, 300 stems/ac) plus controls was implemented for the purpose of evaluating the long-term stand response of PCT work at stand age 20 in coast redwood. Several newsletter articles and *California Forestry Report #2* have reported on results and results have also been reported on at the Conference on Coast Redwood Forest Ecology and Management in 1996, a technical session presented in spring 2000, and at the 2004 Redwood Science Symposium.

The Whiskey Springs Commercial Thinning Study

This study was started in 1970 and the study objective was to monitor and determine the effects of three levels of thinning on stand growth and yield in a 40 year old second-growth stand of coast redwood and Douglas-fir. The study was initially part of a larger set of study areas however it is the only one left intact. The study area has been re-measured many times over the life of the study and has evolved to monitoring also the sprout regeneration resulting from the initial thinning under the two heaviest thinning treatments. A sub-study evaluating the effects of precommercial thinning on these new sprouts was also initiated. Several reports and newsletter articles have resulted from this study and results have also been reported on at the Conference on Coast Redwood Forest Ecology and Management in 1996, a technical session presented in spring 2000, and at the 2004 Redwood Science Symposium. The last remeasurement occurred in 1999 resulting in *California Forestry Report #3* .

The Effect of Silvicultural System and Stocking Level on Productivity, Costs and Site Disturbance – The Railroad Gulch Silvicultural Study

Laid out over 270 acres, this study in the Woodlands area of the state forest was designed to evaluate the long term effect on stand growth and yield of several levels of single tree and group selection sited on large (20 ac.) blocks. The first remeasurement occurred in the early 1990s with the anticipation that a 10-year harvest reentry would be done. This was not accomplished, so in year 2000 a third remeasurement was conducted. Several newsletter articles and California Forestry Note 97 have resulted from this study and the first harvest entry and growth results were presented at the Conference on Coast Redwood Forest Ecology and Management in 1996. A master's thesis was completed from the implementation and completion of the initial phase of this project. Professor Kevin O'Hara and graduate student Pascal Berrill from UC Berkeley are currently using this study for redwood silviculture research.

Developing a Coast Redwood Growth Model for Use in Making Silvicultural Prescriptions

This study which involved several phases builds upon much agricultural and botanical research in applying those results to timber stand growth modeling. The two variables of interest are the trees leaf surface area (LSA) and its net assimilation rate (NAR). The two researchers have used these two variables to develop the relationship between tree growing space and tree growth. Through the development of thinning prescriptions called the triangular thinning method, stand growth in an asymmetrical spaced stand can achieve growth increment comparable to a symmetrically spaced stand. A distant dependent type growth model called GPSACE was developed which computes the stand and tree growth based on the configuration of the trees within the stand for coast redwood in the 120-140 foot class. Several JDSF newsletters have reported on this study and a Ph.D. dissertation was also written with the completion of the project. This study is approaching the end of the period needed to allow the trees to adjust to their new growing space. At some future date, the next phase would be to compare actual growth rates against GSPACE model predictions.

Hare Creek Sprout Stocking Study

Plots were established in a new clearcut to establish a baseline measurement for long term monitoring as the stand develops. The objective is to document stand growth and yield with the effects of management actions such as precommercial and commercial thinning through the length of the rotation. Publication of California Forestry Note 102 presented the results of the study to that point in time. Another remeasurement was completed prior to a precommercial thinning activity in 1998 and in the following year a post thinning remeasurement was completed.

Determination of the Value of Advance Regeneration in Redwood/Douglas-fir Overstory Removal

Plots were established to evaluate survival of large advance regeneration resulting from partial cutting in second-growth stands 20 years earlier, following a third entry focused on a removal of the residual overstory. A contract report is on file.

Large Woody Debris (LWD) Studies On Jackson Demonstration State Forest

The first study in cooperation with the Department of Fish and Game started in 1996. The purpose was to introduce large woody material to the stream channel to determine if higher quality habitat could be produced for anadromous salmonids. Other study reaches are now sited also in Caspar Creek and Hare Creek. Installation and preliminary results have been published in several JDSF newsletters and a presentation was made at the Technical Session in 2000.

Incision of Low-Order Stream Channels

This study will provide for a reconnaissance of a wide range of stream channels on the Forest to formulate and improve hypotheses concerning the factors that influence the occurrence of gully headcuts and incision in low-order channels and swales.

Completed Major Research Projects

Investigation of the Black Stain Root Rot Disease

Studies have been conducted on the prevalence of the disease on the north coast and modes of transmission from tree to tree as well as the various environmental factors that may contribute to the incidence of the disease.

The Response of Algal Communities in Streams on JDSF to Timber Harvesting

Sampling streams in logged and un-logged basins showed significant differences in filamentous algae.

Forest and Fire Technology Transfer

A self guided interpretive/demonstrational trail system in the Woodlands area was developed with an accompanying illustrated brochure ("Forest History Trail Guide").

Factors Affecting Natural Regeneration in Second-growth Redwood Stands Following a Selection Harvest

Regeneration data in cut-over second-growth stands was collected. A doctoral thesis was written as part of this project

James Creek Rock Ripper Tilling Trial

A study implemented to evaluate the usefulness and effectiveness of tilling compacted skid trails using conventional rock rippers and medium-sized crawler tractors. This was done in conjunction with the harvesting of the James Creek 1983 timber sale.

Hare Creek Winged Subsoiler Tilling Trial

The project objective was to demonstrate the effectiveness of tilling skid trails for site rehabilitation using winged rippers versus the conventional method of waterbarring.

New Inventory Design Development and Plot Installation

The implementation of the new forest inventory plot system (IFI) done in 1988-89. Partial remeasurements have also been done in 1997 and 1999. The design allows for upwards of 5000 potential inventory plot sites, with approximately 2400 plots currently proportionately allocated according to vegetation type requirements, of which about 300 are new permanent plots. The old permanent CFI plots have been incorporated into the new design by using the center one fifth acre circular portion of the original one-half acre rectangular plot.

Survival and Growth of One-Year Bare Root, Two-Year Bare Root and One-Year Container Redwood Seedlings

This study was implemented to test the various stock types available for artificial regeneration and make recommendations for the relative chance of plantation establishment for these three types. The chosen sites were located in the group selection units of the Railroad Gulch timber sale which was harvested for implementation of a silvicultural study. A contract report is on file. This project has resulted in a paper in the Western Journal of Applied Forestry (Jameson and Robards, In Press).

East End Vegetation Management

State Forest staff designed a study to test several different types and combinations of mechanical and chemical brush control treatments in the James Creek drainage. A vegetation management firm was contracted to apply the treatments.

Hare Creek 80 Pre-Constructed Skid Trail Study

This study was part of an active timber sale and was designed to evaluate two skidding strategies:

1. Preplanned skidtrail layout before felling and 2. “Loggers choice,” where skid trails are constructed after felling is completed. A JDSF Newsletter reported on the results.

Camp 20 Visitor Center Development

A visitor center kiosk was constructed at Camp 20. Through a contract with Chico State University, nine interpretive sign displays were developed for the visitor center including a steam donkey display. New skids were made for the steam donkey and new center sign and restroom were also developed. Additionally, a pedestrian bridge crossing Chamberlain Creek was installed to allow easy access to the Little Red Schoolhouse. Development was reported in a JDSF newsletter.

Fall and Buck Study for CRYPTOS Calibration

A sample of trees representative of local size class distributions and site characteristics were selected throughout the forest to test whether the regional volume equations used by the CRYPTOS growth model were representative of JDSF stands. Results indicated that the model equations overestimated redwood and Douglas-fir tree volumes by about six percent while other whitewoods were underestimated by approximately three percent. Appropriate calibration coefficients are now being applied to the equations when using the model. Results were reported in a JDSF newsletter. Fall and buck tree data is on file and has been released when requested.

Baseline Surveys of Birds, Mammals, Amphibians, and Reptiles and Basic WHR Analysis of Wildlife on the Jackson Demonstration State Forest

As a first step in understanding the impact of forest management on wildlife diversity, baseline information needs to be gathered on wildlife populations on the forest that is being managed. The primary focus of this study was to provide such information on the birds, mammals, and reptiles on the JDSF. Indices of relative abundance were developed for as many species as possible in as many timber types in the time frame allowed for the study

Analysis of Small Animal Populations in Clear-Cut Areas of the Jackson Demonstration State Forest

The purpose of this study was to 1) obtain quantitative data on small mammal populations in areas harvested by clearcutting and control areas; 2) obtain descriptive, quantitative data of site factors and vegetative cover and; 3) quantify population dynamics over time. Small mammal includes all intermediate-sized species that are known to be important prey for predatory birds such as the Spotted Owl.

Vegetation Succession on Clear Cut Redwood Stands of the Jackson Demonstration State Forest

The purpose of this study was to relate the temporal and spatial successional complexes found in coast redwood clear-cuts to environmental conditions and management variables such as harvesting technique and post-harvest management. Harvesting techniques included both tractor and cable while post-harvest actions included burning and herbicide applications. Environmental variables considered were age since cutting, slope, soils, and rainfall. Eighteen clearcut harvest units were studied using circular quadrates and standard vegetation sampling methods. Two old-growth stands in the area were used as controls.

Effects of Commercial Harvesting of Mushrooms on Mushroom Productivity and on the Mycorrhizae

Management and biological concerns about the extensive harvesting of edible mushrooms have necessitated the need for collection of baseline data to assist in developing management guidelines. The specific objectives were to 1) identify botanic types and forest types in which commercially harvested mushrooms are to be found within JDSF; 2) identification of the average yield of the resource and its value; 3) identification of appropriate harvesting times based on both environmental and life-span data.

Redwood Sprouts On Jackson Demonstration State Forest

The objectives of this long term study were to monitor and assess: 1) the growth and development of redwood sprouts growing on a wide range of redwood stump size and age classes, 2) the percentage of sprouting occurring in each size or age class, and 3) effects of thinning sprout clumps under different levels of stocking and available light. The thinning study started in 1950 and has been remeasured in 1963 and 1983.

Cooperative Forest Fertilization Trials

In cooperation with UC extension and other large timberland owners, this cooperative was started in 1970 to determine whether a redwood/Douglas-fir stand in association with other species would respond by a significant growth increase to fertilizer treatment.

Seasonal Diameter Growth In Trees On Jackson Demonstration State Forest

This study was initiated with the start of the CFI (continuous forest inventory) system to determine the best times to perform inventory work and to accurately compute the number of growing seasons between measurements for growth computations.

Development Of Stocking Guidelines And Growth Response Relationships For Multi-aged Silviculture In Coast Redwood

The purpose of this study was to develop an alternative to clearcutting that also avoids the complexity of classical selection systems. This entails the creation of two or three-age class stands. However, no existing guidelines exist for implementation of these structures in the coast redwood type. Final Report received December, 2003 titled “Predicting Multi-aged Coast Redwood Stand Growth and Yield Using Leaf Area Allocation”. Also named Redwood MASAM report (Multi-aged Stocking Assessment Model). The following journal articles are from this effort: Stancioiu and O’Hara (2005), Berrill and O’Hara (2003), and Waring and O’Hara (2006).

Assessment And Recommendations For Young-Growth Site Index Models And Stand Site Estimation Procedure In California

This study was designed to provide the best set of site index estimation procedures for as many species as possible refined by regional and site specific factors within the limits of available data and any supplementary data collected as part of this project. Final report received. Published as CDF – Forestry Report No. 4, April 2005 titled “Site Index Systems for Major Young-Growth Forest and Woodland species in Northern California”.

A Multi-Scaled Analysis Of Fire History, Jackson Demonstration State Forest

The purpose of this study was to reconstruct the spatial and temporal occurrence of past fire events including baseline data on fire frequency, timing, severity, spatial patterning, and seasonality that is necessary to develop prescribed fire, silvicultural, and management programs. Final report received

December, 2001, Published in Northwest Science, Vol. 77, No.2, 2003. Presented at the Redwood Region Forest Science Symposium, Rohnert Park, CA. March, 2004.

A Predictive Transport Model For Large Woody Debris In Forest Streams

The purpose of this study was to develop a repeatable methodology which assesses the probability of wood movement in streams under a given distribution of flows. This is a necessary part of computing a long term wood budget for planning sufficient LWD loading in riparian corridors. Final report received in January, 2003 titled " A Theoretical Model for the Initiation of Large Woody Debris Movement in Caspar Creek, CA".

Evaluating Long-Term Sediment Storage And Transport In The South Fork Noyo River Watershed, Jackson Demonstration State Forest

This study assessed the fluvial geomorphology and the locations and amounts of stored sediment. The information was used to evaluate the influence of management practices on the past and present distribution of sediment within the basin and to develop better constraints for sediment budget analysis. Final Report received 2001. Published by the CDF - State Forests Program June, 2001. Presented at the Redwood Region Forest Science Symposium, Rohnert Park, Ca. March, 2004.

Genetic Architecture Of Sequoia Sempervirens At Jackson Demonstration State Forest

This study was designed to determine if the levels of cloning and genetic diversity are significantly different on various sites. This will improve information used for the evaluation of the impacts of harvesting on reproduction and genetic diversity. The authors (Douhovnikoff, Cheng et al. 2004) published a paper in the American Journal of Botany detailing the results of this project.

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Appendix IV. Road Management Plan

Introduction and Background

The Road Management Plan presented here reflects the Additional Management Measure for an Accelerated Road Management Plan that was developed in the 2005 DEIR (see DEIR page VII.10-19).

Forest roads on JDSF are used for timber harvesting, forest management activities, forest protection, public access, and recreation.[9] Numerous studies have shown that forest roads are a major source of management-related stream sediment (Furniss et al. 1991). Much of this sediment originates from points at which or near where streams are crossed by roads, from inside ditches, and from large fill failures. The Management Plan for JDSF includes a program to inventory and improve its road system. Additionally, the plan provides guidelines for new road construction. The goal of this program is to protect and enhance stream channel conditions for anadromous fish, amphibians, and other sediment sensitive aquatic organisms by reducing both fine and coarse sediment loading. Implementation of this plan will also improve water quality by reducing suspended sediment concentrations and turbidity. The Road Management Plan includes the following components:

1. Road Network and Stream Crossing Inventory: A plan to inventory roads, road-related facilities, and potential hazards associated with roads.

2. Road Design and Construction Standards: Guidelines for road location, design, and construction.

3. Road Use Restrictions: Guidelines that identify restrictions on use of roads, particularly during wet weather conditions.

4. Road Inspection and Maintenance Program: Guidelines for monitoring Forest roads and establishing a maintenance program.

5. Road Abandonment Plan: A comprehensive plan to identify and prioritize roads to be properly abandoned (i.e., closed or decommissioned).

6. Schedule for the Road Management Plan: A timeline for completion of the road inventory and a method to prioritize the road improvement and abandonment work included as part of the Road Management Plan.

Inventorying and improving the Forest's roads to reduce sediment yield are needed due to the legacy of a road network partially relying on out-dated drainage systems and old segments located along watercourse channels. The current road network reflects a history of various transportation technologies and forest practices. Beginning in the 1870s, railroads were used to transport logs in some watersheds; many railroad grades were located along or adjacent to streambeds. Current Forest roads still use remnants of the old railroad grades in several places. Most of the roads on JDSF, however, were constructed from the 1950s to the 1970s. Roads

[9] Note that CAL FIRE has no jurisdiction over Highway 20 (Caltrans responsibility), Road 408 and 409 (Mendocino County), Simpson Lane, and other minor county roads within the Forest boundary. Some State Forest roads, notably Roads 300 and 800, are the subjects of formal road use agreements with other parties, the terms of which constrain the State's road management options in specific ways.

constructed during this period generally included inboard ditches and cross drains. Concentrated runoff from these types of roads has been shown to be a major source of fine sediment because the inboard ditches are often connected directly to channels that can carry the sediment to fish-bearing streams (Wemple et al. 1996).

In summary, the intent of this Road Management Plan is to provide a systematic program to ensure that the design, construction, use, maintenance, surfacing, and abandonment of the Forest's roads, landings, and road crossings will be conducted to avoid, minimize, or mitigate adverse impacts to aquatic habitats that support anadromous fish, amphibians, and other aquatic organisms. Additional benefits may be the long-term reduction in the costs of repairs as a result of problem avoidance and reduction of the overall road mileage, and improving functionality of the transportation system because roads will be in better condition and road failures will be less frequent.

1.0 The Road and Stream Crossing Inventory

The inventory of roads and stream crossings will provide the basis for maintaining and mitigating the road system. It will allow the managers to: a) identify problems that can be corrected through routine maintenance activities; b) assign maintenance and mitigation priorities to planning watersheds, road segments, and crossings; c) identify the most effective designs for roads, landings, and culvert problem sites; and d) identify roads to be properly abandoned. The inventory will include an intensive evaluation of all roads and crossings.

To the extent feasible, during the first three years of Plan implementation, all existing roads will be inventoried. JDSF estimates that there are approximately 350 miles of actively used roads on the Forest, with another 150 miles of potentially improperly abandoned roads. CAL FIRE or a qualified contractor will inventory all roads currently or formerly used for truck traffic. The road network inventory will include both a general road segment component and a separate stream crossing component.

1.1 The Road Inventory Methodology

The basic components for the road inventory procedure for JDSF are as follows (see Weaver (1997) for a detailed description of these components):

1. In the office, a series of aerial photographs taken over time will be analyzed to record the location of all historic and actively used roads for potential road improvement or abandonment work. This is a relatively low-cost, rapid assessment which will be completed for the entire road network in the first year of the program. Multiple sets of aerial photographs will be used for this task, allowing historic roads to be identified that may require proper abandonment.

2. In the field, approximately 33 percent of the Forest's roads will be inventoried each year of the plan's first three years (including the first year of the program when the aerial photo analysis is completed).

3. In the office, road segments will be mapped so that they are easily identifiable in the field according to relatively uniform characteristics related to sediment generation. The road segments will also be entered into the Forest's GIS database.

4. Road inventory work will be implemented by planning watershed (i.e., the entire planning watershed will be inventoried prior to beginning the next lower priority planning

watershed). The location of critical anadromous fish habitat and estimates of current sediment delivery to watercourse channels will be used to determine the order of priority for road inventory work among planning watersheds.

5. Using the prioritization schedule, road segments within the selected planning watershed(s) will be traversed in the field and information will be recorded, identifying significant road-related features. This part of the program will be a relatively rapid survey to determine where the problem sites are located. Field crews will be trained prior to undertaking this task and supervised by JDSF personnel familiar with hillslope erosion and mass wasting inventory procedures.

6. Following this reconnaissance level screening, Forest staff will develop site-specific mitigation measures for identified significant potential or existing problems.[10] The approximate volume of sediment that will be prevented from entering watercourses following implementation of the mitigation projects will be documented.

The basic unit for the JDSF road survey will be the "road segment". Field inventories will require road segments to be easily mapped. Therefore, road segments will be chosen so that at least one end is easily identified on a map and on the ground. For example, these types of locations include road junctions and stream crossings. If possible, a road segment should be a length of road that is relatively uniform with respect to its attributes that influence sediment production. These may include drainage characteristics, roadbed characteristics, cuts and fills, geomorphic characteristics of underlying terrain, intensity of use, slope, etc. Segments will vary in length depending on the above attributes. Segments may be subdivided following the completion of the field reconnaissance if appropriate.

To facilitate mapping road segments, each road segment will be given a unique identifier. The identifier will be written on the map at the beginning and end of the road segment (Rice 1993). As a convention, the marker adjacent to the easily identified end is underscored on the map. During the initial inventory, information is collected in the field beginning at this end of the road segment. Field crews will document the location of important road features along a road segment.

1.2 The Field Data Sheets for Roads

For each identified segment, a Field Survey Sheet will be filled out. The road survey and crossing survey (discussed below) will be carried out simultaneously, and the roads and crossings will be cross-referenced. For example, each culvert will be identified by its associated road segment(s), and each road segment data sheet will list the culverts in (or at the end of) the segment. Information from the field data sheets will be entered into a database, which will be linked to the GIS through the road segment numbering system.

The following explanations apply to the individual items in the data sheets for the road survey (note that the actual information collected in the field may change over time as the forms are field tested and improved):

Descriptive Information
"Road name", "planning watershed", and "segment identification number" can be determined from map information before going into the field. "Length of segment" should be determined in the field. Under usage category, high ("H") applies to roads used more

[10] Certified Engineering Geologists (CEGs) or other appropriately licensed engineers or earth scientists will be used where evaluation of unstable areas requires geologic and/or other specialized expertise.

than once per day during the summer; medium ("M") to roads used less than once per day, and light ("L") to roads used less than once per month. (Forest patrol staff will be consulted to help estimate usage.) "Seasonality" refers to intended period of use; if someone has driven on a seasonal road in wet weather the category does not change.

I. Road Drainage
The terms used in this section are illustrated in Figure 1. Note that culvert information is included here as well as in the culvert survey. "Water Breaks" include both waterbars and rolling dips, and the type should be indicated.

II. Road Ditchline Draining to Watercourses
The length of road inside ditch that contributes flow directly to a Class I, II, or III watercourse will be recorded in feet.

III. Road Bed
"Width of the Bed" refers to the shoulder-to-shoulder distance, from the top of the cut to the toe of the fill (i.e., not just the running surface). The "dominant and maximum road grades" should be estimated in percent. Road segments are intended to have relatively uniform grade. If rills are numerous throughout the segment, their presence will be documented. (Recent grading may eliminate evidence of rilling, in which case this potential sediment source will be recorded as unassessable).

IV. Cutslope
"Parent material" refers to the native rock; the field team should be able to identify sandstone, shale, chert, etc.[11] "Strength" and "weathering" should be designated qualitatively as high, medium or low. Cutslope parent material should be identified as fractured, sheared, or tectonically shattered (CEG to define terms for reconnaissance team). "Cover Density" refers to the percent plant cover. "Estimated gradient" and "estimated height" should be given as ranges and averages for the segment.

V. Fillslope
Fillslope conditions should also be estimated ranges and averages for the segment.[12]

VI. Mass Wasting Features
Mass wasting features such as fillslope and cutslope failures, and indicators of potential larger slope failures such as cracks associated with perched fill and organic debris in fill, will be noted as part of the road inventory.

VII. Sediment Delivery Hazard Areas
Portions of roads or landings adjacent to Class I and II watercourses that have steep slopes and/or little filter strip potential will be identified. These deserve special treatment during road closure and maintenance activities.

VIII. Access Control
The presence, operating condition, and maintenance needs of gates or other access-control facilities will be noted.

[11] CGS watershed geologic maps should be consulted to assist in identifying parent material.
[12] Fillslopes associated with older roads will be covered with trees and their extent will be difficult to determine precisely. The dimensions recorded will be rough estimates.

1.3 The Crossing Survey

Inadequate and decaying culverts can be major causes of sediment problems. Poorly designed culverts can be blocked by woody debris or sediment, which can cause the road to be overtopped and the fill to be eroded (Furniss et al. 1998, Flanagan et al. 1998). Culverts, including cross drains, draining onto unprotected fill, or "shotgun" culverts with outlets elevated above grade, can initiate gullies. To function properly, culverts must be periodically inspected and maintained. The Crossing Survey will develop a database with information on all crossings within JDSF, including culverts, bridges, fords, Humboldt crossings, and ditch relief cross drains. Recommendations to remove, enlarge, or repair crossings will be recorded.

Drainage structures also include waterbars and rolling dips (collectively called "water breaks"). These structures are not included in the crossing survey since their locations may vary from year to year, depending upon road grading and maintenance. Instead, their location in a road segment will be noted in the road survey.

1.4 The Crossing Survey Form

Each crossing will be assigned a unique number and its location will be noted on a map in the field. Information from the field sheets will be entered into a database, and the culvert locations and ID numbers entered into the GIS. The database will allow the managers to sort by watershed, stream class, channel distance to Class I streams, severity of problems, etc. In addition, the field inspectors will "red-flag" data sheets for culverts that require immediate attention, so that treatment of problems will not have to await the completion of the survey.

Terms used in the Survey Form refer to the following:

Crossing Type

Typical crossing types are abbreviated as follows:

CMPR	corrugated metal pipe (round)—specify if aluminum or galvanized steel and diameter in inches
CMPO	corrugated metal pipe (open bottom)—specify if aluminum or galvanized steel
CMPA	corrugated metal pipe (arch)
RCP	reinforced concrete pipe
RC Box	reinforced concrete box culvert
CPP	corrugated plastic pipe
Open	fill totally removed
BRD	bridge—specify if rail car, timber, log stringer, etc., and length
FORD	ford—specify base, concrete, gravel, sand, cobble, silt, etc.

If more than one culvert of the same type is present, the number should be indicated.

Upstream Channel Dimensions

Active channel width above the crossing entrance (upstream of any backwater effects).[13]

Entrance Type

[13] Research in northern California suggests that culverts with diameters at least 0.7 times the active channel width will pass 95 percent of the woody debris greater than 30 cm long, as well as the 100-year discharge (Flanagan 1996). Generally some training is necessary to consistently recognize the bankfull and active channel widths.

Maximum Head

Maximum head refers to the height (ft) from the bottom of the culvert inlet to the overflow elevation at the road crest.

Rustline Depth

The rustline in a galvanized steel culvert indicates the approximate depth of winter baseflow (note that this does not work for plastic or aluminum culverts). [14]

Diversion Potential

Diversion of water from plugged culverts can be a major source of damage. The path water would follow from the road to an active stream channel if the culvert were blocked should be noted.

Outlet

The dissipation of energy of the water as it leaves the culvert is important in controlling erosion.

Percent Dented/Crushed and Percent Filled

Estimate the percentage of the culvert cross-sectional area lost due to mechanical damage or sediment filling.

Alignment and Grade

Inadequate culvert alignment or gradient will be noted as part of the field inventory (i.e., where alignment varies from that of the natural channel).

Fish Passage

Obvious problems for fish passage will be noted on the field forms. Examples of problem situations include: 1) too steep of gradient, creating excessive velocity, 2) too much drop from culvert outlet to pool below, creating a jump too high, 3) no resting pool below culvert, and 4) inadequate water height over pipe bottom (Evans and Johnston 1980).

2.0 Standards and Guidelines for Design and Construction of Forest Roads, Landings, and Crossings

Road, landing, and crossing design will follow or exceed the current state of the practice, such as is described in The Handbook for Forest and Ranch Roads by Weaver and Hagans (1994)[15], or as suggested by JDSF RPFs and CEGs where a timber harvesting plan (THP) has been submitted. Some of the fundamental considerations in planning, design, construction, and reconstruction from the Weaver and Hagans Handbook are described below. Over time, improvements in road design, construction materials, surfacing materials, construction, and maintenance techniques are likely to continue. JDSF will take advantage of these innovations, as appropriate, to assure that impacts to aquatic habitats are minimized. The “demonstration”

[14] The flow indicated by the rustline is equaled or exceeded about 10 percent of the time on an annual basis. If the rustline is higher than about one-third of the culvert diameter, the culvert may be undersized (Flanagan and Furniss 1996); if it is less than 8 inches above the bottom, the culvert may not be passable for fish. The rustline should be measured at the culvert outlet.

[15] There are some minor exceptions. Road grades associated with new construction are at times steeper than suggested in order to overcome difficult terrain situations. Also, backhoes are not used to construct inside ditches and bridges are not used as extensively as suggested in the Handbook.

mandate of the Forest may lead to cases where an experimental design for roads, landings, and crossings do not match the specifications in this document or the current state of the practice.

2.1 Planning

Careful planning is essential for the development of an efficient and environmentally sound road system. The average road density in the planning watersheds draining JDSF is 4.9 miles per square mile. Road density by planning watershed ranges from 2.6 to 6.7 miles per square mile for roads that currently can be driven. Roads with the highest potential to adversely affect watercourses will be properly abandoned where possible, if they are not needed as part of the seasonal or year-round road network. New roads will generally be located on or near ridge lines. The goal for planning the final transportation network will be to establish roads in low risk locations that will accommodate appropriate yarding and silvicultural systems, and serve other programs such as recreation and protection. However, a specific road density target will not be used.

The planning watersheds draining JDSF with the greatest potential for road-related impacts include Lower Big River, Chamberlain Creek, Caspar Creek, Kass Creek, and Lower North Fork Big River. Together with the road and crossing inventory, this information will help guide decisions on where to focus efforts to reduce sediment generation from roads (e.g., proper road abandonment or improvement of existing roads). High-risk watersheds will have the highest priority for proper road abandonment work, as well as for improvement projects on road segments that will remain in the permanent road transportation network.

The road construction, maintenance, and rehabilitation standards specified in this Management Plan will help prevent significant adverse impacts to aquatic habitats. Because of the mitigation measures included in this Plan, road density will not be constrained. Measures include, but are not limited to: 1) a comprehensive wet-weather use restriction plan that JDSF staff believe has been effective over several years; 2) a commitment to monitor all active roads on an annual basis, providing a feedback mechanism for road maintenance and improvements; and 3) development of a detailed GIS database to record data about road features collected during the monitoring efforts.

Planning for the JDSF road network is based on the following principles:

- The protection of aquatic resources is a major objective of the Road Management Plan.
- The total mileage of roads will be minimized through basin-wide planning.
- Existing roads will be used wherever appropriate, in preference to building new roads. Substandard roads with drainage and sediment production problems will be reconstructed, re-graded, re-aligned, resurfaced, or otherwise treated to prevent sediment delivery to watercourses, or they will be abandoned properly.
- New roads will be designed to the minimum width necessary to safely accommodate required traffic, with turnouts spaced appropriately for the road class. All roads will be classified according to expected use (high, medium or light), and maintained accordingly.
- New roads will generally be located to avoid unstable terrain, and to minimize ground disturbance and watercourse crossings. Roads in unstable areas, including inner gorge areas, will only be built if an assessment by a CEG confirms that the proposed construction is unlikely to result in mass wasting that would contribute sediment to a watercourse.
- Maps showing mass wasting hazards, including shallow landslide instability, deep seated instability, and inner gorge areas, will be used as guides to avoid unstable ground and to indicate the need for input from an engineering geologist in the design and location of roads.

2.2 Design of Roads, Landings, and Crossings

Proper road, landing, and crossing design is the key to minimizing both the costs of construction and maintenance and environmental damage. The following are the key design principles for roads, landings and watercourse crossings that will be followed by JDSF:

- On slopes over 50 percent, road design for hillslope stability will depend on site specific conditions.

- New and reconstructed roads and landings will generally be outsloped for surface drainage; inboard ditches will be avoided except where unavoidable. Where such ditches exist and are determined to be significant sediment sources, they will be eliminated over time if possible.

- Compared to waterbars, rolling dips are more resistant to traffic induced failures and will be used where possible for surface drainage. Other road drainage structures will be used in some situations, such as existing crowned main-line roads with acceptable numbers of cross drains. On temporary roads that are "put to bed" and will not be driven on for several decades, except in very rare cases, all culverts will be removed when they are abandoned and all drainage facilities will be substantial enough to not require maintenance.

- Roads intended for year-round log hauling use will be surfaced to reduce erosion potential. Surfacing agents include, but are not limited to: rock, chip seal, and asphalt paving.

- Watercourse crossings will be designed to accommodate a 100-year runoff event, as well as for wood and sediment passage. Appropriate sizing techniques include USGS regional regression equations, rational method, flow frequency analysis, and flow transference (i.e., scaling discharge by watershed area from gaging station records, using a regional regression coefficient for watershed area—see Waananen and Crippen 1977). The preferred method is to use more than one office-based technique to determine discharge, and then check this result against field observations (Cafferata et al. 2000).

- Watercourse crossings will be designed to minimize diversion potential. Fill volume will be minimized over crossings, while providing sufficient depth of fill to protect a culvert from crushing under truck traffic.

- Watercourse crossings using culverts with diameters of 60 inches or more will have armored entrances and outflows if they are necessary to avoid substantial loss of fill material.

- Crossings of Class I streams will be designed to provide for fish passage (all life stages). Where possible, bridges or pipe arches will be used to facilitate fish passage.[16] A schedule will be developed to improve existing crossings on Class I watercourses that do not currently provide adequate passage for all life stages of fish.

- Rock-lined ford crossings will be used for Class II and III watercourse crossings where appropriate, since their failure rate is much lower than for culverts (Spittler 1992). Approaches to fords will be rocked to prevent sediment delivery to watercourse channels. It is only possible to use rock-reinforced fords in locations where channel gradients and slopes are moderate to low. This type of structure is most applicable to channels that flow only in direct response to rainfall. For each proposed rock-lined dry ford, the THP should identify the construction design needed to minimize the potential for contributing sediment to watercourse

[16] It is necessary to consider the hydraulics of fish crossings in considerably more detail than has been in the past.

channels. Information appropriate for proper design includes: 1) the channel geometry above the immediate zone of influence of the crossing site, 2) the size of the boulders that are stable within steep pitches of the channel, and 3) the thickness of fill needed for the crossing.

- Landings will be designed for minimum safe working size, and care will be exercised in selecting stable sites for construction. This includes avoiding: a) inner gorge slopes and slopes over 50 percent; b) steep headwall swales; and c) narrow ridge-tops between steep swales.

2.3 Construction and Reconstruction

Without proper planning and execution, construction activities may cause serious water quality and sediment problems. The following principles apply to road construction activities on JDSF lands:

- Construction activities that involve significant soil disturbance (such as excavation for roads and landings) will be conducted when soils are not saturated. Culverts and bridges will be installed during the dry period of the year. Material disturbed during construction will be stabilized to prevent movement into watercourses.

- Crossings will be installed in a manner that will avoid input of significant amounts of sediment to the stream.

- Disturbance to the bed and banks of streams will be avoided or minimized.

- New roads in Watercourse and Lake Protection Zones will be avoided, except for approved watercourse crossings and crossing approaches.

- The organic layer of soil, or other organic material such as tree stumps and branches, will not be incorporated within or beneath the road fill.

- The JDSF archaeological database will be checked to determine the location of known archaeological sites before construction and maintenance work is started. These sites will be protected and left undamaged. The specific procedures to protect archaeological sites are addressed in the Forest Management Plan.

3. Road Use Restrictions

Wet weather operations on Jackson Demonstration State Forest will be minimized. In addition, the following guidelines will dictate how dust abatement and water drafting for dust abatement are conducted on the Forest. The following techniques will be used:

- No log hauling will occur if greater than 0.25 inch of precipitation has fallen at the CAL FIRE office in Fort Bragg during the preceding 24 hour period. This applies to the entire year. This practice has been used during the winter period on JDSF for approximately 10 years and has proven to be effective in reducing sediment input from active haul roads to nearby watercourses.

- Hauling can resume only after rain has ceased for 24 hours and no road-related turbid water is observed in inside ditches along the roads where hauling may occur.

- Log hauling will not occur when “pumping” of fines from the road surface produces sediment that enters inside ditches and causes turbid water to flow in ditchlines with direct access to watercourses.

- Only surfaced roads will be considered for wet weather log truck traffic. If road rock begins to significantly break down, wet weather use of that road will cease until the road is adequately repaired.

- Roads located in WLPZs will be seasonally closed, or they will be surfaced if they are subject to moderate to heavy log truck traffic during wet weather.

- Blading roads to reduce surface moisture conditions for improving drivability for log trucks is discouraged and will be evaluated on a site specific basis. Blading of roads to allow log hauling will be allowed only for very short distances (for example, on the order of 500 feet per mile of haul road). Blading to control surface moisture will not be allowed on WLPZ roads. Material developed during the blading process on other types of roads will be deposited in safe locations with no access to watercourses and situated so it can be incorporated into the road’s running surface as soon as possible.

- Gates on seasonal roads on the Forest will be locked when road surface conditions merit closure. Roads are gated to prevent environmental and safety hazards.

- Roads actively used for hauling during the dry period of the year will be treated to reduce the generation of road dust. Generally this will mean watering the roads as needed; chemical treatments might also be employed in certain situations.

- Water drafting for dust abatement will occur in off-channel areas when practicable.

- Water drafting from Class I and II watercourses for dust abatement on Forest roads, or for other uses,will require that the following measures are followed: 1) all water intakes are properly screened to prevent harming small fish; 2) points of access for drafting are described and mapped in the THP; and 3) a general description of the drafting requirements is provided in the THP (i.e., time of year, estimated total volume needed, estimated total uptake rate and filling time, and associated water drafting activities from other THPs). On watercourses where the RPF has estimated that bypass flows are less than 2 cfs, or pool volume at the drafting site would be reduced by 10 percent, or diversion rate exceeds 350 gpm, or diversion rate exceeds 10 percent of the above surface flow, no drafting will occur unless the RPF prepares a water drafting plan that is reviewed by DFG and approved by the CAL FIRE Director (see CCR 916.9 (s) for specific language to be followed and CDF 1997 for additional information).

4. Road Inspection and Maintenance Program

Proper maintenance is the key to reducing the long-term contribution of sediment from roads to stream systems. The maintenance program at JDSF will be based on the road and culvert survey (described above) and the inspection program (described below), which will provide the information base for establishing maintenance priorities.

4.1 Principles of the Inspection Program

- Abandoned roads, including temporary roads in a THP that are abandoned after harvest operations, will be inspected at least twice following the completion of the decommissioning activities. The first inspection will follow the first winter after decommissioning. The second

inspection will occur after five over-wintering periods (this should provide approximately a 75 percent chance of having at least one strong stressing storm event capable of producing mass wasting features, based on Durgin et al. 1989). If significant problems are found, equipment will be used to rehabilitate the site properly, if feasible and practical to do so. Following this work, another inspection will be made after the first over-wintering period following equipment use to determine if the improvements are properly functioning.

- In addition to the detailed road and crossing inventory (see Section 1), active roads and crossings (i.e., roads that have not been properly abandoned) will be inspected once annually to ensure that drainage facilities and structures are properly functioning. Two types of inspections will be used: 1) formal inspections, and 2) rapid ad hoc inspections. During formal inspections, all crossings and roads will be carefully observed every two years and problem sites will be recorded on road/crossing inventory forms. To cover the period between detailed inspections, a rapid ad hoc inspection will be made at least once by JDSF Foresters or other staff. Only obvious problems will be determined with the rapid ad hoc inspections. Both types of inspections will cover permanent and seasonal roads. Information collected on road problems during either the detailed formal review or the rapid observation review will be entered into the road database that will be developed for the Forest, and maintenance personnel will be advised immediately of important hazards. Identified problems will be corrected before the onset of wet weather whenever possible and appropriate, depending on availability of personnel and equipment. Failed culverts will be evaluated to determine the cause of failure.

- Problem facilities (including currently known sites and those identified in road/culvert survey) will be monitored by JDSF foresters more frequently during the winter period. The foresters will report problem sites to a maintenance crew, who will make repairs as needed and as staff and material are available. This "storm patrol inspection" will be triggered by the first winter storm event that produces a stressing storm of 2.0 feet stage at the South Fork Caspar Creek weir (this generally occurs 4-6 times each winter).[17] The first winter storm event of this intensity generally occurs after the fall period when soils are re-charged with approximately 10 inches of precipitation. Subsequent large storm events may also trigger storm patrol inspections. Persistent problem sites will be prioritized for redesign and upgrading.

4.2 Principles of the Maintenance Program

- Maintenance will be scheduled on an "as needed" basis (including sites located from storm patrol inspections and the rapid ad hoc road inspection process), as well as determined by the formal road inspection that occurs on a two-year cycle.

- During normal road maintenance that does not relate to identified problem sites, excessive grading of running surfaces, inside ditches, and cutslopes will be avoided. Additionally, when possible, vegetation will be left on or above cutslopes to stabilize the slope. Vegetation may be removed on or above cutslopes when: 1) it is necessary to improve visibility and promote safe travel on the road, or 2) hazardous trees may fall on the roadway.

- Hazard zones (e.g., where roads are adjacent to watercourses and there is a high sediment delivery potential) identified during the road inventory or the inspections will be highlighted and maintenance personnel will be advised to use alternative maintenance procedures that might be necessary to prevent further disturbance (e.g., carrying graded material farther down the road prism rather than side-casting into streamside areas).

[17] It is necessary to consider the hydraulics of fish crossings in considerably more detail than has been in the past.

5. Road Abandonment Plan

Temporary roads can be defined as roads that are used for one or two years, and then "put to bed" with proper road closure. They may be reopened and reused in the next entry. Properly abandoned roads are defined as roads that have been permanently closed in a manner that prevents erosion, maintains hillslope stability, and re-establishes natural drainage patterns. In the California Forest Practice Rules, abandonment means "leaving a logging road reasonably impassable to standard production four wheel drive highway vehicles, and leaving a logging road and landings in a condition which provides for long-term functioning of erosion controls with little or no continuing maintenance." Similarly, as defined in Weaver and Hagans (1994), proper or proactive road abandonment (i.e., closure or road decommissioning) is a method of closing a road so that regular maintenance is no longer needed and future erosion is largely prevented.

Some roads on JDSF are improperly abandoned roads and may continue to act as sediment sources. These types of roads were simply "walked away from" without proper maintenance or closure. Typically, these roads were blocked and left to grow over with vegetation. Some of these may still present sediment risks to watercourses (e.g., crossings in place, perched fills). A proactive abandonment program includes treating these types of improperly abandoned roads to reduce potential or currently occurring sources of sediment. Proactive road abandonment usually involves removing watercourse crossings and associated fills, removing unstable road and landing fills, and providing for erosion resistant drainage. The focus of proactive road abandonment is to aggressively treat road segments that have the greatest potential to erode and deliver sediment to stream channels.

All roads on JDSF that are no longer required for management and recreation purposes will be evaluated for proactive abandonment, and closure treatments that do not result in increased overall sediment production over a long-term period (i.e., decades), will be implemented. Sometimes, more damage can result from soil disturbance and destruction of vegetative cover already in place, when compared to the benefits of removing old crossings, etc. Therefore, varying levels of proactive road abandonment will be used on the Forest, ranging from full closure to installing water breaks by hand. It is also possible that some historically abandoned roads will not require any further treatment.

Prioritization of Forest roads for abandonment projects will come from the road inventory, which will be completed over the first three years of the Road Management Plan. The actual number of miles of existing road that will be proactively abandoned will depend on the results of the inventory, but it is estimated to be between 50 and 100 miles. Some of the criteria that will be used to identify roads to proactively abandon include: 1) unstable inner gorge areas, 2) roads in close proximity to a watercourse, 3) roads not needed for management purposes, and 4) roads with excessive amounts of perched fill. For further discussion on this topic, see Weaver and Hagans (1990, 1994).

Principles of the Proactive Road Abandonment Program

- Proactive road abandonment means actively treating a road to reduce erosion potential, so it will not contribute significant amounts of sediment to the stream system, even in severe storms, and will not need long-term maintenance. Future vehicular use of these roads is not intended after closure.

- Proactive abandonment will include removing culverts and re-establishing channels to their approximate original grade and channel configuration. The road prism at crossings will be pulled back to a stable slope configuration. Where necessary, the re-graded channel will be armored to prevent downcutting or erosion of the old fill material.

- Potentially unstable fills will be pulled back and graded to a stable configuration, mulched, and seeded.

- Where possible, drainage facilities on temporary roads will be installed with features that will be self-maintaining, such as rolling dips, cross ditches with packed inside ditchlines, or outsloping. Waterbars will only be used where road grade or local topography prevents the installation of rolling dips. Temporary roads are intended to be re-opened for future use. Landings will be outsloped and drained with appropriate drainage facilities.

- Following completion of the road inventory (see section 1), a schedule will be developed for closure of temporary and improperly abandoned roads. This will not preclude abandonment work from being conducted prior to the completion of the inventory. For example, some roads in the Parlin Creek, Hare Creek, and Caspar Creek planning watersheds have already been proactively abandoned.

- Seasonal roads will be blocked during the wet season by locked gates. Access to temporary and proactively abandoned roads will be effectively blocked with physical obstacles.

Schedule for Road Network Improvement Activities

The goal is to complete the entire road and crossing inventory within three years, including data entry and report preparation. This will require surveying approximately 120 miles of road per year. A JDSF forester will directly oversee any contractors hired for this work.

The location of critical habitat for steelhead and coho salmon will be used to prioritize the sequence of the road inventory work. Secondary factors will include existing rates of sediment delivery to sensitive watercourse channels, based on gradient and degree of confinement, and likely hazards such as high density of riparian roads or stream crossings.

The focus of JDSF's road management program will be to minimize the volume of sediment that enters watercourses, rather than to maximize the number of miles of road treated per year. The amount of sediment delivery prevented, not the mileage of treated roads, is the appropriate scale to measure the accomplishments of this Road Management Plan.

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Appendix V. Recreation Data

A. Existing Recreation Facilities

1. Campgrounds

West-end: Roundhouse, South Fork 1, 2, and 3, Red Tail, Southbend, Wagon, Tilley, Trillium, Tin Can, Teacher's, Poison Oak, Camp 4, Camp 6, Camp 8, Bob Woods, and Volcano.

The Camp Host site at Camp One has two trailer pads, a 350-gallon septic tank potable water tank and a phone line.

East-end: Dunlap, Horse Camp, Indian Springs, and Big River.

The Camp Host site at Dunlap has a potable water tank and a phone line.

Group campsite: Tilley

All developed sites have an outhouse, picnic table, trash can, and barbecue or fire ring. No potable water is available. Some of the campgrounds have outhouses and picnic tables that are accessible to the disabled.

2. Day-use only: Camp One, Camp 20, Dogwood

Camp One

This day-use area is accessed on the west-end of the Forest via Highway 20 at post-mile 5.9 onto Forest Road 350 and is located along the South Fork Noyo River. An interpretive display explains the Department of Fish & Game's Egg Collection Station at this location. The day-use area is suitable for large group gatherings, as there is a large parking area and numerous picnic tables with one that is covered and approximately 15' in length.

Camp 20

This area is located adjacent to Highway 20 at post-mile 17 on the east-end of the Forest along the North Fork of Big River. A steam donkey and interpretive displays are located here as well as a ball field, horseshoe pits, public restrooms and picnic tables. The area is approximately 3 acres with a large parking area.

Dogwood

Dogwood is located along Highway 20 at post-mile 18.6 along the North Fork of Big River. There is one picnic table overlooking the river at this location.

3. Hiking Trails

Camp One Loop Trail

This trail has a one-mile and a three-mile loop that traverse through an area that was harvested by helicopter in the mid-1990s with an initial group selection entry. The trailhead is located across the road from the Camp One day-use area. The trail can also be accessed off Forest Road 90 which intersects Highway 20 at post-mile 8.0. The trail traverses Road 90 for approximately ¼ of its total length.

Trestle Trail

This trail is approximately 4 miles in length and follows one of the old logging railroads along the North Fork of the South Fork Noyo River. Numerous trestles can be found along the trail as well as a small waterfall. The trail can be accessed off of Forest Road 361 (approximately 500' from Camp 8) or from Road 1070 (1.9 miles from Road 330). A long loop can be made by continuing up road 1070 from the upper end of the trail, onto Road 330 and down the Woods Trail back to Camp 8.

Waterfall Grove Trail

This is probably JDSF's most popular trail. The trail descends from Forest Road 200 approximately 0.2 miles into an old-growth grove adjacent to the west fork of Chamberlain Creek. The Forest's most scenic waterfall is located here. Access is off of Forest Road 200, 4.5 miles from Highway 20. Another access point can be found further along Road 200 at the intersection of Roads 200 and 1000, where the little-used Camellia Trail follows a longer but gentler grade to reach the grove.

Little Lake-Sherwood Road Trail

This trail connects Little Lake Road in Mendocino (County Road 408) to Sherwood Road east of Fort Bragg by following a series of logging roads which traverse through JDSF. It is accessible for hiking, equestrians, and mountain biking for most of its length and provides users a look at the many aspects of a working forest. The trail is difficult to follow with trail markers varying from road numbers and directional arrows to signs on steel posts. This trail was established by the County of Mendocino and is not maintained by CAL FIRE.

Woods Trail

The Woods trail crosses an open meadow just south of Camp 8 on its way to Road 330 and Three Chop Ridge. The trailhead is marked with a wooden sign on Forest Road 361. The area had its first selection harvest entry in 1999 and 2000, and the trail has been partially re-routed.

B. Policies on Overnight Use:

1. Campfire Permits

The main purpose of requiring campfire permits is to ensure campfires are in compliance with firesafe regulations. In addition, recreation use information is collected from the permit (i.e. where visitor is from and length and location of stay).

Permits are issued by camp hosts and are required of all overnight campers regardless of intent to make a campfire. The Camp Host should write a permit for a large group utilizing a day-use area without a reservation to keep track of visitor-use.

2. Reservation Policy

Pursuant to Title 14 CCR 1404, no individual campsites can be reserved. In the interest of protecting the resource, a group site may be reserved. The Forest Manager or designee must receive the reservation request two weeks in advance. The Forest staff must receive confirmation during the week of the event. Large groups utilizing day-use areas may reserve the site, but may be required to provide proof of payment for pumping the vault toilet at the reserved location.

An organized group event must obtain a special use permit from the Forest Manager which includes (at a minimum): (1) proof of insurance for the sponsoring group, naming the event and dates of operation, and naming the State of California as additionally insured for an amount to be specified for damages and liability; and (2) other conditions such as hours of the event, cleanup criteria, extra outhouses, maps, boundaries of operation, route marking, and an emergency evacuation plan.

3. Occupancy Limits

A general guideline is no more than 2 families and 2 vehicles per small campsite. Time limits are governed by Title 14 CCR 1403 which states campers are limited to 14 consecutive days and no more than 30 days per calendar year on any one State Forest. JDSF policy enforces the requirement for a minimum two-day absence between 14-day periods.

C. Carrying Capacity

1. Campgrounds

There are 21 campgrounds with a total of 65 individual campsites. Of these, 17 are open year-round (365 days) and the remaining 48 are open, on average, April 15 through October 15 (184 days). Capacity at each site is assumed to be eight people (two four-person families). The maximum physical carrying capacity, with every site occupied by eight people every night that it is open, is calculated as:

8 x 17 x 365 =	49,640
8 x 48 x 184 =	70,656
Total physical carrying capacity, campgrounds =	120,296 camper-days

2. Picnic areas

The three day-use picnic areas have picnic table seating for about 124 people. All picnic areas are open year-round:

Total physical carrying capacity, picnic areas = 124 x 365 = 45,260 picnic-days

3. Hiking trails

There are about 16 miles of recreational and interpretive hiking trails managed, maintained, and sanctioned by the State Forest. (There are other trails of unknown total length that have been developed by users without participation by the Forest. They are not included in the determination of carrying capacity.) Since hikers move along trails and do not occupy single points as with campgrounds and picnic areas, capacity is a little more difficult to determine. It

is not reasonable to calculate full occupancy by counting the number of people that could stand shoulder-to-shoulder along the 16 miles of trail. Instead, this assessment assumes that a trail is fully occupied when hiking parties averaging four people each are spaced along the trail at 1/4-mile intervals. Since trails can be occupied more than once each day, maximum use is figured at double occupancy:

Total physical carrying capacity, trails = 4 x 16/.25 x 2 x 365 = 186,880 hiker-days

4. Sustainable carrying capacities

The California Region of the US Forest Service uses 40% of maximum physical capacity to determine the recreation use level at which demand begins to exceed supply. This figure of 40% is used as a reference point in establishing the current sustainable carrying capacities for the three recreation categories.

◊ Campgrounds and picnic areas: Campground use at 40% of the calculated maximum physical carrying capacity would be over 48,000 camper-days, or three times the current average annual use. Counts of picnic area users are not available, but the relative numbers are probably similar. The camping and picnic facilities themselves could likely sustain a doubling of their current use, possibly more, without significant physical or environmental deterioration and without severely diminishing the quality of the recreation experience of the users. However, the personnel and fiscal resources of the State Forest would not be able to adequately manage the increased numbers of visitors, maintain the safety and cleanliness of the facilities, nor protect the Forest from abuse and the users from each other. For instance, the costs of additional garbage disposal and outhouse servicing could not be met by the current operating budget for the recreation program. However, some lesser increase over current use levels could be accommodated. It is estimated that the sustainable carrying capacities for campgrounds and picnic areas are 20% of the maximum physical capacities (which would be a 50% increase over the current level of use):

Sustainable carrying capacity, campgrounds = 24,059 camper-days

Sustainable carrying capacity, picnic areas = 9,052 picnic-days

◊ Trails: The most limiting factor affecting sustainable capacity of most hiking trails is parking space at trail heads. Because of the driving distance to the trail heads for the two longest trails, this calculation assumes that these two parking areas will be occupied only once each day. Using the more limiting of either physical trail capacity or parking capacity for each trail, the sustainable carrying capacity for hiking trails is determined to be:

Sustainable carrying capacity, trails = 81,030 hiker-days

(This figure of 81,030 is 43% of the physical maximum, quite close to the 40% used by the US Forest Service.)

5. Carrying capacities with additional facility development

This management plan proposes to focus any new formal recreational development within a recreation corridor to be centered around the existing core areas of Camp One and Camp 20. For the purpose only of estimating potential future carrying capacities, a feasible, interim recreation corridor is described as:

a) along the flats next to the South Fork Noyo River, from Road 332 downstream to the Forest boundary;
b) along the flats next to the North Fork South Fork Noyo River, from its mouth upstream to the end of Road 361; and
c) along the flats next to the North Fork Big River from near James Creek downstream to the Forest boundary.

◊ Campgrounds: In keeping with the rustic, informal character of State Forest campgrounds it is estimated that campground capacity could be increased by 25% within this interim recreation corridor without compromising the remote, isolated nature of the current camping experience:

Potential expanded carrying capacity, campgrounds = 30,074 camper-days

◊ Picnic areas: Similar to campgrounds, additional picnic facilities could be developed to accommodate a 25% increase in use:

Potential expanded carrying capacity, picnic areas = 11,315 picnic-days

◊ Trails: Hiking trail expansion would likely involve trail heads generally located within the recreation corridor, with trail routes extending outwards into the rest of the Forest. One reason to build additional trails is to have alternatives to current popular trails when they are temporarily closed because of timber harvesting or other management activities. Another way that the trail system might be expanded is to incorporate some of the unofficial community trails that have been developed and used by neighbors along the western boundary of the Forest. Carrying capacity could also be increased by expanding parking areas at some trail heads. A doubling of the current value would be a reasonable estimate of potential future carrying capacity:

Potential expanded carrying capacity, trails = 162,060 hiker-days

Specific documents in JDSF library that can be referenced for more information:

JDSF Management Plan, 1983, CDF, Fort Bragg.

JDSF Recreation Use Needs Study, August 1988, Community Development by Design, Berkeley, DRAFT.

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Recreation Management Plan for the JDSF, March 1997, Albin-Smith, Fort Bragg, DRAFT.

Current Recreation Map (2006)

JDSF Annual Reports

Appendix VI. Public Use Activities Other Than Recreation

Firewood

Camping: Only the campfire permit is required for collecting firewood for use while camping on the State Forest. Dead and down wood may be gathered for use while camping in any approved location .

Personal: Dead and down wood is made available to the public for personal- use firewood in designated locations. Designated firewood-cutting areas normally become available subsequent to a completed Work Completion Report following a timber sale. Personal use permits for 2-4 cords for a given calendar year may be purchased at JDSF headquarters. Specific rules and fire-safe regulations are included with the permit as well as a map identifying which areas are open for noncommercial firewood cutting.

Commercial
Specific areas are designated only for commercial operators (i.e. must have a Timber Operator's License). Areas selected for commercial operations may be associated with a completed timber sale to facilitate fire hazard abatement, or may be located in an area where hardwood (tanoak or eucalyptus) removal is desired to enhance conifer growth. Only tanoak and eucalyptus can be felled in cases where live hardwood trees have been identified for removal.

A maximum of 10 cords may be purchased with each permit. The permit is valid for a 3-month period. No more than three commercial firewood operators are permitted access to a given designated area at one time to enable effective administration of the commercial operations. Thus, permits are available for commercial woodcutters on a rotating basis.

Mushrooms

Personal
Any person harvesting mushrooms on the State Forest must obtain a free mushroom gathering permit. The permit is valid for one calendar year and allows the permittee to harvest a maximum of one gallon per visit. Special permission must be obtained from the State Forest manager if more than one gallon is desired.

Commercial
Commercial permits may be purchased from the State Forest. Regulations, including limitations on the method of harvest, are incorporated in the permit.

Split Products/Poles/Salvage

The Forest Manager or designee responds to all individual requests for "other wood products". Prices are set using the Board of Equalization rates or other sources. At a minimum, the permit must include the following information: price agreed upon, location and date of harvest, estimated quantity and the Forest Manager's and permittee's signature.

Miscellaneous

Written permission from the State Forest Manager is required to gather any product from the State Forest.

Appendix VII. JDSF Publications Bibliography

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Lewis, T. E., D. R. McCanne, D. W. Lamphear, J. P. Krieter, and W. D. Conroy. 2000. Regional assessment of stream temperatures across Northern California and their relationship to various landscape-level and site-specific attributes. Forest Science Project. Humboldt State University Foundation, Arcata, CA. 420 pp.

Sindel, Jean E. 1960. Jackson State Forest pilot study in stream clearance 1952-1959. Report. State of California Department of Natural Resources, Division of Forestry.

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Downstream migrant trap data and reports for Hare Creek. 1996-present. contact: Scott Harris, DFG

Electro-fishing data and reports for Caspar Creek. contact: Scott Harris, DFG

Electro-fishing data and reports for Hare Creek. contact: Scott Harris, DFG

Carcass survey data and reports for Caspar Creek, Hare Creek, and the South Fork of Noyo. contact: Scott Harris, DFG

Valentine, Brad. data relating to the stream habitat and juvenile salmonid population in the South Fork of Caspar Creek. contact: Brad Valentine, DFG.

Caspar Creek Publications

The Redwood Sciences Lab, USFS, has a WEB SITE that has most of the Caspar Creek experimental watershed publications available for downloading. It is:

http://www.rsl.psw.fed.us/projects/water/caspubs.html

In addition, JDSF has hard copies of a few of the publications not available on-line as of 11/17/00. They are:

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2/61	A Test of Variable Plot Cruising in Young-Growth Redwood	Robert J.Malain
8/63	A Monterey Pine Planting - Frazier Planation	J. E. Sindel
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4/66	Redwood Sprouts on Jackson State Forest	Brian R. Barrette
2/68	Shade but not Top Pruning Improves Survival of Planted 1-0 Monterey Pine	R. S. Adams, Samuel T. Gossard, J. R. Ritchey
9/70	Board Foot by the Pound	David M. Burns
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3/72	Use of Annual Ryegrass and Urea for Post Logging Erosion Control on Jackson State Forest	R. Jackman, N.Stoneman
12/74	Jackson State Forest - Caspar Orchard Eucalyptus Grove History and Volume Tables	Brian R. Barrette Ray Jackman
4/75	Black Stain Root Disease in Douglas-fir on Jackson State Forest	Ray Jackman Richard Hunt
4/76	"Mini-Yarder" Clears Streams on Jackson State Forest	Forest B. Tilley
11/76	Timber Sale Appraisals for Jackson State Forest	Gary F. Ross
7/77	Caspar Creek Watershed Study - A Current Status Report	F. B. Tilley
1/79	Rolling Dips	Bill Draper

Date	Title	Author
5/80	An Evaluation of the FMC Tracked-Skidder on Jackson State Forest	Delmer L. Albright
10/82	Effects of Thinning on Redwood Sprout Growth	Dana W. Cole
5/83	Skid Trail Preconstruction: A Case Study of Logging Impacts and Productivity	Dana W. Cole
10/83	Observations of a Thirty-one-Year-Old Radiata Pine (Pinus Radiata D. Don) Planation in Northern California (Frazier Planation - Jackson Demonstration State Forest	Roy A. Woodward, Joseph Ontiveros
1/84	Waterbars - Making Them More Effective	Carlton S. Yee, Thomas Blakemore
3/84	The Evaluation of Formula and Decimal C Scribners; Are Conversion Factors Necessary to Provide Accurate Mill Scale Volumes from Forest Stand Cruises	Craig E. Anthony
9/84	Logging Residue Resulting from an Intermediate Harvest of a Second-growth Redwood Stand	Roy A. Woodward, Norman D. Henry
6/85	Caspar Creek Watershed Study - North Fork Phase, Jackson Demonstration State Forest Status and Plans 1983-1990	Norm Henry, Karen Sendek
6/86	Railroad Gulch: A Silvicultural Demonstration of Uneven-Aged Management Alternatives - A Progress Report	Dana W. Cole, John A. Helms
6/88	The Caspar Cutting Trails A Case Study Report 25 Years After Harvest	James L. Lindquist
9/89	Hare Creek Sprout Stocking Study on Jackson Demonstration State Forest	James L. Lindquist
1/91	Impacts of Ground-Based Log Skidding on Forest Soils in Western Mendocino County	Peter H. Cafferata, Thomas W. Sutfin
1/91	A Comparison of Techniques to Control Sprouting Hardwoods on Harsh Sites in Western Mendocino County	Peter H. Cafferata, Fay A. Yee

Appendix VIII. Guide to Determining the Need for a Licensed Geologist during THP Preparation

CALIFORNIA LICENSED FORESTERS ASSOCIATION
August, 1999

Registered Professional Foresters (RPF) should address the following questions during Timber Harvesting Plan (THP) preparation. RPFs are encouraged to review California Division of Mines and Geology Note 50, *Factors Affecting Landslides in Forested Terrain*.

 Are there unstable areas located within or adjacent to the proposed THP area?

- Were unstable areas identified on available geologic, landslide and watershed maps, aerial photos, or previous THPs in the vicinity of the plan area?
- Were unstable areas observed in the field? Features associated with unstable areas may include:

  - Hillslopes greater than 65%, including inner gorge areas
  - Loose, unconsolidated soils
  - U-shaped swales
  - Irregular topography
    - Scarps
    - Benches
    - Hummocky ground
    - Surface cracks
  - Vegetative indicators
    - Leaning trees
    - Hydrophytes
    - Isolated patches of homogeneous vegetation
  - Disorganized drainage
    - Sag ponds
    - Seeps
    - Diverted watercourse
  - Road cut-bank failure
  - Road or landing fill failure

 If unstable areas were identified in the THP area, proposed timber operations on, adjacent to, upslope, or downslope of these features may have the potential to affect slope stability through:

- Displacement of soil
- Division or concentration of drainage
- Reduction in interception or transpiration
- Reduction in root strength
-

Examples of timber operations that may produce these effects are:

- Timber cutting
- Construction and maintenance of:
  - Roads
  - Stream Crossings
  - Skid trails

Beds for felling of trees (layouts)
Fire breaks

- Mechanical site preparation
- Prescribed burning

 If proposed timber operations have a reasonable potential to affect slope stability, and there is a potential for materials from landslides or unstable areas to affect public safety, water quality, fish habitat or other environmental resources, then a California licensed geologist with experience/expertise in slope stability should be consulted to assess slope stability and assist with designing mitigation measures**.**

Appendix IX. Mitigation and Management Measures

All pertinent mitigation and management measures are to be implemented as appropriate for all the affected resource areas listed below. Some of these have been previously identified in the document text and others are only listed here for reference when considering project implementation. This section is organized in similar format to Chapter 3.

Structure Conditions for Older or Late Seral Related Special Concern Areas

Late Seral Development Areas (active and passive management)

Late seral structure targets will include a significant component of large, old trees (greater than 150 years), as well as large snags, large down logs, deformed trees, multiple canopy layers, and a high degree of within-stand variability.

Buffer*:* No even-aged silvicultural systems may be used within 300 feet, and only single tree selection may be used within the first 100 feet adjacent to these areas.

Mendocino Woodlands Special Treatment Area (excluding the Railroad Gulch Research Area)
This special treatment area will be managed as a Late Seral Development Area. Management may include thinning from below and individual tree selection designed to emphasize development and retention of large trees.

Buffer*:* No even-aged silvicultural systems may be used within 300 feet, and only single tree selection may be used within the first 100 feet adjacent to these areas.

Russian Gulch and Lower Big River Marbled Murrelet Habitat Recruitment / Late Seral Development Area. A study to demonstrate and assess the accelerated development of late seral habitat will be considered for this area. Possible management options include selective timber harvesting and/or prescribed fire to accelerate the natural stand selection process and to accelerate creation of large old trees and other functional habitat elements (i.e., snags, logs, cavities, dead tops). The State Forest will consult with wildlife management agencies, the California Department of Parks and Recreation, the California Department of Fish and Game, and other interested parties before proceeding with any related project.

Buffer: No even-aged silvicultural systems may be used within 300 feet, and only single tree selection may be used within the first 100 feet adjacent to these areas.

Watercourse and Lake Protection Zones (WLPZ)
Class I and Class II streams will be managed for the development and maintenance of late seral forest characteristics.

Older Forest Structure Zone (active and passive management)
A contiguous 6,803-acre corridor will be managed as Older Forest Structure Zone (Map Figure 5), composed primarily of reserved Old-growth Groves, Late Seral Development Areas, and older forest development areas. This area will produce structural characteristics of older forest, which include large trees, snags, down logs, multiple canopy layers, and a high level of structural diversity.

The portions of this Zone available for timber management would be managed on an uneven-aged basis to recruit these structural conditions and wildlife habitat elements, to coincidentally grow and produce timber through careful thinnings and periodic replacement of large trees and to provide recreational opportunities.

Buffer: No even-aged silvicultural systems may be used within 300 feet, and only single tree selection may be used within the first 100 feet adjacent to these areas.

Forest/Timber Management

Initial Implementation Period Harvesting Limitations

The initial implementation period will sunset within three years, during which time the advisory process is expected to complete a review of the described Plan elements and the Department completes and the Board approves any Plan revisions made in response to the advisory process recommendations.

1. Post-harvest conifer stocking (basal area) levels will be approximately 70 percent or greater of pre-harvest levels;
2. Average tree size as determined by quadratic mean stem diameter will be approximately equal to or greater than pre-harvest levels.
3. Efforts will be made to limit the extent of harvest in areas that have had little or no harvest entry since 1925 or that currently have greater than 10 trees/acre greater than 30" in diameter (see Map Figure 8), particularly where those areas have not already had work done to prepare timber harvesting plans.

These restrictions are in part reflected in Table 3.4 (Short-term harvest schedule). Harvesting during the initial implementation period for the potential harvest areas and associated planned silviculture designated in section 2 of the Short-Term Harvest Schedule (Table 3.4) may occur only after advisory entities have the opportunity to review and comment on it.

Allowable Cut

Decadal average annual harvest is expected to be 20-25 MMBF annually, and shall not to exceed 35 MMBF per year.

Uneven-aged Management

Where timber harvest is proposed near old-growth groves, older forest structure zone or late seral development areas, a buffer will be applied (see above).

Even-aged Management

All proposed even-aged management, with the exception of the research-related SF Caspar plan, will be presented to the appropriate advisory entities for review and recommendation prior to implementation.

Clearcutting will be restricted to a cumulative maximum of 100 acres per decade and only for purposes of research, demonstration, or addressing problematic conditions for regeneration. Up to an additional 400 acres may be clearcut per decade, but only for research purposes that cannot be met through any other method.

The total area receiving even-aged silvicultural treatments shall not exceed 2,700 acres per decade. In addition, even-aged management will be tied to:

a). the Forest condition it is intended to produce

b). necessity and appropriateness for accommodating research investigations either immediately or at a later time.

These constraints (i.e., a, b) do not apply to even-aged management necessary for addressing forest health or problematic regeneration conditions.

Where timber harvest is proposed near old-growth groves, older forest structure zone, or late seral development areas, a buffer will be applied. No even-aged silvicultural systems may be used within 300 feet.

Post Timber Operations Monitoring *(also in December 2005 DEIR VII.6.1-95)*
Completed THPs that have over-wintered for 1 to 4 years will be monitored. The scope of this THP monitoring in relation to minimizing erosion impacts will include:

- inspection of all watercourse crossings, road segments and landings
- mapping the location of rilling/gullying on roads, landings, etc. that are contributing sediment to watercourses
- mapping the location of mass wasting features (including cutbank/fillslope failures) associated with roads, crossings, and landings, or within harvest units
- mapping the location of road drainage structures (including crossings) that are contributing significant amounts of sediment to watercourses
- measurement of WLPZ canopy for Class I watercourses
- recording information on the causes of erosion features, proposed improvements, and a schedule for mitigation treatments

Documented erosion problems will be analyzed to determine what management practice or site-specific condition was responsible. Adaptive management solutions will be site specific and based on professional judgment of JDSF staff.

Also see Recreation and Aesthetics, Aesthetics Mitigation 1

Special Concern Areas and Unique Habitat

Special concern areas will be detailed below or will be included under the resource area tied to their objective elsewhere in the Appendix. This section is intended to provide a cross-reference.

Not Listed in Other Sections

Pygmy Forest
JDSF will maintain the current distribution and species composition of this plant community and protect it from harmful human disturbance, while continuing to allow compatible recreational activities. Sphagnum Bogs will be protected due to their location within the Pygmy forest and their wetland status.

In addition, Cypress Groups, elements of bishop pine/pygmy cypress forest on unproductive soils (non-timberland) will not be subject to harvest. Some of this vegetation may also be considered Northern Bishop Pine Forest, a series or association considered rare and worthy of consideration by California Natural Diversity Database (dated 9/2003). Note that both Bishop pine and pygmy cypress can occur on disturbed more fertile redwood forest. In these areas (i.e. timberland) harvest may occur. As a special status plant species, effects to individual upland pygmy cypress will be evaluated on a project basis.

Mushroom Corners
Additional Botanical Management Measure 2

Harvests: The area is available for future study related to the relationship between fungi and the forested habitat. Most of the future harvests in this area will utilize various forms of uneven-aged management, including single tree and small group selection. Consultation will be initiated with representatives of the mycological research community while planning for future harvest activities.

Fire, Fuels Reduction or other Active Management: Consultation will be initiated with representatives of the mycological research community during planning of any management-related fire or fuels reduction activities.

Invasive Plant Management: Invasive plant control will have a high to moderate priority in this area to insure continued presence of native species that interact with the fungi in the area.

Monitoring:

Timing:	During the life of the JDSF Management Plan
Scope:	Mushroom Corners
Implementation:	CAL FIRE
Monitoring Responsibility:	CAL FIRE

Parlin Fork Management Area

This area is used as a demonstration area for small woodland management. It will continue to be managed using a group selection strategy as described in the 1992 Parlin Fork plan. State Forest staff will provide technical assistance and advice to the CAL FIRE Assistant Chief at Parlin Fork in environmental assessment and protection, harvest planning, reforestation, stocking control, burning, and other management activities

Jughandle Reserve

An administrative area designated to protect a tract of pygmy forest within JDSF and to manage recreational access to these lands in a manner compatible with human use in the adjacent Jughandle State Reserve.

Eucalyptus Infestation Area

This is an area of special management concern because of the need to control eucalyptus to allow regeneration of conifers in this stand and to prevent the spread of this exotic species on the Forest. JDSF intends to convert this area to native conifer species.

Research Areas

In research areas, a dedicated timber harvest or other project may be designed specifically to fulfill the objective of that area.

High Relative Landslide Potential Areas

Areas identified as having a high relative landslide potential using the best available information. These areas will be reviewed on the ground following the guidelines presented at the 1999 CLFA workshop. They are potentially subject to limitations on road construction, yarding methods, and silviculture and may need to be evaluated by a CEG. See also Geology and Soils section (in this Appendix).

Inner Gorges

Inner gorge and unstable areas will be identified during initial THP preparation. A Certified Engineering Geologist (CEG) will be consulted for appropriate measures needed to avoid or minimize impacts where timber harvesting is proposed within the inner gorge, and when appropriate for proposed timber harvesting and use of ground-based equipment within unstable areas. While potential inner gorge areas for JDSF have been mapped by the California Geologic Service (largely from aerial photographs), they will be field verified prior to logging. Road construction and ground-based yarding activities in inner gorges will not take place without CEG advice. See also Appendix IV, Road Management Plan and Geology and Soils section below.

Domestic Water Supplies

Designated areas for domestic water supply in JDSF that are sensitive to disturbance. Only a limited range of silviculture is allowed in these areas.

Buffers adjacent to non-timberland neighbors

Areas along the boundary of JDSF adjacent to non-industrial timberland owners where a buffer zone is designated to minimize impacts on neighbors. Only a limited range of uneven-aged silviculture is allowed in these areas.

Power line right-of-way

Operated by PG&E. The power line right-of-way runs through the Forest, generally parallel to Highway 20. The maintained clearing is not available for timber production.

The following subject areas are listed for cross-reference within this Appendix:

Structure Conditions for Older or Late Seral Related Special Concern Areas

- Late Seral Development Areas
- Older Forest Structure Zone
- Woodlands Special Treatment Area - Also see Recreation

Aquatic, Wildlife and Plant Habitat section, with the subsection following

- *Reserved old-growth groves* - Old-growth
- *Northern spotted owl nest areas* - Specific Wildlife Species of Concern
- *Osprey nest areas* - Specific Wildlife Species of Concern

Recreation and Aesthetics:

- *Conservation camps*
- *Road and trail corridors*
- *State Park Special Treatment Areas*
- *Campground Buffers*

Riparian Zone, Aquatic Resources, Wetland, Water Quality, Large Woody Debris:

- *Water/Lake Protection Zones* - See also Timber Management: Post Timber Operations Monitoring, and Late Seral Recruitment Areas

Road Management

Road Management Plan The plan includes six major components and should be referred to in its entirety (Appendix IV). The standards and mitigations included in the Road Management Plan should be referenced in that document to understand the context of the direction.

Road and Dust Emissions (Air Quality) *(also in DEIR VII.5-12)*
Roads that are not in good condition will be properly abandoned.
During periods of commercial use, road surfaces will be treated to prevent or minimize dust and associated PM10 emissions.

For survey and planning regarding roads also refer to the Heritage Resources, Geology and Soils, Wildlife and Plant sections of this Appendix.

Invasive Weeds

Staff will consider the impacts of invasive weeds to native vegetation during the normal course of project development. If there is a reasonable likelihood of weed spread due to a nearby infestation, mitigation will be considered where appropriate and consistent with IWM to minimize the spread of invasive weeds. Conservation and reestablishment of native vegetation will be considered in disturbed open areas adjacent to forest roads in order to minimize weed spread.

Staff Training Program
Training in identification of invasive weeds will be implemented. Training topics will include: integrated weed management, the ecological and management impacts of weeds, a weed location reporting system, and the employee's role in weed management.

Evaluation of Invasive Weeds
Weed infestations on the State Forest will be periodically evaluated. Evaluation will include the following factors: weed species, location, probable causes of infestation, control treatments considered or applied, and the effectiveness of the treatments.

JDSF will cooperate with local, state and federal agencies, forest landowners, private organizations (and public organizations to work towards control of invasive exotic weeds).

State Forest Staff will make an effort to identify post-harvest emerging weed populations during periodic examinations of harvest units and forest roads coincident with erosion control and forest stocking inspections.

JDSF, as one of the project initiators, will continue to support the International Broom Initiative to investigate biological control agents.

Staff will increase their knowledge base of invasive weed species currently infesting, or potentially infesting the Forest.

To the extent feasible, avoid or minimize the use of chemical (herbicides) weed management tools.

Herbicides

Management Measures for the Use of Herbicides
JDSF staff will adopt the following limitations to potential herbicide use:

In an operational context, herbicides will be used only when no other effective and feasible control methods are found after consideration of the scope of the problem, opportunities to effectively manage the situation, and available alternatives and their potential effectiveness, costs, and risks.

An effectiveness and feasibility analysis is required for operational use of herbicides.

No herbicide will be used unless it is integral to long-term, ecological based management.

Public and Environmental Safety
Public and environmental safety is a priority. When herbicide use is indicated, JDSF staff will reduce risk by selecting appropriate herbicide formulations and application techniques as well as taking additional precautions.

Aesthetic Consideration
Herbicide use will be evaluated for aesthetic effects where forest visitors could have negative aesthetic reaction to treatments.

Roadside Vegetation
Herbicides will not be used for roadside vegetation clearance to treat native vegetation, unless there are significant over-riding management concerns specific to the area, such as fire prevention.

Conifer/Hardwood Stocking Levels
Adjusting imbalance in conifer/hardwood stocking levels by utilizing herbicides will be limited to specific reforestation situations on the east side of the Forest. In specific areas toward the east end of the forest, high tanoak stocking levels are capable of preventing native conifer establishment and growth. Herbicides may be used to decrease native hardwood stocking levels only when other options: are prohibitively expensive, dramatically increase fuel loading, are overly damaging to conifer regeneration, or are not likely to be successful.

Riparian, Wetland, and Floodplain Management

Water Temperature/Aquatic Resources (*also in December 2005 DEIR VII6.1-48)*
To prevent any future impacts to water temperature from the proposed management plan, JDSF will meet or exceed all watercourse protection measures as stated in the FPRs. In addition, JDSF is committed to maintaining a network of monitoring stations that can be used to document trends in water temperature and identify potential impacts on water temperature from forest management.

Floodplain Management Measures
Where there is evidence of floodplain connectivity for storm events with return intervals of 20 years or less in areas that are proposed for timber management, Forest staff will be utilize the guidelines stated in "Flood Prone Area Considerations in the Coast Redwood Zone (November 2005). In addition, Forest staff will be guided by the evaluation procedures included in the Riparian Protection Committee's Final Report.

Water Quality
Beneficial uses of water will be protected by compliance with water quality objectives in accordance with the Water Quality Control Plan for the North Coast Region (Basin Plan), and by implementing required TMDL measures.

Comply with other relevant laws of the North Coast Regional Water Quality Control Board, including the Anti-degradation Policy, TMDL Implementation Policy statement, the Nonpoint Source Policy, and other relevant current regulations, as well as any additional relevant regulations that may be implemented over time.

Bare Soil Treatment within WLPZ and ELZs
Bare soil surfaces associated with management disturbances within WLPZs and ELZs that exceed 100 square feet are to be mulched to achieve at least 95 percent coverage to a minimum depth of four inches where there is potential for soil detachment and transport.

Water/Lake Protection Zones- Habitat Protections *(also in December 2005 DEIR 6.1.12)*

Due to both the research and demonstration mandate for JDSF and the need for flexibility based on site-specific requirements, a range of possible riparian prescription measures will be possible. These include the following management measures (partially based on the approved BOF July 2000 Threatened and Impaired Watersheds rule package):

- Class I – 150 foot WLPZ; class II – 50 to 100 foot WLPZ. Zone widths are to be expanded where appropriate (e.g., unstable areas, etc.). Both the Class I and II WLPZs will be managed to create late-seral forest characteristics.

- Timber operations within channel migration zones will not occur (except as allowed in the Forest Practice Rules).

- Class I inner band– 25 feet wide beginning at the watercourse transition line: No-cut (except for harvest of cable corridor trees where needed) or limited entry to improve salmonid habitat through use of selection or commercial thinning silvicultural methods. At least 85 percent overstory canopy (where it exists prior to harvest) is to be retained within 75 feet of the channel.

- Class I outer band– 125 additional feet: High basal area and canopy retention zone. Basal area retention will remain high through the use of single tree selection silvicultural systems. Vertical overstory canopy (measured with sighting tube) at least 70 percent (where it exists prior to harvest) is to be retained in the outer band.

- Class I/II: Ten largest conifers per 330 feet of stream channel retained within 50 feet of the watercourse transition line.

- Class II inner band– 25 feet wide beginning at the watercourse transition line: No-cut (except for harvest of cable corridor trees where needed) or limited entry to improve salmonid habitat through use of selection or commercial thinning silvicultural methods. At least 85 percent overstory canopy (where it exists prior to harvest) is to be retained within 25 feet of the channel.

- Class II outer band – remainder of WLPZ (25 to 75 additional feet): High basal area and canopy retention zone. Basal area retention will remain high through the use of single tree selection silvicultural systems. Overstory canopy will be retained to prevent water temperature increases and allow for adequate canopy recovery where required.

- Within Class I and Class II WLPZ, retain a minimum of 240 sq. ft. conifer basal area following completion of timber operations.

- Reentry - No more frequently than every 20 years for Class I WLPZs.

- Class III – Equipment Limitation Zones (ELZs) will be at least 25 feet on side slopes less than 30 percent, and 50 feet on slopes greater than 30 percent. These zones will be expanded where site-specific investigations reveal that additional protection is merited for preventing sediment movement into class III channels.
- Class III – Burning will be conducted so that the majority of large woody debris is left within the ELZ. Fuels are not to be ignited within 50 feet of Class III channels.
- LWD within the WLPZ will be retained and recruited to the stream system unless it presents an imminent risk to drainage structures.
- Retain native hardwoods in the WLPZ except where species imbalance has occurred.
- Salvage of dead or dying trees will not occur within the WLPZ, old-growth augmentation area, species-specific management area described in a Habitat Conservation Strategy, or other area specifically identified. Exceptions may exist in response to large-scale occurrence of fire, insect attack, windthrow, or threat to infrastructure.

Riparian Zones

- LWD within the WLPZ will be retained and recruited to the stream system unless it presents an imminent risk to safety or drainage structures.
- The Road Management Plan will be implemented to minimize delivery of road-related sediment to aquatic habitats and facilitate fish passage at Class I and II road crossings.
- Selected roads within the WLPZ will be abandoned and decommissioned as described in the Road Management Plan. Construction and abandonment will be consistent with the standards described in the Road Management Plan.
- Road construction and harvesting proposed in inner gorge areas may be approved only after conferring with a Certified Engineering Geologist.
- Fish passage at Class I crossings will also be assessed and addressed as needed.

Springs, and Seeps
Natural springs and seeps that may provide habitat for non-fish aquatic species are provided the same protections as Class II streams.

Wetland
JDSF will manage wetland habitats in a manner that maintains or restores productivity and contributes to aquatic habitat, water quality, and ecological functions and processes. JDSF will protect wetland site integrity and hydrologic function in accordance with the CA Forest Practice Rules.

Large Woody Debris Survey, Recruitment, and Placement (*also in December 2005 DEIR VII.6.1 page 97)*
Large woody debris survey, recruitment, and placement management measures have been developed to contribute towards a more rapid recovery of aquatic habitat features and functions related to LWD.

I. The following apply to all THPs:

A. Conduct either programmatic or THP-specific instream LWD surveys of Class I and II streams to determine LWD loading prior to designing final WLPZ prescriptions for a THP.

1. If the surveys indicate that instream wood loads meet target criteria as described in Bilby and Ward (1989), then no further steps are needed and the standard FMP measures apply.

2. If the surveys indicate that instream wood loads do not meet target criteria as described in Bilby and Ward (1989), then implement either a or b:

a. Class I and Class II WLPZ silviculture will either be no-cut (except for harvest of cable corridor trees where needed) within 100 to 150 feet of the watercourse transition line for Class I or 75-100 feet for Class II, or limited to removal of codominant, intermediate, or suppressed trees to promote growth on the larger diameter dominant trees and improve LWD recruitment potential. Some flexibility should be maintained to allow removal of large trees to adjust species composition and improve the potential permanence of future LWD; however the goal of enhanced LWD recruitment must still be met.

b. Assess the potential for placing large wood into the Class I or Class II channel. Where assessment indicates that instream LWD placement is feasible, would have a clearly beneficial effect upon aquatic habitat, and is deemed appropriate by DFG, place unanchored log and/or rootwads in streams. Most of the placed LWD should exceed one bankfull width in length. Where assessments indicate instream LWD placement is not feasible, then measure A(2)(a) is to be applied.

B. If LWD surveys per A are not conducted, WLPZ prescriptions default to A(2)(a), above.

C. For specific research and demonstration purposes related to ecological questions (e.g., exploring the role of streamside canopy openings in increasing benthic productivity and fish response), A and B may be overridden on a limited basis.

II. Experiment with placement of LWD in Class III streams to improve sediment metering and other hydrologic functions.

JDSF will manage for a minimum of two downed logs per acre that are at least 20 feet in length with a diameter of 16 inches on the large end and one log per acre at least 24 inches in diameter on the large end and at least 20 feet long. Log densities are averaged over a 160-acre subwatershed area. WLPZs and special concern areas will contribute a greater proportion of downed logs.

Stream Channel Conditions *(also in December 2005 DEIR VII.6.1-95)*

Surveys of stream channel conditions will be implemented for a limited number of streams on JDSF. Monitor long-term trends in channel morphology, habitat quality and woody debris, and evaluate the effectiveness of prescriptions designed to maintain or improve aquatic and riparian habitat conditions and minimize sediment delivery to watercourses.
Parameters sampled will vary depending on the stream reach evaluated, but may include:

- LWD frequency by size class, with information on condition and placement
- Pool dimensions (including pool volume], residual pool depth, and useable rearing/holding/overwintering habitat)
- Pool frequency
- Gravel permeability, embeddedness and size distribution (including overall d50 of sampled reaches)
- Channel dimensions (measured using transects)
- Longitudinal profiles and cross sections
- Bank conditions and entrenchment
- Benthic macroinvertebrates

Watercourses Crossings

Refer to the mitigations/management measures for the following topics that are included in this Appendix (Heritage Resources, Fish, Wildlife, and Plants, and Watersheds as well as the mitigations included in the Road Management Plan (Appendix IV Sections 2.to 5). The following are an example of mitigations found in those sections that are specific to roads located in or near watercourses:

1. Roads to be part of the permanent road network are to primarily utilize upper slope locations without ditchlines connected to watercourses where possible.

2. Roads located within watercourse and lake protection zones (WLPZs) are to be abandoned where other existing feasible routes are available. Where there are no feasible alternatives, use will be minimized.

3. Winter storm inspections are to be used in sample and high-risk areas to insure that road drainage structures are functioning properly.

4. Work is to continue to restrict public motorized vehicular access to vulnerable sections of the road network during the winter period, as well as to educate the public regarding the importance of wet-weather road closures.

5. Road segments near watercourses that are to remain in the permanent transportation network with inadequate road surfacing will be evaluated for potential surfacing with competent rock to reduce surface erosion.

6. Placement of road spoils within the WLPZ will be avoided.

Geology and Soils *(also in December 2005 DEIR VII.7-30)*

The following methodology will utilized for the assessment of slope stability to be conducted during preparation of THPs and other management related activities:

Office Review of Existing Information

- CGS maps of landslide related features and relative landslide potential
- relative landslide potential maps prior THPs and their geologic reports

Field Review

Once office review has been completed, an on-site evaluation will be conducted throughout the project area by an RPF. Areas highlighted during the office review of existing information will receive special attention. The RPF will follow the 1999 "California Licensed Foresters Association Guide to Determining the Need for Input From a Licensed Geologist During the THP Preparation." Refer to Appendix VIII.

Certified Engineering Geologist Input

A Certified Engineering Geologist (CEG) is to be consulted as appropriate during the design phase of timber sale preparation work to address slope instability and erosion issues identified during office and field reviews. The 1999 California Licensed Foresters Association (CLFA) Guide to determining the need for input from a licensed geologist during THP preparation in Appendix VIII will be will be used to aid in determining when to call for the services of a CEG.

Mitigation 1

Use CGS-compiled landslide maps (Short and Spittler 2002a; Manson, Sowma-Bawcom, and Parker 2001; Manson and Bawcom 2004) and relative landslide potential maps [Short and Spittler 2002b; Manson, Sowma-Bawcom, and Parker 2001] to (a) identify areas of potential instability during THP preparation, road layout, and other construction activities, and (b) designate "shallow landslide potential areas" as Special Concern Areas.

Monitoring 1

Timing:	During the life of the JDSF Management Plan
Scope:	Designation of shallow landslide potential Special Concern Areas throughout the Forest; THPs, road layout, and other construction projects.
Implementation:	CAL FIRE
Monitoring Responsibility:	CAL FIRE

Mitigation 2

Use CGS-compiled landslide maps (Manson and Bawcom 2004; Manson, Sowma-Bawcom, and Parker 2001; Short and Spittler 2002a) and relative landslide potential maps (Manson, Sowma-Bawcom, and Parker 2001; Short and Spittler 2002b) to (a) identify areas of potential instability during THP preparation, road layout, and other construction activities, and (b) designate "shallow landslide potential areas" as Special Concern Areas.

Monitoring 2

Timing:	During the life of the JDSF Management Plan
Scope:	Designation of shallow landslide potential Special Concern Areas throughout the Forest; THPs, road layout, and other construction projects.
Implementation:	CAL FIRE
Monitoring Responsibility:	CAL FIRE

Mineral Resources *(also in December 2005 DEIR VII.4-1)*

Any new rock pit or quarry would be subject to separate environmental review when specific information is known regarding size and location.

Protection and Enhancement of Wildlife Species, Habitat, and Forest Structure

Old-growth

An old-growth conifer tree is any live conifer, regardless of size or species that was present in the original stand before the first historic logging on JDSF (1860), based upon the professional judgment of JDSF staff. Characteristics often found in old-growth trees that can help identify them are:

The bark is more deeply furrowed and more weathered on old-growth trees than on young-growth trees, often having a plated appearance. Bark scorching may be heavier on old-growth trees, indicating that they were present during fires that occurred before the first logging in the Forest. A tree size that is larger than would be expected for the stand age, management history, and site quality may indicate an old-growth tree. Limbs often significantly larger in diameter than expected for the stand age, site quality, and canopy closure may indicate an old-growth tree. Limbs often extend from the trunk at more of a downward angle than is common in younger trees.

Old-growth conifers that also have one or more of the following structural characteristics will be retained unless specified otherwise in the Plan:

(a) DBH greater than 48 inches.

(b) Goose-pen (an opening one foot or more in diameter inside and above the top of the trunk opening).

(c) Platform branches greater than 8 inches in diameter.

(d) Exfoliating flanged bark slabs.

(e) Chimney top (hollowed upper stem)

(f) Dead top at least 16 inches in diameter and 16 feet long.

Guidelines for Protecting Old-growth Trees and Reserves

Old-growth conifers with any of the attributes described in a. through f. above will be retained in any prescription unless the tree presents a public safety issue or retention would result in the potential for greater long-term environmental damage, including but not limited to issues related to road and landing sites, soil instability, damage to aquatic resources, or cable yarding requirements.

Since it is often difficult to visually distinguish between young-growth and old-growth hardwoods, size will serve as a surrogate for age. All hardwoods 36" DBH + will be considered for retention, as will other hardwoods that appear to be old-growth and possess characteristics similar to those in a. through f. above. Where forest stands appear to have greater hardwood site occupancy than in the past, hardwoods of any age may be removed to restore former species balance, favoring old-growth hardwoods for retention whenever appropriate.

Old-growth Grove Reserves

Known old-growth stands have been identified and will be retained. No harvesting shall occur in the reserved old-growth groves.

Old-growth Aggregations

An old-growth aggregation is defined as an obvious, intact, undisturbed remnant of the original stand, with an area of at least two acres. Delineating the boundary of an aggregation will be guided by the principle that a gap of 200 feet or more between trees breaks the continuity of a potential aggregation. No trees, young or old, shall be designated for harvesting in an old-growth aggregation, except as necessary for the

construction or use of truck roads, landings, skid trails, cable corridors, tail holds and guy anchors needed for timber harvesting. All identified aggregations will be mapped. No old-growth trees within aggregations will be removed unless the tree presents a public safety issue or retention would result in the potential for greater long-term environmental damage, including but not limited to issues related to road and landing sites, soil instability, damage to aquatic resources, or cable yarding requirements.

Aquatic Organisms and Habitat

Protection measures for Aquatic organisms and habitat are included in the Riparian Zone, Aquatic Resources, Wetland, Water Quality, Large Woody Debris section and Appendix IV (Road Management Plan).

Snag Retention and Recruitment

Snag Retention/Recruitment goal for the entire forest is to attain one snag per acre (on a 160-acre sub-watershed scale) that is at least 30 inches DBH. The desired future condition for snags in all WLPZs and wildlife special concern areas (i.e. old-growth groves, older forest structure zone, and late seral development areas) is to have three snags per acre, of which two are at least 20 inches DBH and one is at least 30 inches DBH, averaged over a 160-acre sub-watershed area. Periodic sampling will be utilized to monitor snag density, as part of the CFI inventory system.

Wildlife Mitigation 1 (*also found in 2005 DEIR VII.6.6:6.7)*

Retain all snags within all timber harvest areas with the exception of snags that pose a fire or safety hazard, or are within the alignment of roads proposed for construction. The largest snags, including residual old-growth snags, should have priority for protection until the snag retention goals of the FMP are met.

Wildlife Monitoring 1

The FMP establishes monitoring standards in-regard to the snag retention requirements.
No changes to those standards are required.

Large Woody Debris on the Forest Floor

JDSF will manage for a minimum of two downed logs per acre that are at least 20 feet in length with a diameter of 16 inches on the large end and one log per acre at least 24 inches in diameter on the large end and at least 20 feet long. Log densities are averaged over a 160-acre subwatershed area. WLPZs and special concern areas will contribute a greater proportion of downed logs.

Hardwoods

JDSF will maintain the naturally occurring hardwood components in riparian stands (WLPZs) and other special concern areas when consistent with the objectives of that area. The goal is to maintain hardwood tree composition at approximately 10 percent (West End) to 15 percent (East End) of the stand basal area. Representative trees of large sizes will be retained or recruited, in addition to trees with other structural values, such as basal hollows and cavities.

Wildlife Species of Concern

Species Surveys

1. Pre-Project Scoping

JDSF will engage in a project-specific scoping process to identify those special status species likely to occur in the affected environment of a project area and the potential habitat impact from the activity either individually or cumulatively. A variety of sources of information will typically be consulted and contribute to the planning process. These include the California Natural Diversity Database, JDSF GIS database, as well as a variety of completed survey and focused species' inventory and research efforts. The scoping process will evaluate likelihood of species presence, habitat availability, survey methodology and timing, and possible mitigation or opportunities for habitat enhancement. Population density and detectability of the special status species, habitats occupied, and the level of habitat disturbance expected from the land management action guide survey intensity. Current literature and species authorities will be consulted as necessary.

2. Training

JDSF will provide for, on an as-needed basis, a sensitive wildlife identification training program to enhance the ability of field personnel to recognize these resources. Personnel who will be responsible for NSO and MAMU surveys will meet the USF&WS and/or DFG recommended qualifications for conducting the appropriate survey. JDSF also supports personnel seeking more formal instruction and training in this area.

3. Biological Survey

Surveys conducted for special status animal species, when indicated following pre-project scoping, will be to established protocols, after consultation with federal or state wildlife management agencies as appropriate, or practices commonly accepted by CAL FIRE and DFG for Timber Harvesting Plan review. In general these species are listed and may be among those considered Species of Special Concern by the DFG California Natural Diversity Database or otherwise recognized by State or federal endangered species acts. Surveys for special status species will include suitable habitat within the proposed project impact area and inquiries regarding occupancy or suitable habitat off-site that may be affected by project implementation. Surveys, irrespective of the state of protocol development, are conducted at a time of year that facilitates positive identification and maximizes the likelihood of contact in the field. Observations of rare, threatened or endangered plants, animals or plant communities will be recorded on Field Survey Forms and copies provided to the DFG California Natural Diversity Database.

Northern Spotted Owl Conservation Strategy

- Habitat protections provided for existing activity sites are described in detail in the Forest Practice Rules and the March 25, 2005 CDF memo (http://www.fire.ca.gov/rsrc-mgt_content/downloads/NSOReviewGuidelines03_25_05.pdf). Activity sites are considered a nest or primary roost site occupied by a resident single or pair of birds irrespective of their reproductive success. Activity sites are valid if occupied at least one year in three. Activity sites are protected with one-quarter mile radius seasonal disturbance buffer and a 1,000-foot habitat protection buffer and other measures to prevent take as described in the Forest Practice Rules unless otherwise modified during consultation with the USFWS.

Species Protection

- All proposed timber harvesting plans containing suitable nesting or roosting habitat will continue to be surveyed following established survey protocols endorsed by the responsible state or federal agency.

- All timber operations within the disturbance buffer of an active site will occur outside of any seasonal closure to prevent disturbance. The determination of seasonal closure dates to prevent disturbance during the nesting period are between February 1 and August 31 as described in the CDF memo (March 25, 2005).

Habitat Management Practices

- Within 500 feet of the nest site, habitat will be retained as follows: 25 percent of area composed of trees greater than 11 inches DBH and 60 percent or greater canopy cover. 75 percent of area composed of trees greater than 24 inches DBH and 60 percent or greater canopy cover. Trees greater than 24 inches DBH and over a distinct layer of trees of 6-24 inches DBH and greater than 60 percent canopy closure may contribute to the 75 percent.

- Within 500-1000 feet of the nest or roost site habitat will be retained as follows: trees greater than 11 inches DBH and greater than 40 percent canopy closure.

- Within a 0.7-mile radius of the activity site 500 acres of habitat will be provided (inclusive of the 1000 foot radius buffer above).

- Within a 1.3 mile radius of the activity site 1336 acres of habitat will be provided (inclusive of the 0.7-mile radius buffer above).

Operational Protection Measures

- Helicopter yarding within 0.5 miles of an activity center will be prohibited between February 1 and August 31.

Osprey Conservation Strategy

Habitat Protection

- Osprey nest trees will be protected with a buffer zone using topography to minimize disturbance to the maximum extent possible. Disturbance buffer location and configuration will be determined in consultation with the California Department of Fish and Game (DFG).

- A nest site will be considered unoccupied and protection standards do not apply if after a period of 3 years occupancy cannot be documented. However, the nest tree and any associated screen trees will be protected.

- Protect perch, screen and pilot trees identified in consultation with DFG. These trees will be designated in the interest of long-term occupancy of the territory and not based just on an individual bird's tolerance or accommodation of disturbance.

Species Protection

- Nests within the boundaries of the proposed management activity or unit of treatment will be surveyed prior to operations to assess occupancy. These surveys will also be conducted within the largest disturbance buffer established (see below). Nest surveys are defined as two visits of up to 3 hours long to the nest site and distributed across the nesting period to assess occupancy.

- All timber operations within the buffer of an occupied nest site will occur outside of any seasonal closure to prevent disturbance to occupied nests. The critical period that defines seasonal closure dates to prevent disturbance during the nesting period is described in the Forest Practice Rules (919.3(d)(5) as March 1 to April 15, extended to August 1 for occupied nests) unless site-specific conditions warrant otherwise. DFG will determine the need for modification of seasonal closure dates.

- Disturbance buffers (within which the seasonal closure will apply) specific to management activities will be established per the Forest Practice Rules.

- There shall be no log hauling within 300 feet of an active nest during the nesting and fledging seasons. The log-hauling buffer shall not apply for nest sites within 300 ft of permanent haul roads when there is no other feasible existing haul route available.

Habitat Management Practices

- Nests within the boundaries of the proposed management activity or unit of treatment will be surveyed prior to operations to assess occupancy. These surveys will also be conducted within the largest disturbance buffer established (see below). Nest surveys are defined as two visits of up to 3 hours long to the nest site and distributed across the nesting period to assess occupancy.

- All timber operations within the buffer of an occupied nest site will occur outside of any seasonal closure to prevent disturbance to occupied nests. The critical period that defines seasonal closure dates to prevent disturbance during the nesting period is described in the Forest Practice Rules (919.3(d)(5) as March 1 to April 15, extended to August 1 for occupied nests) unless site-specific conditions warrant otherwise. DFG will determine the need for modification of seasonal closure dates.

- Disturbance buffers (within which the seasonal closure will apply) specific to management activities will be established per the Forest Practice Rules.

- There shall be no log hauling within 300 feet of an active nest during the nesting and fledging seasons. The log-hauling buffer shall not apply for nest sites within 300 ft of permanent haul roads when there is no other feasible existing haul route available.

Marbled Murrelet

CAL FIRE will conduct an assessment to determine which areas offer the greatest potential for current and future Marbled Murrelet habitat. CAL FIRE has identified key areas for assessment of their suitability for current habitat and for future potential marbled murrelet habitat development and species recovery: Russian Gulch, Lower Big River, Mitchell/Jughandle Creek, and lower Hare Creek. The assessment process is described in Chapter 3.

Habitat Protection

- Marbled Murrelet Augmentation Areas will be managed to recruit late seral habitat conditions. The location of these areas will be determined by the assessment process described in Chapter 3.

Species Protection

- Surveys to protocol endorsed by DFG will be conducted on all project sites with potential habitat and include the largest disturbance buffer established (see below) if management activities have the potential to affect occupied marbled murrelet habitat and management activities are to be conducted within the seasonal closure period to prevent disturbance.

- The marbled murrelet breeding season and disturbance seasonal closure is March 24 through September 15. From August 6 through September 15 there will be no operations until two hours after sunrise and no operations within the buffer area after two hours prior to sunset to prevent disturbance to occupied habitat areas, unless protocol surveys document murrelet absence.

- Disturbance buffers (within which the seasonal closure will apply) specific to management activities will be established as follows as measured from the occupied nest site:
  Blasting operations: one mile.
  Helicopter use: within 1/4 mile.

Habitat Management Practices

- CAL FIRE will consult with an interagency prescription team that includes representation from the USFWS, DFG, and CAL FIRE to develop further details on silvicultural prescriptions applicable to augmentation, old-growth areas, and the Mendocino Woodlands Special Treatment Area.

- THPs that are proposed adjacent to marbled murrelet augmentation areas will provide a 100 to 300 foot special silvicultural zone (single-tree selection managing for large trees) depending on silvicultural prescription adjacent to augmented and old-growth groves. Uneven-aged units adjacent to the augmented groves will receive a 100-foot special silvicultural zone; even-aged units will receive 300 foot special silvicultural zone.

- Special silvicultural zones will be subject to harvest activities but only during times outside of the seasonal closure for disturbance or if protocol surveys document the absence of murrelets.

Northern Goshawk, Cooper's Hawk, and Sharp-shinned Hawk

The northern goshawk is not currently known to inhabit JDSF or adjacent lands, but may be present.

Species Protection

- Northern goshawk, Cooper's hawk, and Sharp-shinned hawk surveys will be conducted in potential habitat areas subject to timber management activity and include the largest disturbance buffer to be established for that management activity (see below).

- Occupied northern goshawk nest sites and associated habitat (including perch, screen, and pilot trees) will be protected and mapped when the species is located during Timber Harvesting Plan preparation or other project surveys. The area protected will include the nest site (100 acres) and Post Fledging Area (PFA) (300 acres). Cooper's and Sharp-shinned hawk nest sites will be provided protections after consultation with DFG.

- All timber operations will occur outside of any seasonal closure to prevent disturbance to active sites. The critical period that defines seasonal closure dates to prevent disturbance is described in the Forest Practice Rules (919.3(d)(4) March 15-August 15) unless site-specific conditions warrant otherwise. DFG will determine the need for modification of seasonal closure dates and those required for Cooper's and/or Sharp-shinned hawk.

- Disturbance buffers (within which the seasonal closure will apply) specific to management activities will be established in accordance with the Forest Practice Rules.

- DFG will be notified when nesting northern goshawk or Cooper's or Sharp-shinned hawks are detected to facilitate enforcement of falconry laws.

Habitat Management Practices

- Vegetation structure of an active northern goshawk nest site and post fledging area (PFA) will be managed outside of the seasonal closure established for disturbance to attain the following structural characteristics:

- Nest Site: for goshawk nest sites maintain CWHR 5D or 6 (if not available, then CWHR 4D) or other condition derived by an interagency prescription team that includes representation from DFG and CAL FIRE.

- PFA: interagency prescription team will meet to develop details on silvicultural prescriptions to be applied.

- Vegetation structural stage objectives for nest site and PFA conditions may be altered under an adaptive management approach as additional data is acquired regarding northern goshawk habitat requirements in redwood and Douglas-fir forests.

Vaux's Swift and Purple Martin

Habitat Protection

- Retain trees exhibiting cavities considered suitable for Vaux's swift and purple martin that do not interfere with the development of required forest infrastructure.

- In even-aged regeneration silvicultural treatments (including clearcut, shelterwood, seed tree seed step, and shelterwood or seed tree removal) and group selection, all snags will be retained unless representing a worker safety or fire control issue. Wildlife Mitigation 1 has expanded the retention

standards to all harvests.

Habitat Management Practices

- Within the WLPZ, recruit snags by retaining large fir trees as a stand component.

- Salvage of dead or dying trees will not occur within the WLPZ, old-growth augmentation area, species specific management area described in a habitat conservation strategy. Exceptions may exist in response to large-scale occurrence of fire, insect attack, windthrow, or threat to infrastructure.

- Snags reflective of the range of conifer species present will be recruited within or nearby even-aged and small group selection areas. Snag recruitment trees will be clustered if practicable specifically in areas that are considered important to purple martin: ridge lines, adjacent to ponds or other natural forest openings, or areas of prevailing wind.

Sonoma Tree Vole

Sonoma tree vole management issues are specific to the maintenance of habitat connectivity and forest tree species composition.

Habitat Protection

- Potential habitat is defined as those areas that are at least 40 percent forested by trees greater than 11 inches DBH, 60 percent canopy closure and a high proportion of Douglas-fir.

- Management will maintain a significant area of potential habitat in a connected state with a significant component of Douglas-fir. It is anticipated that uneven-aged management, stream zones, and other connected patches of timber meeting the potential habitat definition will accomplish this goal.

Species Protection

- CAL FIRE will encourage a research effort to examine Sonoma tree vole habitat, seral stage use and habitat connectivity requirements in JDSF and adaptively manage for the species based on results.

Habitat Management Practices

- Each planning watershed will maintain a significant Douglas-fir component.

Plant Species of Concern

Guidelines for Plant Species Surveys and Avoidance of Significant Impacts *(also in December 2005 DEIR VII.6.21)*

Rare, threatened, and endangered species, as defined by Section 15380 of the CEQA Guidelines, will be addressed during the scoping, surveying, and mitigation-development processes. For species that do not meet the Section 15380 definitions of a rare, threatened, or endangered species but that are CNPS list 3 or 4 species, evaluation, scoping, and mitigation practices are likely to vary according to identified need, the current state of species knowledge, and consideration of input provided by DFG through the scoping process.

Scoping

The scoping process would normally begin with the identification of sensitive species and their habitats that may be affected by the project and are of management concern. For habitat issues, the scoping process may include habitat issue characteristics, a description of presence in the assessment area, and where potentially impacted, a description of the potential impact, measures to minimize the impacts, and an analysis of significance. For individual species, project-associated risks, limiting factors and current status will be considered. Project specific review may include an evaluation of the availability, quality, and quantity of suitable species habitat within the project and assessment area including an evaluation of known actual or potential presence of the species. To be thorough, the pre-project scoping process will include referencing JDSF plant list from the EIR and current updates, available database information from the DFG California Natural Diversity Database and CNPS Inventory, and other sources of sensitive plant habitat and occurrence data.

Surveys
When suitable habitat is present within or immediately adjacent to the project area, project-planning documentation will include surveys as described below, and a discussion of the efforts made to determine presence or absence of the species in question. An assessment area that extends beyond the boundaries of the planned activity may also be required for some species.

For timber harvest plans and other large projects with the potential for negative effects on rare plants, JDSF shall follow the Guidelines for Assessing the Effects of Proposed Projects on Rare, Threatened, and Endangered Plants and Natural Communities (DFG 2000). On smaller scale projects, the survey effort will be appropriate for the level of CEQA analysis and the risk of impact to rare plants.

Observations of rare, threatened, or endangered plants or plant communities will be recorded on field survey forms and copies provided for the California Natural Diversity Database (CNDDB).

Mitigation Development
Upon determination that a proposed action is likely to result in a significant adverse effect, mitigation measures proposed to substantially lessen or avoid the impact will be included in project-associated documentation. Avoidance measures and other necessary mitigations will be specified. Some projects will require consultation with DFG Botanist and an adaptive management approach. An example is conducting invasive weed control and road maintenance in areas with exiting or potential Humboldt milk-vetch (*Astragalus agnicidus*) occurrences.

Improving Knowledge of Rare Pants
JDSF will provide for, on an as-needed basis, a sensitive plant identification-training program to enhance the knowledge of field personnel that may encounter sensitive plant resources. Personnel who will be responsible for botanical surveys should meet the recommended qualifications for botanical consultants included in the DFG survey guidelines (DFG 2000).

Additional Botanical Management Measure 1 (Invasive Weed Management and Rare Plants)

Protection of rare plants (candidate, sensitive, or special status species) from invasive plants will be a high priority for Integrated Weed Management activities. Although the analysis did not find mitigation necessary to prevent the project alternative from impacting rare plants due to invasive species, this Additional Management Measure was developed to provide further protection.

Some examples of project-specific mitigation include: retaining canopy cover for rare plants that favor this condition while discouraging invasive plants that favor more sunlight, and planning continued monitoring for rare plant occurrences in areas at risk for invasive plant infestations.

Implementation and effectiveness monitoring would occur during the course of project implementation, as well as post-operation, including timber sale follow-up, such as erosion control maintenance inspections, and road maintenance surveys.

Monitoring 1

Timing:	During the life of the JDSF Management Plan
Scope:	Forest-wide
Implementation:	CAL FIRE
Monitoring Responsibility:	CAL FIRE

Additional Botanical Management Measure 2 (Mushroom Corners Management Area)
While the analysis did not find mitigation necessary to prevent the project alternative from resulting in a significant adverse impact, Additional Management Measure 2 would further reduce any remaining risk of impact by initiating a consultation process with representatives of the mycological research community while planning for future harvest activities or fire or fuels reduction activities. It would also set a high to moderate priority to control invasive plants in this area to insure continued presence of native species that interact with the fungi.

This measure applies to the 330-acre Mushroom Corners Management Area, as designated in DEIR Figure VII.6.2.1.

Harvests: The area is available for future study related to the relationship between fungi and the forested habitat. Most of the future harvests in this area will utilize various forms of uneven-aged management, including single tree and small group selection. Consultation will be initiated with representatives of the mycological research community while planning for future harvest activities.

Fire, Fuels Reduction or other Active Management: Consultation will be initiated with representatives of the mycological research community during planning of any management-related fire or fuels reduction activities.

Invasive Plant Management: Invasive plant control will have a high to moderate priority in this area to insure continued presence of native species that interact with the fungi in the area.

Monitoring 2

Timing:	During the life of the JDSF Management Plan
Scope:	Mushroom Corners
Implementation:	CAL FIRE
Monitoring Responsibility:	CAL FIRE

Recreation, Aesthetics and Public Use

Recreation Corridor
The FMP establishes the concept of defined Recreation Corridors. The size (width) of these corridors is to be determined by aesthetic considerations from the point(s) of concern. The FMP generally defers the explicit definition of the Recreation Corridors until a user-survey is conducted as part of the JDSF recreation management program (see also Section VII-14, Recreation). However, the FMP does propose a defined corridor width of 300 feet around major campgrounds and identifies that this zone will preclude even-aged silviculture, but does not specify any other particular management prescription for that zone.

A defined corridor width of 300 feet around campgrounds has been incorporated into current planning. Appropriate timber management options within this corridor, while not being specifically identified, could potentially include single tree selection, hazard tree removal, or no harvesting. Other management options for the Recreation Corridor identified in the FMP include restricting the timing of timber operations to avoid conflicts with high visitor-use weekends or restricting operating hours to minimize noise pollution.

Management Measures for Recreation

- Timber harvesting within the 300 feet of campgrounds and day-use areas will be planned and conducted with the designated site use in mind. Main access routes to high-use recreation areas will have slash abatement within 50 feet of the road.

- Active timber operations within the vicinity (to be discussed at time of sales preparation) of occupied campgrounds and picnic areas will be limited to weekdays and non-holidays. Noise abatement mitigation will be included in any timber sale within 1000 feet of an open campground for timber operations occurring between July 1 and Labor Day. Camp Hosts will be kept informed of activities associated with timber operations affecting campgrounds under their jurisdiction.

- Road surfacing for heavily used recreational roads will be upgraded in order to limit erosion, protect the beneficial uses of water, and provide safe driving conditions.

- JDSF will seek joint efforts with the Department of Parks and Recreation and the Mendocino Woodlands Association to manage the area adjacent to the Mendocino Woodlands Outdoor Center for educational and recreational purposes.

Mitigation 1 *(also in December 2005 DEIRVII.2-15 to -16)*
For even-aged timber harvest plans, conduct field evaluations by a RPF or his or her designee to determine the visibility of the THP area to the Forest visitor as seen from roads, trails, and recreation areas. Evaluations will include, but be not limited to, consideration of the following factors:

- the potential frequency of viewing by the general public,
- the degree and duration of vistas,
- the general topography of the THP area in relation to the view aspect,
- and type and density of forest canopy and understory cover of forest areas surrounding the THP area.

The RPF will make a finding of whether or not the evaluation leads to a conclusion that a significant impact to a scenic vista exists. Where appropriate, to visually soften and mitigate significant impacts created by even-aged management on the integrity of scenic views from designated overlooks visible to significant numbers of general forest visitors, the THP shall include one or a combination of the following: modify the configuration of the harvest area to better reflect topography and natural patch shapes; modify the configuration of the harvest area to avoid spanning ridgelines in whole, or in part; reduce the size of the individual harvests units and/or total harvest area; or leave selected standing trees along the harvest edge boundaries.

Monitoring 1

Timing:	During the life of the JDSF Management Plan
Scope:	Even-aged management THPs
Implementation:	CAL FIRE
Monitoring Responsibility:	CAL FIRE

Mitigation 2 *(also in December 2005 DEIR VII.2-18)*
For all timber harvest plans conducted within or adjacent to Special Treatment Areas or buffer areas that are identified but not specifically defined in the FMP, conduct field evaluations by a qualified RPF or other qualified professional, as determined by CAL FIRE, to determine the visibility of the THP area. Evaluation will consider, but not be limited to:

- the potential frequency of viewing by the general public,
- the degree and duration of views from areas of concern;
- presence of distinctive visual attributes such as rock outcrops, streams, or distinctive flora;
- type and density of forest canopy and understory cover;
- and general topography in relation to the view aspect.

Evaluations should take into account the configuration of the THP in relation to the areas around it. The RPF will make a finding whether or not the evaluation leads to a conclusion that a significant impact to a scenic vista exists. Where appropriate to visually screen views from Special Concern Areas, the Mendocino Woodlands State Park and Outdoor Center, and other state park units adjacent to JDSF, or to direct views to provide desirable vistas, modify the width of the buffer appropriately (wider or narrower). Designate timber harvest practices within buffer areas to be one or a combination of single-tree selection, hazard tree removal, or no harvesting, as appropriate.

Monitoring 2

Timing: During the life of the JDSF Management Plan
Scope: THPs within or adjacent to Special Concern Areas
Implementation: CAL FIRE
Monitoring Responsibility: CAL FIRE

Aesthetics related buffers that are specifically defined in the FMP are: *(also in December 2005 DEIR VII.2-15)*

- *Campgrounds and day-use areas buffers* - where timber harvesting within 300 feet of campgrounds and day-use areas will be planned and conducted with the designated site use in mind.
- *Road and trail corridors* -buffer areas along designated roads and trails, to maintain aesthetic qualities valued by the public, plus additional corridors to be considered for designation following recreation user survey.
- *Slash abatement* zones - where main access routes to high-use recreation areas; timber harvest plans will have slash abatement within 50 feet of the road.
- *Non-catastrophic tree mortality and down wood retention* zones - within old-growth management areas, WLPZs, or within 100 feet of old-growth groves.
- *Watercourse and Lake Protection Zones* - where a series of management prescriptions are defined to include, but not be limited to: a 25-foot no-harvest zone; an Equipment Exclusion Zone; leaving uncut the 10 largest trees per 330 feet of stream channel within 50 feet of the watercourse transition line; retaining a minimum of 240 sq. ft. of conifer basal area within the WLPZ following harvest activity; reentry no more frequently than every 20 years in Class I WLPZs; and retention of native hardwoods except where species imbalance has occurred.
- *Neighbor/State Park Buffer Special Concern Area - a 200-foot zone has been established along all neighboring non-industrial timberland ownerships and State Parks where the silvicultural method has been restricted or scenic values must be considered in selection of an appropriate silvicultural system.*
- A 200-foot harvest exclusion buffer from camp areas, recreational cabins, or main roads located within Mendocino Woodlands State Park. This buffer does not apply to the Railroad Gulch Silvicultural Study area.
- 200-foot buffers have historically been considered around residential properties that are adjacent to the Forest boundary. The type of timber management that has occurred within these buffers has been based on discussions with individual property owners.

Mitigation 3. *(also in December 2005 DEIR VII.2-20)*
Require the Forest Learning Center and Forest interpretive Center to be located and designed in accordance with the CEQA process to not significantly affect day or nighttime views from campgrounds or residential areas. CEQA processes also shall be followed for any other facilities, not identified at this time, that are proposed at a later date.

Monitoring 3
Timing: During facility site selection
Scope: Forest-wide
Implementation: CAL FIRE
Monitoring Responsibility: CAL FIRE

Mitigation 4 *(also in December 2005 DEIR VII.2-26)*
For all timber harvesting plans, the RPF or designee shall conduct field evaluations to determine the visibility of the proposed THP area in combination with the existing viewshed, past, present, and probable

future operations, to the Forest visitor as seen from areas of high public use. Evaluations will consider, but not be limited to:

- the potential frequency of viewing by the general public
- the degree of visibility
- duration of view
- general topography of the view area
- character of the forest canopy and understory cover
- visually dominant landscape features
- visual recovery trajectory
- past visual forest management impacts within the viewscape regardless of ownership.

The RPF will make a finding of whether or not the evaluation leads to a conclusion that a significant adverse cumulative impact to a scenic vista exists.

This mitigation must be applied to areas including but not limited to all foreground views (views up to 200 feet), to the middleground vistas looking into James Creek from Highway 20 and the surrounding viewscape from the Camp 20 Recreation Area from Highway 20, and any identified background views of JDSF seen from areas of high pubic use.

Where appropriate to maintain visual quality and to mitigate cumulative impacts created by forest management on the integrity of scenic views, the THP shall include one or a combination of the following:

- modify the project to reflect the natural character of the landscape
- incorporate edge treatments into the design of the proposed operation (feathered edges, irregular harvest unit design, etc.)
- create islands or patches of trees to mitigate visual impacts under silvicultural methods involving the use of variable retention
- retain stems under an appropriate silvicultural prescription to maintain visual quality
- minimize major visual lines if not in character with the viewed landscape.
- modify the size, shape and configuration to fit the character of the surrounding landscape
- delay harvest until the visible landscape has recovered a forested appearance

Monitoring 4

Timing:	During the life of the JDSF Management Plan
Scope:	All proposed THPs
Implementation:	CAL FIRE
Monitoring Responsibility:	CAL FIRE

Noise *also in December 2005 DEIR VII.12)*

Mitigation 1

While timber operations are generally limited to daylight hours when many people are away from home, logging adjacent to rural residential homes and neighborhoods will generate noise. Noise will be mitigated on a site-specific basis, taking into account the nature of the area and the inhabitants, or receptors. Options to reduce noise impacts might include limiting operations to weekdays, keeping landings and heavy equipment as far away from receptors as feasible, and where necessary, utilizing methods and machinery that are less noisy.

Monitoring 1

Timing:	During the life of the JDSF Management Plan
Scope:	Forest-wide
Implementation:	CAL FIRE
Monitoring Responsibility:	CAL FIRE
Parameters to be Monitored:	Noise levels created by site-specific project activity near rural residential neighborhoods adjacent to JDSF.

Mitigation 2

Active timber operations within the vicinity of occupied campgrounds and picnic areas will be limited to weekdays and non-holidays. Noise abatement mitigation will be included in any timber sale within 100 feet of an open campground or within 200 feet of a residence, park, or other identified sensitive receptor. Camp hosts will be kept informed of activities associated with timber operations affecting campgrounds under their jurisdiction.

Noise impacts on wildlife can be mitigated by avoiding nesting/breeding areas of noise-sensitive listed species during the critical reproductive and young-rearing months. JDSF will conduct area-wide wildlife surveys in viable habitats for listed species for one or more years prior to commencement of operations wherever timber operations are proposed. The data will be incorporated with other known locations of wildlife, both on and off the property, helping staff design operations for minimal impact to sensitive and listed species on the Jackson Demonstration State Forest.

Helicopter-Mitigation 2

Any proposed helicopter logging will use the Mendocino General Plan standards for residential dwellings in rural suburban communities as a guide in estimating noise impacts of specific timber harvest operations. Potential noise levels can generally be determined by considering the equipment used, time of use, terrain, and distance to sensitive receptors.

The following helicopter flight characteristics will be considered in the design of timber management operations to further mitigate noise impacts within and adjacent to JDSF where sensitive receptors are identified:

- Buffer helicopter pads by using ridges or other solid sound attenuating landscape features where available and practical.
- Design helicopter flight paths to provide buffering distance from hiking trails, campgrounds, and nest sites of listed species.
- Where practical, design helicopter flight paths using terrain features that would reduce noise reception by sensitive receptors (i.e. fly behind ridges).
- Limit times of day for helicopter use to reduce impacts when operating near residential neighborhoods and occupied campgrounds.
- Logging operations will increase ambient noise levels near an active timber harvest; however, given the temporary, remote and seasonal nature of timber harvest, the above mitigation measures will reduce noise impacts to a less than significant level.

Monitoring 2

Timing:	During the life of the JDSF Management Plan
Scope:	Forest-wide
Implementation:	CAL FIRE using a sound level meter
Monitoring Responsibility:	CAL FIRE
Parameters to be Monitored:	Noise levels created by site-specific project activity
Performance Criteria:	Noise levels remain near or below standards within County General Plan

Additional helicopter mitigations in FMP: (not in the above December 2005 DEIR list)

- Active operations will be limited to weekdays and non-holidays.
- Noise abatement will be included in a THP within 1000' of an open campground or 200' of a residence, part or other identified sensitive receptor.
- Camp-hosts will be informed of timber operations affecting campgrounds under their jurisdiction.
- In addition, noise impacts on nest sites of listed species and neighbors will be considered in decisions to prescribe helicopter use in logging operations.

Mitigation 3

Noise-generating management activities will be assessed for cumulative noise effects, and JDSF will incorporate mitigation measures to minimize them. Examples of mitigation that can be applied to projects include alteration of project methods, timing, location, scope, and duration. Trees have potential to buffer ambient (chronic) highway and residential noise, and site-specific retention should be considered to reduce potential impacts to residents or recreationalists.

Target shooting and chainsaws (firewood cutting) are generally the noisiest recreational activities, with potential individual and cumulative noise impact that may not be mitigated by distance. For harvesting and construction activities, mitigating noise to a level that is less than significant is accomplished by limiting days and hours of operation, as well as providing buffering distance, taking advantage of topographic features, and time between noise-creating activity and nearby sensitive receptors, and using equipment that makes less noise.

Monitoring 3

Timing:	During the life of the JDSF Management Plan
Scope:	Forest-wide
Implementation:	CAL FIRE
Monitoring Responsibility:	CAL FIRE
Parameters to be Monitored:	Noise levels created by management or recreational activity near rural residential neighborhoods adjacent to JDSF and near recreation sites within JDSF.

Forest Protection

Forest Pest Management *(also in December 2005 DEIR VII.6.4-12)*

State Forest staff will continue to monitor the Forest for early signs of forest pests or conditions that may lead to infestation. JDSF will also assist the pest-monitoring program of the California Department of Food and Agriculture by allowing deployment and inspection of gypsy moth traps in high use areas of the Forest.

Other efforts to reduce pest damage or predisposition will include:

- The minimization of injuries to residual trees during forest management activities.
- Reuse of old skid trails where available to reduce soil compaction.
- Retention of a diverse species composition in or adjacent to stands following forest management activities and within or nearby future regeneration units.
- Avoidance of non-native tree species that may be predisposed to pests with few local pest predators and parasites.
- Use of CAL FIRE or other forest pest management specialists to train employees in forest pest recognition and management.

Sudden Oak Death (refer to Chapter 3)
JDS F staff will keep abreast of current regulations and host-species updates by consulting CDFEA's web site at http://cdfea.ca.gov/pqm/manual/htm/455.htm as well as referring to current information from CAL FIREA, the County Agricultural Commissioners, USDA Forest Service, and CAL FIRE.

Pitch Canker (refer to Chapter 3)
JDSF staff will incorporate the most current best management practices as identified by the California Pitch Canker Task Force for controlling the distribution and spread of Pitch Canker.

Fire Protection

The Forest Manager, the Operations Officer, the Fire Prevention Battalion Chief, and the local CAL FIRE Battalion Chief will work together to ensure an adequate fire protection program is in place for JDSF. In addition, the State Forest staff will work with other agencies, adjoining landowners, and timber sale purchasers as needed to provide a comprehensive fire protection program for the State Forest.

Prescribed Fire

Prescribed fire only under prescription and on permissive burn days with necessary permits from the MCAQMD.

Safety Measures
For public safety, post and maintain signs around all areas closed to public access for timber operations that includes information defining the period of closure. In order to avoid conflicts between recreation uses and for public safety, post and maintain appropriate signs around all areas closed to hunting, trapping, and the use of firearms. Signs should be posted at all points where roads and trails enter such areas and, in the case of hunting restrictions, at legally required intervals along the perimeter of such areas.

Research and Demonstration

The varied nature of proposed research projects precludes applying specific mitigation measures to each proposed project. Rather, each project will need scoping and further assessment to determine the applicable mitigations needed, refer to pertinent mitigations listed above for the resource potentially affected. Specific additional mitigations are listed below that are not included elsewhere in this Appendix or they are listed here as they are specific to Research and Demonstration.

Research projects incorporating manipulation of forest stands and vegetation

As part of JDSF's research and demonstration mission, small-scale herbicide trials or vegetation control studies are appropriate. These activities may utilize products that are not listed in the EIR.

Fertilization will not be used as a stand improvement practice on JDSF except in conjunction with a specific research project. No fertilization research projects are currently under consideration.

The concept of conducting control burns in the pygmy forest originated some years ago as an idea to benefit the Lotis blue butterfly and a host species coast hosackia (*Lotus formosissimus)*. Currently it is understood that other herbaceous members of the pea family may be hosts for the butterfly and that host plant habitat is not limited to pygmy forest. The concept of manipulating the rare pygmy forest for the possible benefit of the Lotis blue butterfly is not supported at this time. Local botanists have supported the concept of carefully reintroducing fire into pygmy forest areas on JDSF. CAL FIRE recognizes that any proposal would be: research focused on improving understanding of the pygmy forest, limited in

scope, based on sound ecological and botanical knowledge, supported by experts in the field, undergo appropriate CEQA analysis, and include appropriate survey, study, and monitoring.

Development and Construction of the Learning and Interpretive Centers
A Forest Learning Center complex and JDSF Interpretive Center at Camp 20 are both listed as potential on-site actions within the EIR. These actions will be subject to separate, project-specific heritage resources review per CEQA and/or Section 106 of the NHPA.

Specific mitigations developed for these projects are:

(DEIR Aesthetics) Mitigation 2
For all timber harvest plans conducted within or adjacent to Special Treatment Areas or buffer areas that are identified but not specifically defined in the FMP, conduct field evaluations by a qualified RPF or other qualified professional, as determined by CAL FIRE, to determine the visibility of the THP area. Evaluation will consider, but not be limited to:

- the potential frequency of viewing by the general public,
- the degree and duration of views from areas of concern;
- presence of distinctive visual attributes such as rock outcrops, streams, or distinctive flora;
- type and density of forest canopy and understory cover;
- and general topography in relation to the view aspect.

Evaluations should take into account the configuration of the THP in relation to the areas around it. The RPF will make a finding whether or not the evaluation leads to a conclusion that a significant impact to a scenic vista exists. Where appropriate to visually screen views from Special Concern Areas, the Mendocino Woodlands State Park and Outdoor Center, and other state park units adjacent to JDSF, or to direct views to provide desirable vistas, modify the width of the buffer appropriately (wider or narrower). Designate timber harvest practices within buffer areas to be one or a combination of single-tree selection, hazard tree removal, or no harvesting, as appropriate.

Monitoring 2

Timing:	During the life of the JDSF Management Plan
Scope:	THPs within or adjacent to Special Concern Areas
Implementation:	CAL FIRE
Monitoring Responsibility:	CAL FIRE

The development and construction of both the Learning Center and Interpretive Center are both listed as potential on-site actions within the EIR. Specific aesthetic mitigations developed for these projects are:

(DEIR Aesthetics) Mitigation 3
Require the Forest Learning Center and Forest interpretive Center to be located and designed in accordance with the CEQA process to not significantly affect day or nighttime views from campgrounds or residential areas. CEQA processes also shall be followed for any other facilities, not identified at this time, that are proposed at a later date.

Monitoring 3

Timing:	During facility site selection
Scope:	Forest-wide
Implementation:	CAL FIRE
Monitoring Responsibility:	CAL FIRE

Refer to mitigations and monitoring requirements contained within this management plan: Chapter 3 – Recreation, Aesthetics and Public Use.

(DEIR Heritage Resources) Mitigation Measure 18 (see section below)

Heritage Resources

Mitigation Measure 1

Implement appropriate measures (project redesign and site avoidance, or mitigation such as data recovery or documentation of historic buildings in accordance with the Secretary of Interior's Standards) to avoid, minimize or mitigate adverse impacts from timber harvesting on significant heritage resources that may be impacted by THP activities. THP reviews will regularly consider potential impacts to significant heritage resources located along regularly used or main logging access roads, assess the potential for long-term site attrition, consider the appropriateness of CARIDAP: Sparse Lithic Scatters (Jackson et al. 1988) and, for other types of sites, consider data recovery excavations, site capping, and/or road realignment and proper abandonment where feasible and appropriate. To do this, the appurtenant roads need to be mapped and included in the archaeological survey for the THP. Road survey coverage shall be plotted on the JDSF archaeological survey database maps.

Monitoring 1

Timing:	During the life of the JDSF Management Plan
Scope:	Forest-wide
Implementation:	CAL FIRE
Monitoring Responsibility:	CAL FIRE

Mitigation Measure 2

THP-specific studies performed in accordance with Forest Practice Rules shall include (a) oversight and review of Confidential Archaeological Addendums by qualified professional archaeologist for studies conducted by certified RPFs, (b) a current archaeological records check as defined in 14 CCR Section 895.1 that would include review of identified but unrecorded historic resources listed in Gary and Hines (1993), and (c) formal recordation to current standards of all identified heritage resources, among other standard procedures.

Monitoring 2

Timing:	During the life of the JDSF Management Plan
Scope:	Forest-wide
Implementation:	CAL FIRE
Monitoring Responsibility:	CAL FIRE

Mitigation Measure 3

Conduct heritage resources training for all permanent forestry field staff at JDSF, and obtain and maintain current certification in identification of archaeological sites for key staff to assist with heritage resources surveys, site recordation, monitoring of mitigation measures and site conditions, handling inadvertent discoveries, and educating contractors and the public about heritage resource protection laws and JDSF's heritage resources.

Monitoring 3

Timing:	Yearly, during the life of the JDSF Management Plan
Scope:	Forest-wide
Implementation:	CAL FIRE
Monitoring Responsibility:	CAL FIRE

Mitigation Measure 4

The JDSF Forest Manager or his/her designee will initiate consultation with local Native American tribes regarding Native American gathering areas or other locations of cultural or religious importance. Confirmed locations shall be plotted on the JDSF heritage resource database. This database will be reviewed prior to each THP, and specific management of these locations will be developed.

Monitoring 4

Timing:	Annually during the life of the JDSF Management Plan
Scope:	Forest-wide
Implementation:	CAL FIRE
Monitoring Responsibility:	CAL FIRE

Mitigation Measure 5

In concert with the Pre-Suppression Plan to be developed for JDSF, employ appropriate procedures prescribed in *Archaeological Review Procedures for CAL FIRE Projects (*Foster 2003) to avoid potential impacts to significant heritage resources where pre-fire defense improvements (e.g., fire breaks, fuel reduction treatments, helispot locations, water tanks, adequate road and trail access) and incident camps would be established. Document heritage resources study findings using the CAL FIRE Archaeological Survey Report form or other report format consistent with OHP (1989) guidelines.

Monitoring 5

Timing:	During planning and implementation of the Pre-Suppression Plan
Scope:	Forest-wide
Implementation:	CAL FIRE
Monitoring Responsibility:	CAL FIRE

Mitigation Measure 6

To the extent practical during emergency fire-fighting activities, rely on persons trained to identify archaeological sites (CAL FIRE Archaeologists, professional archaeologist-contractors and/or CAL FIRE staff with current archaeological training) to avoid or minimize heritage resource impacts from fire suppression and support activities (e.g., grading or hand-digging of fuel breaks, establishment of incident camps).

Monitoring 6

Timing:	During the life of the JDSF Management Plan and Fire Protection/Management Plan
Scope:	Forest-wide
Implementation:	CAL FIRE
Monitoring Responsibility:	CAL FIRE

Mitigation Measure 7

After a wildfire has been suppressed, request a CAL FIRE Archaeologist to oversee and document site damage assessments and as needed, develop and supervise site stabilization, data recovery or rehabilitation efforts, with assistance, to the extent possible, from CAL FIRE staff possessing current archaeological training.

Monitoring 7

Timing:	During the life of the JDSF Management Plan and Fire Protection/Management Plan
Scope:	Forest-wide
Implementation:	CAL FIRE
Monitoring Responsibility:	CAL FIRE

Mitigation Measure 8

To lessen the potential for significant impacts to heritage resources, CAL FIRE shall adhere to the procedures for the identification and protection of heritage resource established for prescribed burn projects located on private or state lands conducted under the Department's VMP program. These

procedures are specified in *Archaeological Review Procedures for CAL FIRE Projects* (Foster 2003), which requires a Preliminary Study to determine if impacts to heritage resources are possible. If so determined, a heritage resource inventory will be required, including a records check, notification to Native Americans, prefield research, an on-the-ground field survey, development of protection measures, recording of sites, and the completion of an archaeological survey report meeting professional standards.[18]

Monitoring 8

Timing:	During the life of the JDSF Management Plan and Fire Protection/Management Plan
Scope:	Forest-wide
Implementation:	CAL FIRE
Monitoring Responsibility:	CAL FIRE

Mitigation Measure 9

Potential adverse impacts to important Native American plant collecting areas from prescribed burns will be avoided by consulting with interested Tribes about potential effects of fire on plant collecting areas and modification of prescribed burn plans as necessary to avoid significant adverse effects.

Monitoring 9

Timing:	During the life of the JDSF Management Plan and Fire Protection/Management Plan
Scope:	Forest-wide
Implementation:	CAL FIRE
Monitoring Responsibility:	CAL FIRE

Mitigation Measure 10

Prior to the conduct of potentially damaging project activity and in consultation with CAL FIRE professional archaeologists, apply appropriate research and survey methods to identify heritage resources along roads that have potential to be impacted by regular road maintenance and use of existing rock borrow pits and enact protection measures (e.g., avoid grading, cover with imported soils or asphalt, monitor operations) to minimize or avoid impacts to significant sites. Document heritage resources study findings using the CAL FIRE Archaeological Report Form or other report format consistent with OHP (1989) guidelines. In concert with the present practice of avoiding impacts to known heritage resources from regular road maintenance, apply the standard steps prescribed in *Archaeological Review Procedures for CAL FIRE Projects* (Foster 2003) to avoid impacts to known heritage resources from maintenance of related road appurtenances (e.g., culverts, bridges) and existing borrows pits. Prior to any road grading work, the current database of heritage resources shall be checked to determine if any known sites exist along the road segments to be treated, and an archaeological survey of the road segments shall be conducted by either a professional archaeologist or permanent forestry field staff with current archaeological training. The results of road segment surveys will be added to the heritage resources database and referred to for determining which road segments can undergo periodic road maintenance activities without additional archaeological considerations and which segments need ongoing monitoring. Specific mitigation measures to record and/or protect the site(s) will be developed.

[18] This survey work may be conducted by an archaeologically-trained CAL FIRE Forester rather than a professional archaeologist, however, in such cases, a CAL FIRE staff archaeologist reviews the work for elements of completeness, accuracy, content, and professional adequacy. The reviewer also makes specific recommendations to correct any deficiencies, and if necessary, conducts a field inspection to examine heritage resource discoveries, spot check areas to test adequacy of survey coverage, review site records in field settings, and make recommendations for follow-up work, if needed. Most importantly, this review includes a careful evaluation of the proposed protection measures to ensure that the project has been designed to be in conformance with applicable state laws and regulations.

Monitoring 10

Timing:	During the life of the JDSF Management Plan and Fire Protection/Management Plan
Scope:	Forest-wide
Implementation:	CAL FIRE
Monitoring Responsibility:	CAL FIRE

Mitigation Measure 11

For new road construction or substantial improvements to existing roads and appurtenances (including development of new rock borrow pits), apply standard procedures described in *Archaeological Review Procedures for CAL FIRE Projects* (Foster 2003) to avoid potential impacts to significant heritage resources. Consider relocation of new roads as needed to avoid potential impacts to significant heritage resources. Where known site boundaries are not systematically defined or in question, establish reasonable buffer zones for heritage resources where ground disturbing maintenance activities will be avoided, and monitor for compliance. Document heritage resources study findings using the CAL FIRE Archaeological Survey Report form or other report format consistent with OHP (1989) guidelines.

Monitoring 11

Timing:	During the life of the JDSF Management Plan; in conjunction with implementation of JDSF Road Management Plan
Scope:	Forest-wide
Implementation:	CAL FIRE
Monitoring Responsibility:	CAL FIRE

Mitigation Measure 12

When planning for decomissioning of roads and/or related appurtenances, employ standard procedures described in *Archaeological Review Procedures for CAL FIRE Projects* (Foster 2003) to avoid potential impacts to significant heritage resources. Consult with interested Tribes whose aboriginal territories included all or part of JDSF to determine if significant traditional cultural properties or other heritage resources such as plant collecting areas are present and may be affected. Where impact avoidance is not feasible, consult with a CAL FIRE archaeologist to develop and implement alternative mitigation measures. Document heritage resources study findings using the CAL FIRE Archaeological Survey form or other report format consistent with OHP (1989) guidelines.

Monitoring 12

Timing:	During the life of the JDSF Management Plan; in conjunction with implementation of JDSF Road Management Plan
Scope:	Forest-wide
Implementation:	CAL FIRE
Monitoring Responsibility:	CAL FIRE, SHPO

Mitigation Measure 13

Before substantial ground disturbing maintenance or planned improvements are carried out (FMP Section 3, Recreation, Aesthetics, and Public Use), an archaeological survey shall be performed by a CAL FIRE staff archaeologist or a person with current CAL FIRE archaeological training. The survey shall follow the procedures outlined in *Archaeological Review Procedures for CAL FIRE Projects* (Foster 2003). Document heritage resources study findings in a format adapted from CAL FIRE's Archaeological Survey Form or other report format consistent with OHP (1989) guidelines.

Monitoring 13

Timing:	During the life of the JDSF Management Plan
Scope:	Forest-wide
Implementation:	CAL FIRE
Monitoring Responsibility:	CAL FIRE

Mitigation Measure 14

Identify known heritage resources in existing campgrounds, other high-use visitor areas (e.g., Camp 20), and in area of other administrative facilities that are being impacted by regular maintenance activities, and enact protection measures to minimize or avoid impacts to significant sites. Document heritage resources study findings using the CAL FIRE Archaeological Survey Form or other report format consistent with OHP (1989) guidelines. Planning for regular maintenance of, development of new, improvements to and abandonment of facilities needs to consider and implement measures to avoid or minimize potential impacts to significant heritage resources. Document heritage resources study findings in a format adapted from CAL FIRE's Archaeological Survey Report form or other report format consistent with OHP (1989) guidelines.

Monitoring 14

Timing:	Implement appropriate protection or treatment measures after heritage resources are inventoried and/or prior to carrying out activities
Scope:	Forest-wide
Implementation:	CAL FIRE
Monitoring Responsibility:	CAL FIRE, SHPO

Mitigation Measure 15

Develop new trails, recreational and visitor facilities to minimize potential for vandalism. Educate contractors and visitors about the proper procedures for protecting any artifacts that they may find on JDSF.

Monitoring 15

Timing:	During life of the JDSF Management Plan
Scope:	Forest-wide
Implementation:	CAL FIRE
Monitoring Responsibility:	CAL FIRE

Mitigation Measure 16

Revise the more widely distributed JDSF visitor brochures to include an advisory statement that the unauthorized collecting of artifacts and the looting or vandalism of sites is prohibited by State law, and provide direction on what the visitor should do in the event that prehistoric or historic artifacts are encountered on the Forest.

Monitoring 16

Timing:	Completion within the life of the JDSF Management Plan
Scope:	Forest-wide
Implementation:	CAL FIRE
Monitoring Responsibility:	CAL FIRE

Mitigation Measure 17

Consult with interested Tribes to identify important traditional plant collecting areas. Minimize or avoid pesticide use in traditional collection areas where such action will reduce adverse impact on plant resources traditionally utilized by Native Americans. Develop a Native American gathering permit policy where such gathering can be permitted by the Forest Manager, and take steps to ensure that gathering does not take place in any areas that may have been treated with herbicides.

Monitoring 17

Timing:	During life of the JDSF Management Plan; in conjunction with development and implementation of subsequent planning documents
Scope:	Forest-wide
Implementation:	CAL FIRE
Monitoring Responsibility:	CAL FIRE

Mitigation Measure 18

When planning for or reviewing proposed demonstration and research projects that have the potential to disturb significant heritage resources, employ standard procedures described in *Archaeological Review Procedures for CAL FIRE Projects* (Foster 2003), and in the *Forest Practice Rules for the Protection of Archaeological and Historical, and Cultural Sites (CAL FIRE 2003)*, and include a check of the current JDSF heritage resource database to include review of historic period sites identified by Gary and Hines (1992) to avoid potential impacts to significant heritage resources. Document heritage resources study findings in the CAL FIRE archaeological Report form, or other report format consistent with OHP (1989) guidelines.

Monitoring 18

Timing:	During life of the JDSF Management Plan
Scope:	Forest-wide
Implementation:	CAL FIRE
Monitoring Responsibility:	CAL FIRE