Jackson Demonstration State Forest Management Plan

Draft

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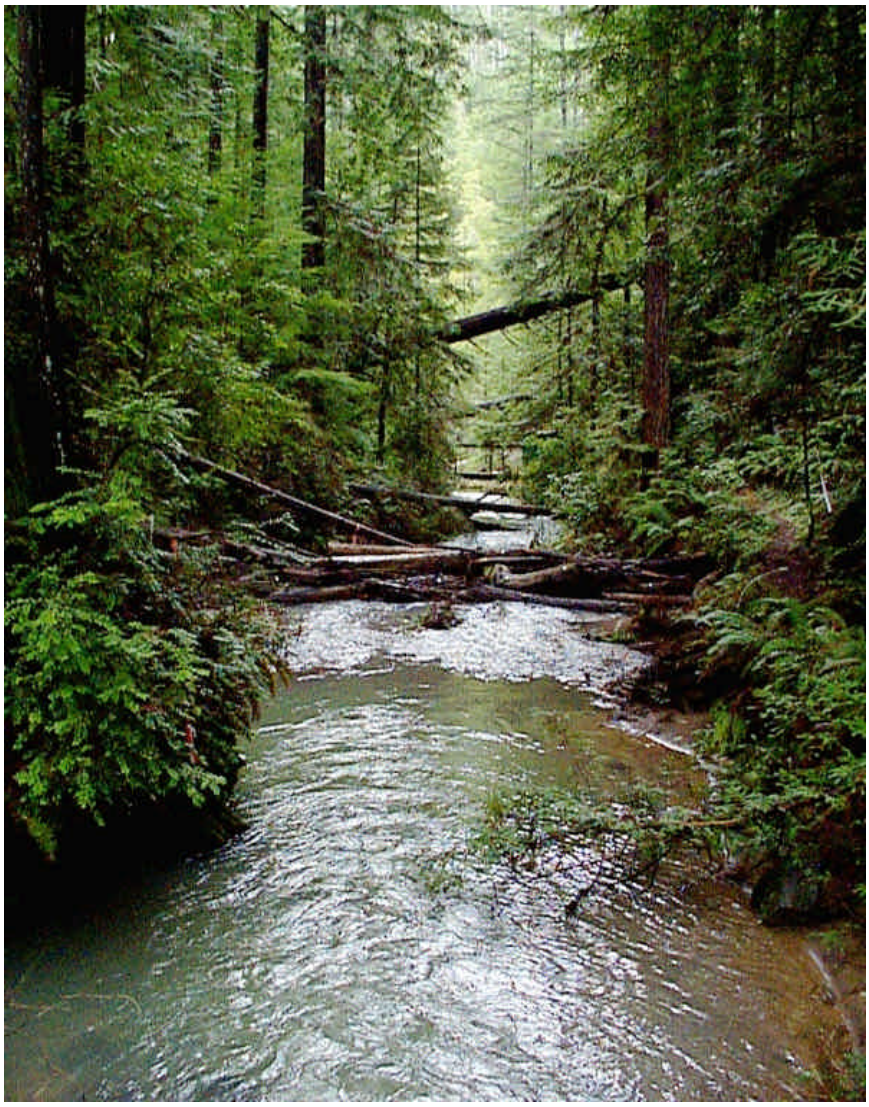

California Department of Forestry and Fire Protection
The Resources Agency
State of California

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Executive Summary

The Forest, Its Purpose and Direction

California's state forest system continues to provide a broad base of diverse forest values and products, as originally intended at the time of establishment over 50 years ago. The system has remained resilient, evolving as new issues and concerns have confronted the people of the state of California.

Jackson Demonstration State Forest, the largest in the system, was established as a demonstration of economical forest management, predicated upon waning supplies of private timber. It has become much more than this. Originally purchased from the industry in a depleted condition, the Forest has continually built inventory, and forest growth continues to exceed harvest by a considerable margin. A diverse set of conditions is being fostered by rapid recovery of natural forest processes, aided by management to achieve those conditions.

The Forest has grown to include mature second-growth timber stands, and the maturity of the forest will continue to develop through the preservation of unique stand elements and promotion of sustainable recruitment of late-seral elements. Far from being simply a tree farm, the Forest will continue to be managed to produce a range of habitats and timber stands that support biodiversity while remaining a viable and relevant laboratory for resource professionals, private timberland owners, and the general public.

The Intent of the Plan

The JDSF management plan establishes a Desired Future Condition or target for management. It sets a direction for management, utilizing a diverse set of silvicultural systems, creating diverse sets of forest structures and habitats. The Plan specifies functional ecosystems, and emulation of natural processes, while recognizing that man is an integral part of the ecosystem. Restoration and recovery of functioning systems is of high priority. The Plan includes an aggressive road management plan and includes provisions to recruit large woody debris, snags, and other characteristics of natural forest ecosystems.

The JDSF management plan presents a workable plan to create and maintain multiple seral stages, along with important structural habitat elements. It preserves old-growth groves, augmenting some of them to provide large patches of late-seral habitat. It provides for recruitment of late-seral habitat in the Mendocino Woodlands Special Treatment Area. It protects individual large old-growth trees and smaller residual old-growth with unique habitat attributes. The Plan sets goals for recruitment of snags and downed logs.

Planned harvest levels are set to achieve desired forest structural conditions, not simply to cut current growth. Silvicultural systems allow most stands to achieve the highest growth possible by approximating the anticipated culmination of biological growth. Inventory continues to build over time, while providing a significant contribution to the local economy.

Having achieved a significant expansion of recreational facilities over the past 15 years, this plan proposes to maintain a rustic outdoor recreational experience, with some expansion of the trail system and proposes a user-needs study to guide future recreational development that is compatible with demonstration of forest management.

This is a proposal to maintain a diverse set of conditions available for research and demonstration, while remaining mindful of the need to remain relevant to the private sector that the Forest serves. For the first time, the Plan incorporates the term "research" to augment its demonstration value.

The plan sets realistic monitoring goals, and establishes an adaptive management framework.

Chapter 1. Introduction

The need for forest products, and thus the need for effective forest management, continues to evolve. Coast redwood is among the most productive of temperate forest tree species 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. Professor Emanuel Fritz championed the concept of the State Forest System during the 1940's because of the need to demonstrate responsible and innovative forest management practices for the private timberland owners of California. Jackson Demonstration State Forest 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 economic efficiency with maximum fiber production and at the same time protecting public trust resources. Due to the long-standing practice of harvesting less than growth, inventories of standing timber continue to increase. Some of the densest and highest volume stands of second-growth timber in the redwood region can be observed on JDSF.

The definition of sustainability has evolved to include forest ecosystems, both terrestrial and aquatic. Current issues revolve around restoration of managed forest ecosystems to maintain biodiversity and system functions. These actions are not likely to succeed on private timberlands if it is not financially viable to implement them. Incentives for investment are needed to relieve pressure to change to other land uses.

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 will also help guide private landowners on how best to allocate funds to restoration efforts which will have the greatest likelihood of success. In addition, this plan is intended to provide timber management practices compatible with local and state public interest values so that visitors and neighbors will continue to use and enjoy the State Forest.

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'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 State Forest system was established to promote an increase in productivity from private timberlands within the State (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).

The State Board of Forestry and Fire Protection sets policy for management of the state forests. This policy builds upon legislation, directing the Department to prepare detailed management plans and to conduct programs in timber management, recreation, demonstration, and investigation. Echoing the legislature, the Board cites a large acreage of potentially productive timberland in California not producing a 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 recognized that the significance of a program demonstrating improved practices would increase with the demand for forest products and as public interest in forest management intensified. Demonstrations of the compatibility and conflicts involved in multiple use of forestland were determined to be essential as population and development pressures increased.

Board policy consists of eight articles that outline and guide management actions (see Appendix I). Article 1 establishes the primary purpose of the State Forest program as the conduct of 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.

The Forest Management Plan sets forth goals and objectives beyond those incorporated into existing State and Federal regulations, and the approximate timing and location of practices necessary to achieve these goals and objectives. The Plan sets requirements for monitoring and evaluation to insure that the management direction is implemented and the objectives are met, and to trigger changes in that direction, if needed.

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. An Environmental Impact Report (EIR) will be prepared which describes the management alternatives considered for the Jackson Demonstration State Forest Management Plan and the potential environmental effects of each alternative. The preferred alternative has been developed in this Forest Management Plan. For purposes of consideration of environmental effects, the Forest Management Plan and the EIR are to be considered as a whole, rather than as separate documents.

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 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 Department headquarters staff and included specialists in forestry, silviculture, harvest scheduling, forest economics, wildlife biology, hydrology, geology, and archeology.

Plan preparation began with 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, and review by Department managers.

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.

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 comprised of 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.

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 is implemented in 2001 or 2002, budget proposals for fiscal year 2001/2002 will have been submitted to the Governor's office based upon current planning. These budget plans may or may not meet the budget requirements of the approved Forest Management Plan. Moreover, legislative appropriations and allocations of 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 change the proposed Plan implementation schedules to reflect differences between proposed Plan budgets and actual appropriated funds.

Currently, all revenues derived from management activities on the State Forest are deposited into the Forest Resource Improvement Fund (FRIF). The FRIF is also the sole source of money available to budget management activities on the Forest. 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 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 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

As directed by the Board of Forestry and Fire Protection, the Forest Management Plan is expected to be revised at least every 15 years and ordinarily every 10 years. 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 review conditions of the lands covered by the Plan at least every five years 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 approval and, ultimately, for the Board's approval.

Public notification requirements and adherence to CEQA procedures apply to any significant Plan amendments.

Public Input into the Planning Process

This plan was prepared with consideration of public input. A number of forums have enabled the public to provide input and make suggestions concerning the management direction of the Forest. In 1997, a Citizens' Advisory Committee was appointed by then-Director Richard Wilson. The committee met periodically over an 18-month period and produced a number of recommendations for management of the Forest (CDF 1998). A number of the recommendations of the committee have been incorporated into the management plan.

Prior to preparation of the Plan, public scoping sessions were held in three Northern California locations. Both written and oral comments were received. Management issues were brought to the Department by the public.

This plan will be submitted to the State Board of Forestry and Fire Protection for review and approval. The review process before the Board is a public process, and comments by the public are welcomed.

An environmental impact report (EIR) will be prepared to accompany this plan. The EIR process will comply with review processes set forth by the California Environmental Quality Act (CEQA). Public input is an important part of the CEQA process.

Forest Management Goals

The Forest Management Plan is designed to achieve specific goals that comply with the statutory direction given to the State Forests by the Legislature. The long-term management goals for Jackson Demonstration State Forest are (these goals are described in more detail in Appendix II):

1. Improve the amount and quality of information concerning economic forest management and timber management methods that is available to the general public, small forest landowners, resource professionals, timber operators, and the timber industry.
2. Manage the forest on the sustained yield principle, defined as management which will achieve continuous high yields of timber production that sustain local employment and tax revenue, consistent with environmental constraints related to recreation, watershed, wildlife, fisheries, and aesthetic enjoyment.
3. Promote and maintain the health, sustainability, ecological processes, and biological diversity of the forest and watersheds during the conduct of all land management activities.
4. Work towards achieving a balanced mix of forest structures and attributes in order to enhance forest health and productivity.
5. Plan for and provide low impact recreational opportunities that are compatible with forest management objectives and healthy ecological processes, and that are consistent with historic recreational use characteristics.
6. Develop, maintain, and update management plans and other planning documents and processes and keep them current. Manage and support the information needs of all State Forest programs.
7. Protect the forest from damage and preserve the peace within.
8. Maintain a program that provides an opportunity for the public and small businesses to purchase minor forest products.
9. Improve the boundary layout of the State Forest to facilitate management logistics and increase demonstration and research opportunities.

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 1930's.

The original J. G. Jackson Company was later incorporated as the Caspar Lumber Company in 1883. Despite periodic financial and catastrophic hardships (a new mill was built in 1898 after the original mill was destroyed by fire) the company remained in the Jackson family. The company lands gradually expanded into Jughandle Creek and Hare Creek as the old growth redwood stands near the coast were depleted and the owners were forced to search progressively inland for timber.

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. 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 1860's, most of the Forest can be assumed to have been virgin old growth. The coastal watersheds were all very heavily cut up until the 1930's 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 1800's witnessed the introduction of railroads and steam yarders. Most of the stands from the coast inland, up to the Chamberlain 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.

Caspar Lumber Company started partial cutting on the East End of the Forest in the 1930's, 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 1950's and 60's. 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. Existing forest structure characteristics play a part in determination of current and planned management of the Forest.

In the late 1950s, after most of the old-growth areas within JDSF had been entered, management 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, and South Fork Noyo watersheds during the 1960's.

Management of JDSF continues to make use of both even-aged and uneven-aged systems. A range of silvicultural methods are in use on the Forest, for research and demonstration projects as well as operational forest management (Lindquist 1988). Harvest on JDSF generally involves longer rotations and less frequent re-entries than on most industrial timberlands within the region. As a result, many of the restrictions on timber management described in this document have been under implementation for some time.

Chapter 2. Current Management Situation

Background

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. Of these, one is partially owned by the Hawthorn Timber Company; the remainder 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 the Pioneer Timber Company.

The western boundary of the State Forest comes within about 1½ miles of the coast at the mouth of Hare Creek. The Forest extends inland (eastward) about 16½ miles to near the ridge separating the coastal Noyo and Big River watersheds from the interior Russian River watershed. The north/south dimension varies from over seven miles at the western end of the Forest to as little as 2½ miles at the center.

For the most part, the Forest boundary follows section lines and subdivisions. This irregular configuration often complicates road access and the layout of management areas adjacent to neighbors. Across much of the northern boundary, and for small sections of the southern boundary, the property line is a ridge-top meander line.

Special Concern Areas

It is important to recognize areas of special concern within the State Forest where management options are limited or constrained in some way, or where achievement of particular management objectives has dictated a certain type of activity. Some constraints are imposed by external influences such as physical or biological limitations, legal requirements, or Forest Practice regulations. The major areas affected by these constraints are:

- Cypress groups.
- Pygmy forest.
- Jughandle Reserve.
- Eucalyptus infestation area.
- Inner gorges.
- Shallow landslide potential areas.
- 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.

Major areas affected by management policy-driven and objective-driven constraints are:

- Reserved old growth groves.
- Late seral development areas.

- Campground buffers.
- Conservation camps.
- Road and trail corridors.
- Parlin Fork management area.
- Research 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. The complete list, including descriptions of management option limitations and the area in each category, is presented in Appendix III. The approximate locations of these Special Concern Areas are shown in Figure 5.

Public Trust Resources

Similar to forested landscapes throughout the region, Jackson Demonstration State Forest supports a wide variety of uses and serves many environmental functions. Other than providing forest products, Jackson supports public trust resources such as soil, air, fish and wildlife, water, historic and prehistoric sites and artifacts, recreation opportunities, and aesthetic values.

Managing this array of resources and values can require choices and finding balance among occasionally incompatible entities. As described in Chapter 1, legislation, regulation, and policy have established the primary purpose for creation of the State Forest as demonstration of economic forest management. While this appears to designate a priority to timber production, other resource values must also be considered. The degree to which these other resources are considered in relation to timber and to each other has evolved over time in response to changing perspectives, public and government interest, and the growth of scientific knowledge about the function and management of forest ecosystems.

In recent years there have been substantial additions to the legal protections provided to fish and wildlife resources. These protections have evolved in part due to the listing of coho salmon and steelhead trout under the federal Endangered Species Act, amendments to the Forest Practice Act to consider watersheds with threatened and impaired values, and increased expectation for survey of plant and wildlife species of concern during preparation of timber harvest plans.

Public Ownership

As a publicly owned resource, Jackson Demonstration State Forest is held in trust and managed for the benefit of the people of California. The primary benefits that the public derive from the Forest were defined by the State Legislature. The Legislature delegated State Forest policy authority to the Board of Forestry and Fire Protection and management authority to the Director of the Department of Forestry and Fire Protection.

Past Management Plans

Management plans were prepared for Jackson Demonstration State Forest in 1958, 1964, 1970, and 1983. As might be expected, each plan has been more complex and comprehensive than the one being replaced or revised, and each has reflected the development of new thinking about forest management and what a demonstration state forest can contribute to the welfare of the people of the State.

The 1983 plan can be characterized as a plan to improve the resources available for more sophisticated ongoing planning. It contained the following elements:

- A system of management units to demonstrate various approaches to achieving different forest management objectives, including demonstrations of silvicultural alternatives.
- A new set of tree volume equations, which were developed after a fall-and-buck study in 1984.
- A more intensive forest inventory system.
- A proposal to base harvest levels upon a desired level of growing stock rather than the simple harvest of annual growth.
- An emphasis of the importance of the demonstration program.
- A ranking of the demonstration program's clientele groups and of the appropriate fields of investigation.

Major accomplishments since 1983 have included:

- Addition of a silviculturist, timber sale preparation specialist, GIS technician, law enforcement officers, road program manager, education forester, recreation assistant, and heavy equipment operator to the forest staff. Additional money were provided in the Forest budget for road management, timber stand improvement, recreation, and additional temporary help.
- Delineation of management units and assignments of general silvicultural systems to each one.
- Establishment of an intensive forest inventory system.
- Completion of the North Fork phase of the cooperative Caspar Creek Watershed Study.
- Staging two significant professional conferences, one on redwood ecology and management and the other on research in the Caspar Watershed.
- Successful transition from harvesting primarily in residual old growth stands to working entirely in second growth stands.
- Performing cultural activities that have established vigorous, well-stocked third growth stands following regeneration harvests.
- Adopting modern methods for protecting and enhancing wildlife habitat, including demonstrations of practical methods of restoring habitat for anadromous salmonids.
- Compilation of data and information, and development of management strategies for state-of-the-art planning processes.
- Inclusion of public input in planning for the Forest's future.

Forest Management

Current forest management on JDSF is characterized by a timber program that is biologically and economically sustainable. Over any rolling five year period, harvest averages about 1.5 percent of inventory. This allows the Forest to meet its demonstration mandate of sustainable and economic forest management, and also keep the maximum number of options open for future research projects. The economics of forest management under an endowment of a high standing inventory level and several objectives in addition to profit maximization has not been well researched. JDSF is uniquely suited as a research site for answering these questions, and the management of the Forest continues to keep a wide range of options open for future management and research.

Each timber sale either has a specific demonstration component or it contributes to the general forest-wide demonstration of silvicultural systems, yarding systems, and maximum sustained production. Timber is harvested under the demonstration mandate of sustained yield at the Forest level. The timber management program on the Forest constitutes a demonstration of sustainability that augments forest capital and builds a progressively higher inventory of mature second-growth conifer stands.

Forest Structure

The forest is currently dominated by second-growth stands of redwood and Douglas-fir. Within these stands are varying amounts of conifer species such as hemlock and grand fir. Bishop pine is a minor component of conifer stands towards the west end of the Forest. Tanoak and madrone typically occupy a mid to lower canopy position within most forest stands, being more prevalent towards the eastern end of the Forest. Residual old-growth conifer trees are present in many stands, being most prevalent towards the East End of the Forest that was subjected to selective cutting of the original old-growth stands.

The age class distribution among the timber stands of the Forest is due primarily to the pattern and practice of historic timber harvest activity. Stand ages vary between seedling and sapling stage and over 100 years of age. There are a few remnant stands of virgin old-growth within the Forest. Stand structures vary greatly, from closed-canopy even-aged second-growth, moderately open selectively harvested stands with multiple canopy layers, and vigorous stands of reproduction.

Structural components reminiscent of decadent or late-seral forest stands (e.g. snags, down logs, live trees with cavities and large limbs) exist throughout the forest, but at relatively low levels.

Approximately 1,572 acres of the Forest consist of vegetation types other than conifer stands, such as pygmy forest, grass, and brush.

The property has been conservatively harvested, resulting in a relatively high volume of standing timber that currently averages approximately 43 thousand board feet per acre. Because growth exceeds harvest, the forest continues to build inventory.

Resource Inventories

Estimates of timber volumes and other vegetation characteristics are derived primarily from a system of plots referred to as the JDSF Intensive Forest Inventory (IFI). This system of plots was established in 1989 and augmented in 1997 to account for harvested areas and under-represented timber types. In total, the IFI system incorporates 1,896 individual inventory plots (1,506 from 1989 and 390 from 1997).

The 390 supplementary plots from 1997 along with the 1,506 surviving 1989 plots provided sufficient data to compute volume and growth and yield estimates for all commercial vegetation strata occurring on the forest.

The JDSF IFI is based on a stratified random sampling design. The IFI plots were located on randomly selected points of a 10-chain grid. The plots were installed as 3-plot clusters or single plots, with each plot being comprised of three nested fixed radius plots. Trees 11 inches and greater were measured on the largest plot (1/5 acre). Trees 7 inches and greater were measured on the intermediate plot (1/20 acre). Trees smaller than 7 inches were tallied by 2-inch classes on a 1/100 acre regeneration plot. Tree measurements included species, diameter breast height and live crown ratio. A subset of trees was also measured for total height, defect, and 10-year radial increment. JDSF is moving toward a stand-based inventory in which a portion of the Forest will be inventoried annually.

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 rectangular plots was installed throughout the Forest. The system was designed to track changing forest conditions and structures within reasonable tolerances for the Forest overall. Six measurements have been completed since 1959 using the original plot design (1959, 1964, 1969, 1974, 1979, 1984). In 1989, with the implementation of the new intensive forest inventory system, the CFI system was transitioned into the new system by using only the center one-fifth acre circular plot area similar in plot design to the rest of the new system. In 1999, the first re-measurement of these one-fifth acre plots was completed, corresponding to 40 years of tree measurement data.

The sustainable constrained harvest level modeled for JDSF is about 43 million board feet per year (potential sustainable harvest projected during the last decade of a 120-year planning period). Historical harvests on the Forest have averaged 29 million board feet per year over the past 20 years.

Timber Sale Program

The State Forest plans for 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 $60,000 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 have a limit of $10,000, and typically include firewood, split products, poles, greenery, and mushrooms. The Department of General Services exempts CDF 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 are between 5 and 12 million 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 harvest 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 CDF Forest Practice inspectors on the sales which they administer. Although sale administrators, as Registered Professional Foresters and as CDF employees, have a duty to enforce the Forest Practice Act and Rules, there is potential of a perception of conflict of interest. It is important that there be oversight of Act, Rule and THP compliance by CDF inspectors that are not State Forest staff. State Forest sale administrators are expected to recognize and report apparent Forest Practice violations, but should not be asked nor given the authority to encroach on the jurisdiction of CDF's Forest Practice program in determining that something is not a violation.

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.

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 State 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, and access road designation.

Greenery:

Permits to collect greenery are available to the public. Very little of this activity occurs as a general rule, 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.

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 timber harvest operations in proximity to the Camp without bringing loggers and inmates into potential contact.

In 1992 it was determined that a permanent solution to this problem was needed. It was decided to delineate a 312-acre area around the Conservation Camp where the timber resource would be managed by CDF Camp personnel and harvested with CDF 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 CDF 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, with harvests generally conducted annually. Applied management objectives that simulate those of a non-industrial private timberland owner are described in the plan.

After allowing for protection of riparian zones, deleting non-forested areas, and providing a camp area buffer, there are approximately 240 acres remaining that are available for active timber management. This net acreage is divided into 15 units, each of about 16 acres. The group selection method is implemented by harvesting in one unit each year, regenerating about three acres in group openings and conducting a stocking control and stand improvement commercial thinning in the remainder of the unit. Thus, each unit will be treated on a 15-year cutting cycle. Up to four acres in each unit will be made available for retention of large trees, protection of identified wildlife habitat elements, and development of late-seral habitat characteristics.

Non-commercial cultural treatments include site preparation, prescribed burning, artificial regeneration, manual release, and pre-commercial thinning.

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 or supervised by a CDF 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.

Wildlife, Fish and Plants

Unique Habitat Types

Compared with most large private ownership in the region, JDSF has an abundance of mid- to late-seral stage forest, but like most of the region, stands of old-growth forest are small and fragmented. There are 11 known old-growth groves designated on JDSF, totaling 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.

Several rare and sensitive habitat types, in addition to patches of old-growth forest, can be found on JDSF. Mendocino pygmy forest, a unique ecological system recognized by the California Natural Diversity Database as a sensitive plant community type, occurs on JDSF and adjacent State Park lands. This rare plant community occurs only in coastal Mendocino County. Pygmy forest on JDSF is concentrated along the western edge of the Forest. Another sensitive community that occurs on JDSF is *Sphagnum* bog, two examples of which can be found on JDSF and another on private lands. Streams, riparian areas, and a few isolated ponds provide valuable habitat for aquatic plants and animals, as well as amphibians and terrestrial wildlife. In a few cases, stream margins and some isolated seeps and springs support small wetlands on JDSF. Other unusual habitat types occur outside of JDSF and include northern coastal salt marsh, coastal brackish marsh, coastal and valley freshwater marsh, and grand fir forest. 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. A single sizable meadow (Bob Woods Opening), which supports native perennial grasses, is located on JDSF in the North Fork South Fork Noyo watershed. A large plantation of non-native eucalyptus is located in Caspar Creek. Physical features such as coastal dunes, and serpentine or peridotite (ultramafic) soils, which support rare community types in the region, are not known to occur on JDSF.

Old-growth Forests:

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. “Old-growth” as a forest condition has not been specifically defined given the variety of social and biological values assigned by the general public and resource management professionals. 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. Similarly, many of the suppressed or intermediate redwood trees retained after logging activity in the 1880s and early 1900s have been released from competition and now appear to be second growth trees, but in reality possess an "old-growth" core. Descriptions of old-growth have historically been based largely on social perceptions of old-growth values rather than legal precepts or biological principles. For management purposes, remnant old-growth groves have been identified and protected, along with specific stands of residual old-growth forest and individual large trees with structural characteristics of value to wildlife.

Pygmy Forest:

The pygmy forest is a unique and declining ecological community (Sholars 1984). The small, closed-cone coniferous trees found in the pygmy forest are the result of acidic, sterile, podzolized soils that are underlain by a shallow impervious hardpan, which creates impoverished soil conditions that only specialized plants can tolerate. Pygmy forest is primarily confined to a narrow discontinuous strip up to several miles wide along the Mendocino County coast (Barbour and Major 1988). Approximately 613 acres of pygmy forest is located in JDSF, which represents about 30 percent of the pygmy forest found in Mendocino County, and 15 percent of the pygmy forest found in California (and worldwide).

Hardwoods:

Madrone, canyon live oak, tanoak, California bay, chinquapin, red alder, bigleaf maple, willow, and eucalyptus (a non-native species) are the representative hardwoods found on JDSF. Alder, maple, and willow are generally restricted to riparian areas. There are very few stands consisting entirely of

hardwoods, although some riparian areas in the western area contain relatively pure stands of alder. There is a large area of eucalyptus interspersed with native species in the Caspar Creek watershed.

Wetlands:

The wetlands on JDSF are small in extent, but of high public interest and biological value. They include two S*phagnum* bogs and numerous springs and seeps. It is likely that some poorly drained areas in the pygmy forest also meet wetland criteria. 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).

Riparian Zones:

Streams and associated riparian zones provide a proportionately large amount of valuable public benefit in the form of wildlife and fish habitat, clean water, and recreational opportunity. These zones are also among the first to exhibit the effects of improper management and a departure from the production of desired values. Riparian areas form a critical link between the terrestrial and aquatic environments, exerting a strong influence on the biological and physical processes that create and maintain aquatic habitats. Riparian vegetation contributes large woody debris (LWD) which provides shade that moderates stream water temperatures; influences aquatic and terrestrial food webs by contributing organic matter and nutrients to streams; helps stabilize stream banks, maintains channel bed form, stores sediment; affects nutrient cycling processes, instream flows, water quality, sediment transport; and provides important habitat for a variety of plants and animals.

General Forest Habitats:

A study reported in 1992 (Kitchen) evaluated 205 different locations within the Forest for habitat type as developed by the Wildlife Habitat Relationships (WHR) system (Mayer and Laudenslayer 1988). Each location was visited in the field. The locations evaluated corresponded to forest inventory plots selected randomly from a grid system laid over a map of JDSF. The study was not intended to seek out rare or uncommon habitat types, but was intended to represent a general cross-section of the Forest selected on a random basis. A total of 19 WHR habitat types were found in the survey. The most common types found within JDSF were R4D and D4D (dense redwood or Douglas-fir forest with mean stem diameter 18-24 inches), which occurred at approximately 60 percent of the sample locations.

Approximately 10 percent of the sampled locations were in dense forest habitat types with a mean stem diameter over 24 inches (R5D and D5D). There were no plots representing habitat type WHR 6. This is understandable, given the management history of the Forest. Multiple canopy layers are beginning to develop in stands selectively harvested over the past 40 years. Eventually, many of these stands are expected to develop layered characteristics and structural habitat elements if managed as planned.

The remainder of the sample plots were in habitats of lesser density or smaller average stem diameter. Eight plots (4 percent of total) were in habitats with an average stem diameter less than 11 inches.

A need has been identified to produce a more detailed forest and habitat type map of the Forest. Such a map is currently scheduled to be produced within the next few years.

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.

Snag Retention, Recruitment:

Snags are important structural components of the forest ecosystem, and the dependency of wildlife species on snags ranges from incidental to absolute. According to the California Wildlife Habitat Relationships system database, 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 forest inventory plot 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. The estimated current average density of snags (1.9 snags per acre, 0.5 of which are at least 20 inches DBH and 0.1 of which is at least 30 inches DBH) is substantially less than the guidelines for special wildlife concerns areas such as Class I and II watercourse and lake protection zone (WLPZ), old-growth grove reserves, marbled murrelet management areas, and northern spotted owl nesting areas (3 snags per acre, 2 of which are at least 20 inches DBH and one of which is at least 30 inches DBH).

Large Woody Debris:

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.

Biological Diversity

Biological diversity can be defined as the variety and variability of living organisms and the ecological complexes in which they occur. Biological diversity is an important ecosystem characteristic for a variety of ecological, economic, and aesthetic reasons. It is likely that science will never fully understand the dynamics and interrelationships of ecosystem function. Nevertheless, complete knowledge is not a prerequisite to recognition that retaining the diversity of components, structure, and processes of ecosystems is important to future forest productivity.

The current mix of forest seral stages on JDSF results in a high level of species richness. Habitat for a total of 325 terrestrial vertebrate species (amphibian, reptile, bird, and mammal) potentially occurs within JDSF (CDFG 1996). This represents the maximum number of species that could occur in the area if other

aspects of their 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.

Species of Concern

A total of 18 vertebrate and 6 plant species of concern currently occur or may have a high probability of occurrence on Jackson Demonstration State Forest and are considered specifically in the management plan (Table 1). 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, 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 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. JDSF will develop appropriate management strategies for those species as necessary.

TABLE 1. Species of Concern Occurring or with a High Probability of Occurrence on JDSF.

Species	Legal Status				Local Distribution			
Common Name *Scientific Name*	Federal[a]	State[b]	BOF[c]	CNPS[d]	North	South	East	West
Southern Torrent Salamander *Rhyacotriton variegatus*	1	1						X
Tailed Frog *Ascaphus truei*	1	1			X			X
Northern Red-Legged Frog *Rana aurora aurora*	1	1			X	X	X	X
Foothill Yellow-Legged Frog *Rana boylii*	1	1			X	X	X	X
Northwestern Pond Turtle *Clemmys marmorata marmorata*	1	1						X
Marbled Murrelet *Brachyramphus marmoratus*	2	2	1					X
Osprey *Pandion haliaetus*		1	1		X			X
Cooper's Hawk *Accipiter cooperi*		1			X			
Northern Goshawk *Accipiter gentilis*	1	1	1					
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
Yellow Warbler *Dendroica petechia brewsteri*		1					X	X
Purple Martin *Progne subis*		1						X
California Red Tree Vole *Arborimus pomo*		1			X	X	X	X
Pacific Lamprey Lampetra tridentata	1				X		X	
Coho Salmon *Oncorhynchus kisutch*	2				X	X	X	X
Steelhead *Oncorhynchus mykiss*	2				X	X	X	X
Pygmy Cypress *Cupressus governiana ssp. pigmaea*	1			1B		X		X
Bolander's Pine *Pinus contorta ssp. bolanderi*	1			1B		X		X
Pygmy Manzanita *Arctostaphylos mendocinoensis*				1B		X		X
Coast Lily *Lilium maritimum*	1			1B		X		X
Humboldt Milk Vetch *Astragalus agnicidus*	1	2		1B	X			
Swamp Harebell Campanula californica	1			1B				X

[a] 1=Species of Concern; 2=Threatened
[b] 1=Species of Special Concern; 2=Endangered
[c] 1=Sensitive
[d] 1B=CNPS rare, T/E

Watersheds

About 30 percent of JDSF drains into the Noyo River watershed, 45 percent into the Big River basin, and 25 percent into small coastal streams. Fifteen planning watersheds (1) drain significant portions of JDSF ownership. The amount of JDSF land in each of the 15 planning watersheds ranges from about 3 percent to 99 percent. The total amount of JDSF land in the 15 planning watersheds is 51 percent. Several watershed-related attributes for these planning watersheds have been summarized below. Management practices described in Chapter 3 for both riparian zones and hillslope areas were developed using the information presented in this section, as well as information provided by field personnel describing ongoing efforts for both planned and future management.

Climate

Jackson Demonstration State Forest has a Mediterranean climate, characterized by a pattern of low-intensity rainfall in the winter and cool, dry summers with coastal fog. Mean annual precipitation is 39 inches at Fort Bragg (CDWR 1997), but measures higher in more inland and high-elevation portions of the Forest. In the Caspar Creek watershed, annual means of 51 inches and 45 inches have been recorded at the North and South Fork gauges, respectively (Ziemer 1998a). Mean annual precipitation at the eastern edge of JDSF is about 70 inches based on isohyetal information. About 90 percent of the precipitation in this area occurs between October and April, with the highest average precipitation in January. About half the precipitation that falls eventually becomes runoff. Snowfall is very rare, and rain-on-snow events are not a significant factor in generating runoff from the Forest.

Air temperature and evapotranspiration are strongly influenced by the extent of the coastal fog belt, which typically extends about 10 miles inland during summer nights, generally burning off to the coast by afternoon. The mean monthly air temperature, measured in the Caspar Creek watershed between 1990 and 1995, ranged from 60° F in July and August to 44° F in December (Ziemer 1996). The monthly average maximum air temperature at the same location was 72° F in July, and the average minimum was 40° F in December. Because of the temperature gradient from the coast to inland areas, evapotranspiration is greater inland and at higher elevations than it is near the coast.

Soils

Throughout the forested areas of JDSF, soils are chiefly characterized by slightly developed inceptisols and base-depleted ultisols that developed under forest cover (Donley et al. 1979), with alfisols also found in the eastern portions of the Forest. In the eastern one-third of JDSF, soils are predominately the Ornbaun-Zeni and Vandamme series. These soils are well-drained and form from weathered sandstone (Ornbaun-Zeni and Vandamme) and mudstone (Ornbaun-Zeni). In the western part of the Forest, the Irmulco-Tramway series is the most common soil type; these soils are loamy, well-drained, and form from weathered sandstone. In the North Fork Caspar Creek basin, Irmulco-Tramway soils typically are found on the middle portions of hillslopes (Napolitano 1996). Vandamme soils, which are found on upper portions of hillslopes and on ridges, are also common in the western two-thirds of the Forest. Gravelly Dehaven-Hotel complex loams often characterize inner gorge areas and the bases of hillslopes in the North Fork Caspar Creek basin (Napolitano 1996). Soils found on marine terraces include the Cabrillo-Heeser, Ferncreek, Quinliven-Ferncreek, Shinglemill-Gibney, and Caspar-Quinliven series; many of the soils in the flat marine terrace areas are poorly drained. Marine terrace soils are largely sandy and range from shallow to deep. This and other local soils information is available in the Soil Survey of Mendocino County, Western Part, California (NRCS 1987).

1 Planning watersheds are typically 10,000 acres or less in size and are used in planning forest management and assessing impacts. See the following website for planning watershed boundaries: http://frap.cdf.ca.gov, click on "Major Projects", then "Watersheds", then "Salmon and Watersheds Mapping Tool."

Geology

JDSF is located in the Coast Range physiographic province of northern California which includes three northwest trending geologic belts progressively older to the east: the Coastal Belt, Central Belt and Eastern Belt of the Franciscan Assemblage. These geologic units were formed 38 to 80 million years ago during the Tertiary and Cretaceous periods. Younger, Quaternary Era (2 million years to present) geologic features and sources of sediment that influence stream channels include marine terraces, dune deposits, colluvium, landslide deposits, and alluvium. Rapid tectonic uplift resulted in the formation of multiple marine terraces along the northern California coast. During the most recent period of uplift in the last 11,000 years, stream channels became deeply incised, resulting in naturally high mass wasting and erosion rates.

The Coastal Belt terrain underlies more than 90 percent of the planning watersheds draining JDSF, the Central Belt terrain forming the remaining bedrock exposed in the east. Rocks of the Coastal Belt terrain consist of structurally deformed, massive, hard marine sedimentary sandstone and shale inter-bedded with small amounts of limestone, pebble conglomerate, and Mesozoic volcanic rocks (Blake et al 1985, Wahrhaftig and Birman 1965). High erosion rates are characteristic of portions of the Coastal Belt terrain, where hillslope erosion is dominated by shallow debris slides and deep-seated landslides.

The Central Belt geologic terrain occupies less than 10 percent of the area encompassed by the 15 planning watersheds draining JDSF, including an area of the eastern headwaters of the Upper North Fork Big River planning watershed. The Central Belt terrain is an assemblage of fragmented and sheared Franciscan Complex rocks and Mesozoic Era volcanic and metavolcanic rocks (Blake et al 1985, Wahrhaftig and Birman 1965). Rocks of the Central Belt are predominantly melange (Blake et al 1985). Melange is composed of a matrix of pervasively sheared shale containing discontinuous blocks ranging in size from a few feet to miles of sandstone, chert, high-grade blueschist, serpentine, and serpentinized ultramafic intrusive rocks. Earthflows are especially prominent in the Central Belt terrain and mass wasting rates are typically higher than in the Coastal Belt. The Central Belt's characteristically unstable and erodable sheared shale and melange is prone to mass wasting even on low-gradient slopes.

Along the coastal part of JDSF, as many as seven Pleistocene (2 million to 11,000 years ago) marine terraces have been carved in Coastal Belt bedrock. These terraces were formed by a combination of major changes in sea level and incremental uplift of the Mendocino County coast in the late Pleistocene (Lajoie 1986). They are characterized by low relief, not exceeding 180 feet per terrace, are broad, flat, and moderately deformed in shape, and are tilted a few degrees in some areas (Wahrhaftig and Birman 1965). These terraces are deeply incised by coastal drainages. Marine terrace deposits are composed of quartz sand and small amounts of gravel and are generally at least 33 feet thick.

Topography

The terrain on JDSF becomes steeper and more rugged moving from west to east. Elevations range from near sea level to over 2,000 feet at the eastern boundary. Planning watersheds draining JDSF are characterized by mean hillslope gradients ranging from 10 percent (Mitchell Creek planning watershed) to 50 percent (Upper North Fork Big River planning watershed). Average hillslope gradients are lowest for the western planning watersheds and highest for the eastern watersheds. The landscape is also characterized by moderate to high relief (elevational differences on a valley-ridge scale of up to 900 feet). The terrain is distinguished by the presence of northwest-trending mountain ranges and intervening valleys. The structure of these ranges is shaped by the trend of the San Andreas Fault Zone that forms the boundary between the Pacific and North American tectonic plates. The San Andreas Fault zone is located about five miles offshore of Fort Bragg, just west of the Forest. Main rivers flow primarily west and northwest, draining to the Pacific Ocean. Some stream channels are locally controlled by weak rock in faults, shear zones, erodible bedrock, synclines, and joint systems.

Hydrology

A USGS stream gauging station has been operated on the Noyo River since 1951. Large runoff events have occurred in 1955, 1964, 1974, and 1993. Streamflow has been measured in the Caspar Creek basin since water year 1963, with large runoff events documented in 1964, 1966, 1974, 1993, and 1999. 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 1998b). This project has been carried out jointly by the USFS and CDF since 1962. The North Fork phase involved clearcutting 50 percent of the watershed over seven years. Five tributaries were 100 percent clearcut, and larger downstream watersheds were 30-50 percent clearcut. The results of the project were published in 1998 as the proceedings of a conference held in Ukiah (Ziemer 1998b). The basins that were 100 percent clearcut had mid-winter peak flows that were increased on average about 30 percent (the response ranged from about 10 to 80 percent, depending on soil wetness and the number of years since logging) for storms that occur once every two years. Early fall storms had increases of up to 300 percent, when the soils in the cut watersheds were much wetter than the uncut basins. For the entire North Fork that was 50 percent clearcut over seven years, mid-winter peaks increased about 9 percent for 2-year recurrence interval storm events. Based on Caspar Creek watershed data, detectable effects of logging on peak flows were found to be a function of four variables: 1) the proportion of the watershed logged, 2) the number of years since logging, 3) the size of the peak in the control watersheds, and 4) the wetness of the watershed at the beginning of the storm (Lewis et al in press, Rice et al in press). Hydrologic recovery is occurring at a rate of about 8 percent per year—with full recovery expected in about 13 years (Lewis et al in press).

Surface Erosion, Road-Related 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.

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 1950's to the 1970's. 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.

Mass wasting on JDSF is dominated by: 1) shallow debris slides associated with roads, 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. Tools used to evaluate mass wasting hazard includes aerial photographs, DMG geomorphic maps, field mapping, and a distributive computer model of shallow landslide potential based upon digital elevation information denoted as SHALSTAB (Dietrich et al 1992, Dietrich et al 1993 Montgomery and Dietrich 1994). The key variables for SHALSTAB are drainage area and local slope. The ratio of precipitation to soil transmissity is calculated and used to assign relative landslide hazard. Overall, about 9 percent of JDSF was modeled to be in the chronic, high, and moderately high instability classes generated by SHALSTAB. Comparison of aerial photograph mapped landslides with predicted landslide areas demonstrated that the model performed reasonably well. About

63 percent of mapped non-road related landslides were found in areas predicted to be least stable. The eastern planning watersheds were calculated to have the highest shallow landsliding hazard.

Rapid Sediment Budget

A rapid sediment budget has been developed for the planning watersheds draining JDSF. A sediment budget includes estimates of hillslope erosion, sediment yield to channels, and changes in sediment storage within channels. Results include estimates of surface erosion and mass wasting described above. Estimates were provided for the period from 1958 to 1997, since 1978 and 1996 air photos provide a record of landsliding covering the period from 1958 to 1996. Separate budgets could not be constructed for the periods from 1958 to 1978 and 1978 to 1997 due to lack of substantial fieldwork, but separate rates of landsliding were produced. Therefore, the overall sediment yield estimate encompasses a very wide range of forestry practices.

The rapid sediment budget projected that road-related surface erosion and road-related landsliding accounted for 74 percent of the sediment delivery; 19 percent came from hillslope landsliding (non-road related), surface erosion, and creep; and 7 percent originated from release of channel stored sediment (due to large woody debris (LWD) removal). Average sediment yield was estimated as 856 $t/mi^2/yr$ for the period from 1958 to 1997, approximately a 2.5 fold increase over background rates. Two results show that improved forestry practices with the use of the modern Forest Practice Rules (i.e., after 1974) have significantly reduced sediment yields in the past two decades. Logging conducted prior to the implementation of the modern rules in the South Fork of Caspar Creek produced from 2.4 to 3.7 times more suspended sediment compared to that produced in the North Fork (Lewis 1998). Most of the increased suspended sediment load generated in the North Fork resulted from one large landslide that occurred in January 1995 (Lewis et al in press). Overall, sediment production over three decades in Caspar Creek has averaged about 550 $t/mi^2/yr$. In addition, the amount of sediment resulting from road related shallow landslides from 1979 to 1996 for all the planning watersheds draining JDSF was approximately half that found during 1958 to 1978. Erosion from road related shallow landslides and surface erosion is expected to continue dropping as the Road Management Plan (see Appendix VI) on the State Forest is implemented.

Fluvial Geomorphology

The most significant impact to stream channels located within JDSF boundaries has been the widespread removal of LWD from low gradient (0-4 percent) stream channels from the 1950's to the early 1990's. This 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-1970's 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.

Current Condition of Aquatic Resources

The current condition of aquatic resources has been evaluated, 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. 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 were 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). 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.

Overall, it is likely that salmonid habitat in the planning watersheds is near current carrying capacity in most years, based on out-migration data. This is supported by evidence of relatively high annual variability in the number of age 0+ salmonids out-migrating and relative stable numbers of out-migrating age 1+ salmonids. Impacts of past management have reduced the amount of suitable habitat available. An increase in the amount of usable rearing habitat is expected to provide the greatest increase in salmonid production.

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.

Regional Economic Role of Jackson Demonstration State Forest

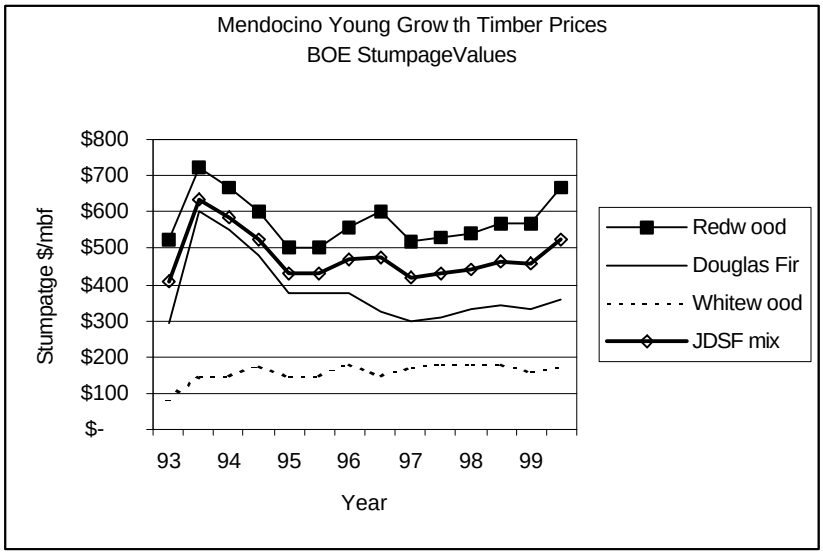
The objectives of the Jackson Demonstration State Forest Management Plan reflect the research and demonstration mandate of the Forest. The primary objectives of the Plan are to maintain healthy forested landscapes, healthy streams and a financially viable timber management program, in a manner applicable to small and large landowners in the redwood region.

To achieve these objectives and to meet the JDSF demonstration mandate, CDF maintains a vigorous research and demonstration program requiring management flexibility to conduct potentially large-area studies, such as paired watershed experimental designs, to address public trust resource issues at a comprehensive landscape level.

From an economic point of view, JDSF provides four very different types of economic benefits – 1) timber and other commodity production, 2) diverse recreational opportunities, 3) research and demonstration results applicable to forest landowners on the North Coast of California, and 4) a proportionally greater allocation of forest resources towards relatively rare vegetation types and wildlife habitats than would otherwise be legally required from surrounding private lands. The first two types of economic outputs can be measured based on priced (e.g. timber stumpage) and un-priced (e.g. hunting access) goods and services. The last two types of economic outputs are difficult to precisely measure in the short term but do utilize a significant portion of the overall JDSF resources and contribute significantly to the central objectives of the role of a research and demonstration forest.

Sustained yield timber production

The current harvest level averages around 29 million board feet per year. After accounting for acres dedicated to ecological goals and research and demonstration projects, the Long Term Sustained Yield (LTSY) is calculated to be 43 million board feet per year with an average of 31 million board feet per year scheduled for harvest in the first decade (see Option "a" document). From 1988 to 1998, the stumpage sold consisted of 58 percent redwood, 33 percent Douglas-fir, and 7 percent other conifers. The following figure illustrates the stumpage price trends for the three major young growth species harvested on JDSF (nominal stumpage values). Projections of future stumpage revenue are based on the JDSF mix that has fluctuated around $500 per thousand board feet.



Source: California Board of Equalization Harvest Value Schedules

Hardwoods are also harvested but currently produce little direct revenue to the Forest. In addition to the fixed property taxes paid by JDSF, 2.6 percent of the overall yield tax (2.9 percent tax rate) based on stumpage value, is returned to Mendocino County from the State Board of Equalization (BOE).

Timber related employment

The timber program stimulates considerable direct employment related to the harvesting and milling of timber. The following table summarizes the economic impacts of current and other possible harvest levels. The current harvest level is projected harvest level under the Option A plan. The other levels are shown to illustrate the potential impacts if the harvest level was increased towards the long-term sustained yield (LTSY). The timber program on JDSF generates around 550 local jobs, $12 million in local wages, and $644,000 in local taxes.

TABLE 2. Economic Impacts at Different Harvest Levels. (2)

		Current Level	Midpoint between LTSY and Current	LTSY Level
Variable	Timber harvest MMBF	29	36	43
$500/mbf	Stumpage value	$14,500,000	$18,000,000	$21,500,000
2.6%of stumpage	Local yield tax	$377,000	$468,000	$559,000
Fixed by acreage	Property tax	$112,438	$112,438	$112,438
	JDSF timber staff	12	12	12
10 jobs/mmbf	Direct Timber Employment	290	360	430
8.5 jobs/mmbf	Indirect Timber Employment	246.5	306	365.5
$25,257	Direct Wages	$7,324,570	$9,092,569	$10,860,569
$20,714	Indirect Wages	$5,106,001	$6,338,484	$7,570,967
	Total Wages	$12,430,571	$15,431,053	$18,431,536
1.25% of wages	County Sales Tax	$155,382	$192,888	$230,394
	Local Taxes	$644,820	$773,326	$901,832
	Local Employment	549	678	808

Recreation and Personal Forest Products Collection

Jackson Demonstration State Forest is also open for public recreation including camping, biking, horse riding, hiking, hunting and target shooting. 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 14 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 four times as many visitor-days as overnight camping (50,000 days). Unlike the surrounding smaller State Parks, JDSF has more roads available for use and allows a much wider range of recreational uses (horse back riding, mountain biking, and hunting). Jackson does not collect any fees for recreational uses but does provide considerable public value to the visitors. Based on the estimated economic value of these recreational opportunities used by the US Forest Service in their 1990 publication 'Resource Pricing and Valuation Procedures for the Recommended 1990 RPA Program', the economic value of the recreational visits would be approximately $1.2 million annually.

In addition to providing opportunities for a wide variety of recreational activities, JDSF also permits the collection of a wide range of non-timber forest products for personal and small-scale commercial use. In 1999, personal use permits were given for over 800 cords of firewood and 139 mushroom collecting permits were issued. Commercial use permits were also sold for firewood (40 permits), mushrooms (29 permits), forest greens (5 permits), and specialty wood products (10 permits).

2 Sources: employment and wage data: California Economic Development Department (EDD) - ww.calmis.cahwnet.gov/htmfile/subject/indtable.htm www.calmis.cahwnet.gov/file/indh&e/allawe99.exe)); economic multiplier to estimate indirect timber employment: (Stewart 1993; (http://elib.cs.berkeley.edu/cgi-bin/doc_home?elib_id=1738)). Timber harvest values: California Board of Equalization (BOE) www.boe.ca.gov/proptaxes/pdf/harvcnty.pdf)

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 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. Much of the research and demonstration is focused on how different silvicultural practices can increase productivity while improving the environmental attributes of the forest and different management activities to reduce overall erosion and improve fish and wildlife habitats. 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 CDF, 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.

Ownerships of less than 500 acres comprise over 50 percent of the forested land base on the North Coast. Compared to industrial timberlands, non-industrial private forestland holdings have considerably lower total inventories and overall forest growth rates. A consistent pattern found across the whole region is the high hardwood stocking level that generates little or no revenue. 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. The need for continued forest research at JDSF for both non-industrial and industrial forestland could be presumed based on the extent of forestlands existing on the north coast as illustrated in the following table.

TABLE 3. Target for Research and Demonstration – Forests of the North Coast (3).

	Total Private	Industry	Non-indust. Prvt.
Forest Acres	3,342,000	1,461,000	1,881,000
Total Inventory per Acre	2.93	3.54	2.45
Conifer Inventory per Acre	1.61	2.24	1.11
Hardwood Inventory per acre	1.32	1.30	1.34
Conifer as Pct. of Total	55%	63%	45%
Forest Growth Rate	3.2%	3.6%	2.7%

Units: thousand cubic feet

Regional Natural Ecosystem Responsibility

A portion of the forest is off limits to timber management and is not developed for intense recreational use in areas where those uses would detract from the unique biological characteristic of the land. Examples of such areas include the pygmy forest, old growth groves and adjacent areas managed to enhance late-seral habitat values, northern spotted owl nest sites, and osprey nest sites.

3 Source: Waddell, Karen L. and Patricia Bassett. 1996. Timber Resources Statistics for the North Coast Resource Area of California. USDA Forest Service Pacific Northwest Research Station. (http://www.fs.fed.us/pnw/Prime/pdfdocs/nctabs.pdf)

Summary and Long Term Trends

The sustainable timber production program is the financial backbone of the Forest and is instrumental in financing the other programs that produce a range of economic benefits for a wide range of beneficiaries. While the timber harvests are projected to remain relatively stable over the planning period, increased investments in the recreational infrastructure and the research and demonstration program should substantially increase the benefits associated with those two programs. Both of these programs are associated with considerable economic benefits to the users of the recreational opportunities and to the relevant target audience for sustainable forest management demonstrations on the North Coast.

Public Concerns and Their Effect on Management

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.

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, generally thought of as not aesthetically pleasing in the short-term, 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

Camping:

In general, the public has requested that the availability of rustic campsites be increased. In response, the Department has initiated a process to re-open 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. 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:

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 and funding allow.

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 CDF 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.

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.

Stream channels are protected, and shade canopy is retained at or near pre-harvest 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. 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.

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.

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 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.

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. Riparian ecosystems will be protected or enhanced to provide for restoration in those areas.

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 beginning in fiscal year 2000/2001. However, much of the revenue generated on the State Forest will continue to be deposited in the Forest Resource Improvement Fund (FRIF), which provides monies to support other State programs, such as the California Forest Improvement Program,

the Forest Resource Assessment Program, and the Urban Forestry program. CDF's forest practice program (regulation of private timber operations) is no longer funded out of the FRIF.

Implement a Road Maintenance Program 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 VI). In addition, increased funds have been 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 staff in order to increase road maintenance capabilities. The road management program will be integrated with the demonstration and education programs to offer the public and private timberland owners information and first-hand experience with appropriate road management.

Even-Aged Management

Some individuals have requested 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.

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 constraints. The Forest will continue to meet the legislative mandate to manage for maximum sustained production of high quality timber products. As planned, the level of annual harvest will slowly increase over the coming decades, as the growth capacity of the forest increases.

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 not decline, and local jobs will not be adversely affected by the availability of timber from the State Forest.

Forest Certification

The Department has been requested to obtain independent certification of forest management activities for JDSF. The Department is currently considering certification for each of the state forests within the system.

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 Department's intention to increase the amount of research and demonstration conducted on the Forest, and to improve the dispersal of the information.

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.

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 an overabundance of hardwoods, an effort will be made to restore the stands to a conifer-dominated condition.

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 low thinning demonstration in the upper area of Thompson Gulch designed to eventually produce late-seral habitat with a large average tree size.

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, and to implement policies established by the Board of Forestry and Fire Protection. Logging and timber production are being planned to maintain JDSF as a demonstration of sustainable forest management for the benefit of the public, landowners, and professional land managers and regulators.

Old-Growth Management

Old growth stands will be preserved, and additional forest will be managed to develop late-seral 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.

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 no-silvicultural treatment designation to specified areas of the Forest. Much of the area dedicated to the production of late-seral 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.

Herbicides

There have been many requests from the public, as well as a recommendation from the Citizen's Advisory Committee, that the use of herbicides on the Forest be eliminated, and that alternatives to herbicide use be evaluated. In response to these concerns, the use of herbicides has declined substantially in recent years, and future management of exotic plant species and competing vegetation will rely upon an integrated pest management program. This program will utilize a combination of control methods and will rely much less upon herbicide use as a preferred method of choice. Please see Chapter 3 for more information on vegetation management plans.

A few comments received have requested the continuation or increase in the use of herbicides to control exotic species on the Forest. As stated above, herbicide use has declined substantially, and management of exotic species to restore and cultivate native plant species will integrate a number of control methods.

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, equestrian activities, 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.

The public has never been excluded from JDSF, except for temporary area closures and the areas around the two conservation camps. 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.

Public Use

Although there are signs at the east and west entrances to the Forest along Highway 20, access to campgrounds is not readily visible from the Highway. In some cases, there are small engraved wooden signposts that designate an entrance. 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 opening weekend of deer hunting season and close to full on 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.

A Recreation Master Plan was drafted in 1990 by contract with Community Development by Design to improve the recreation opportunities and address the interests and needs of Forest users reflected in the 1988 survey. Special Fund monies allocated by the Legislature sponsored two Forestry Technician positions from 1991 to 1993. Implementation of the Recreation Plan (still in draft form) began by focusing on improving existing facilities and establishing two additional campgrounds (Red Tail and Southbend) and one hiking trail (Camp One Loop Trail). Emphasis was placed on focusing camping opportunities in areas that are adjacent to Highway 20 or rivers, as these are the primary visitor-use areas, both historically and currently. Three outlying campgrounds, Berry Flat, Volcano, and Chamberlain Camp, were closed in 1992 as they were neither adjacent to a river nor Highway 20. Indian Springs Campground and Camp 6 were closed to vehicle access in order to provide hike-in only camping opportunities on the Forest. One additional campground, Forks Camp, was closed in 1995 to reduce enforcement problems. Many of the existing campgrounds have been improved to enhance the visitors' experience while maintaining the primitive aspect of camping on the Forest. Access roads were labeled and signs were made to identify the major recreational access roads from Highway 20.

The Recreation Master Plan also provided guidelines for limiting identified visitor-use conflicts. The Forestry History Trail main access was constructed and identified with a sign along County Road 408. An additional horse camp (Red Tail) was developed on the west end of the Forest. The Camp One Day-use area was redesigned and a permanent (bilingual) interpretive display of the Department of Fish and Game's Egg Collection facility was installed. A group campsite, Tilley Camp, was developed in the Camp One area. Big River Campground was closed for several years, primarily due to its unsafe access from Highway 20. A new access road was constructed in 2000 and the campground will be re-opened in the spring of 2001.

Several public scoping sessions were held in 1999 to include public interest issues relating to development of this management plan. Approximately 15 percent of the comments received were oriented towards recreation issues. The primary interests were to expand low-impact recreation by increasing the number of interconnected trails, providing walk-in campsites, and enhancing aesthetic quality by maintaining old-growth groves.

Facilities

Maintenance of existing facilities has been the primary recreation management objective for the past 7 years. As staffing levels and budgets varied over the years, priorities fluctuated. For example, for the past 5 years, the Camp 20 day-use area has been under-funded and perhaps as a result, underutilized. The majority of recreational facility maintenance has been made possible by utilizing crews from the two Conservation Camps located on the Forest. Refer to the Appendix 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 Ranger 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 well as 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.

Public Uses other than Recreation

Other than recreational use, JDSF is utilized extensively by the public for a number of activities, including: firewood cutting, collection of minor wood products (e.g. poles, split products), and collection of greenery and mushrooms. Permits are required for collection of any forest products on the State Forest. 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. Current collection limitations and pertinent data are included in Appendix VII.

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. For example, firewood collection is limited to dead and downed material, and is not allowed within the Watercourse and Lake Protection Zone or in areas away from roads. The vast majority of the Forest remains off limits to firewood collection, resulting in an overall increase in downed woody debris and snags over time. In addition, collection of deadwood from old-growth trees is not permitted, due to its decay-resistant value as a wildlife habitat element. Other constraints identified by Forest staff that preclude collection activities in a given area include access control, seasonal restrictions, vehicle use and volume limitations.

Camp 20 Highway Stop

A very 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 newly constructed 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.

Heritage Resources

Jackson Demonstration State Forest contains a variety of 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.

The history of archaeological research in the North Coast Region has been summarized by Fredrickson (1984). The archaeology of the outer coast range of Mendocino County is not well known. Various archaeological studies have been undertaken, but there are few published references. The cultural resource overview prepared for JDSF (Levulett and Bingham 1978) was one of the earliest major surveys in the redwood forest belt. Although considerable research has been conducted since that time, there has yet to appear a comprehensive synthesis of this information. Archaeological excavations in western Mendocino County, including studies at the Three Chop Village within JDSF, have made a substantial contribution to archaeological research in this region (Layton 1990).

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). This study included background information pertinent to the region; record search results; Native American consultation; field survey; the recordation of sites with maps, descriptions and site records; evaluations of the identified sites; an estimation of additional significant areas; and management recommendations. The survey for this overview covered approximately 1,430 acres and resulted in the recording of thirteen prehistoric sites, one ethnographic site, and one historic site.

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. An assemblage of stemmed points of Franciscan chert suggested a late persistence of this point form. A mid-nineteenth century component that included Chinese blue-on-white porcelain stoneware sherds and green bottle glass is believed to represent materials salvaged by Native Americans from the shipwreck of the brig *Frolic* near Point Cabrillo on July 26, 1850 (Layton 1990).

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. A second phase of this investigation attempted to visit as many of the previously identified locations as possible, and provide a brief description and preliminary significance assessment of these locations. This study focused on identifying historic Euro-American period resources, only noting prehistoric resources when they occurred at multicomponent sites. The purpose of this study was to provide JDSF with a useful document to achieve compliance with historic resource protection mandates.

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.

As of 1998, at least forty-seven archaeological surveys had been conducted within JDSF. Foster and Thornton (2000) have provided a listing of these surveys, most of which were carried out for the preparation of Timber Harvesting Plans and included only limited areas of land. As a result of these surveys, however, approximately 75 percent of the total acreage of the forest has been examined at least once for archaeological resources. These surveys have resulted in the identification of forty-nine archaeological sites and approximately 150 additional locations where minor historical features or artifacts have been documented. Most of these resource locations are from the historic era of Euro-American occupation.

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. Each site was posted with an aluminum K-tag to serve as a permanent reference point for future identification. 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. The initial overview prepared by Levulett and Bingham (1978) developed a typology for the prehistoric sites, categorizing them as

procurement sites, temporary seasonal camps, permanent occupation sites, and sacred ceremonial areas. Prehistoric artifact types most commonly encountered on the forest include flaked and groundstone tools and debitage including projectile points, bifaces, scrapers, waste flakes, manos, metates, and hammerstones. The historic era sites on the forest are primarily associated with early logging activities. Historic site types include logging camps, trash scatters, railroad grades, trestles, and a broad variety of isolated artifacts.

Current Practices

CDF 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 prefield research, Native American consultation, field survey, documentation of findings, preliminary significance assessments, and site protection measures. This report is prepared either by a CDF staff archaeologist or JDSF staff forester with the required archaeological training. Prior to the submission of a THP, written notification is provided to the designated Native American representative for the area which includes a request for information concerning the existence of any archaeological or historical sites within the project area along with locational information and a map for the project. All CAAs prepared for JDSF are reviewed by the CDF archaeology staff. The document is checked for completeness to insure that all required elements are present, such as the survey coverage map, the Native American contact letter, and site records for any newly discovered sites. The document is also evaluated to determine the adequacy of the prefield research, survey methods and coverage, and site protection measures. These issues may be further evaluated on the ground during the preharvest inspection.

Data Base

CDF maintains a comprehensive database of the known heritage resources located within JDSF. This information is housed at the CDF Archaeology Office in Sacramento, the Coast Cascade Regional Office in Santa Rosa, and JDSF Headquarters in Fort Bragg. This data base consists of archaeological site records, survey reports, resource location base maps, and artifact collections. These files are reviewed as part of the planning process for all projects on the forest with potential for site disturbance. 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 CDF data base.

A composite base map of all known heritage resource sites within JDSF is kept by the Forest Manager and the CDF 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.

Record Status

A recent archaeological investigation at JDSF has resulted in the relocation and complete 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

guidelines (CDPR 1995). The status of the site records for the numerous historic era properties within the forest range from complete site records to brief descriptions included in the historic resource inventory compiled by Gary and Hines (1993). Many of these historic sites have not been fully recorded.

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, approximately 75 percent of the total acreage has been surveyed for heritage resources, mostly during review of individual project undertakings. These surveys are conducted by a CDF staff archaeologist, JDSF personnel with CDF archaeological training, or a consulting archaeologist.

Protection Practices

All significant heritage resource sites identified as a result of THP planning are protected in accordance with Forest Practice Regulations. 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).

Current Impacts

In a recent study of the prehistoric sites within JDSF (Betts 1999), several potential impacts to archaeological sites were identified, including road maintenance, fire, and recreational activity. Some additional site degradation may occur over time, although specific causes have not been identified in all cases.

JDSF contains an extensive road network. The objectives of road maintenance have been found to conflict occasionally with the preservation of archaeological sites. Additionally, the utilization of day use and camping

facilities at the Camp 20 Recreation Area and at the Indian Springs Campground has resulted in impacts to the sites at these locations. Dispersed recreational activity may also cause impacts at some sites.

Data and Information Management

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

Most of these legacy data are stored separately in flat files. Most data are accessible, but 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 data base 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.

Staffing and Budget

Staffing

The level of staffing to manage JDSF has been augmented recently to reflect recognized needs. Including recent staff augmentation authority, the staff will attain the following level once all empty positions are filled:

General Duties	Classification
State Forest Manager	Deputy Chief
Timber Sale Program	Division Chief
Demonstration and Education Program	Division Chief
Administration, Recreation, and Roads Program	Division Chief
Timber sale officers (4 positions)	Forester I
Roads program	Forester I
Education program	Forester I
Demonstration program	Forester I
Geology (1/2 time)	Engineering Geologist (Dept. of Cons.)
Timber sale assistant (2)	Forestry Assistant I & II
Demonstration assistant	Forestry Assistant I
Recreation assistant	Forestry Assistant II
Clerical	Office Assistant
Finance (1/2 time)	Account Clerk
Road maintenance (2)	Heavy Fire Equipment Operator
Geographic Information System	Research Program Specialist I
Law enforcement and fire prevention (2)	Fire Captain Specialist
Seasonal work, misc. (approx.10)	Seasonal Aide, Retired Annuitant

Budget

Personnel Budget::

The annual budget to support personnel on JDSF is approximately $1,400,000 (including benefits). This figure includes approximately $140,000 to support seasonal employees.

Operating Budget:

The State Forest is allocated approximately $170,000 on a fiscal year basis to fund operations. A recent budget change authorized $300,000 in annual funding to support the road management program on JDSF. In addition, $150,000 was authorized to support timber stand improvement.

Research, Demonstration, and Monitoring Funds:

JDSF shares available funds with the other state forests for purposes of financing competitive grants for research and demonstration, and to conduct monitoring projects. The available funds include $600,000 annually for purposes of research and demonstration projects and $150,000 for conduct of monitoring activities and support of infrastructure within the State Forest system.

Exotic Weed Species

Invasive exotic plants are an increasing threat to biodiversity and ecosystem processes. Whenever such plants interfere with land management objectives, they are considered to be weeds. Exotic weeds are rapidly spreading throughout all regions of the United States. Jackson Demonstration State Forest is not immune to this problem. Exotic weeds have the potential to displace native vegetation and associated wildlife habitat. Other exotic weed-related problems on the State Forest include increased hazard of fire, increased road maintenance needs, and reduced conifer seedling survival and growth. Exotic plants are typically capable of very rapid dispersal, in part because of the absence of natural predatory agents in local ecosystems. Several exotic weed species have invaded the State Forest during the past century, some of which have become substantial problems in recent decades. The risk of new exotic weed species becoming established on the State Forest over the next 10 to 20 years remains very high.

Weeds are typically well adapted to disturbed, open sites, which often enables them to become established in areas where native vegetation has been removed. 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 density of seeds in the surface soil (i.e. the seed bank), thus increasing the long-term risk of infestation, even when no weed plants can be observed. Many weeds initiate growth early in the season and display rapid vertical growth, which allows them to overtop and suppress neighboring native annuals. They are often efficient at utilizing available soil moisture, which also enhances their competitive advantage. Forest roads provide a seed dispersal mechanism (i.e. vehicle traffic), as well as sunlight, bare soil, and concentrations of water conducive to rapid expansion of infestations.

Chapter 3. Desired Future Conditions and Planned Management

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). Chapter five, monitoring and adaptive management, describes the application of this process on JDSF.

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, timber, 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.

Habitat Fragmentation and Connectivity

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. It is not well known whether for example 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. 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 was not present. 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). The assessment 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 will include a blend of even and uneven-aged management, long rotations and reserves and the maintenance as well as creation of 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.

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 four, 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 four and five.

Forest Level:

- Manage for a range of stand conditions at the landscape scale.
- Consider the existing landscape in terms of pattern (juxtaposition) and composition (patch size, patch area) 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 forest conditions and WLPZs.

Stand Level:

- Use thinning and selection prescriptions to create a range of stand stocking levels. 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 old-growth management areas, WLPZs, or adjacent (within 100 feet) of old-growth groves.
- 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 selected species.
- Protect nest sites and other areas of importance as described in species accounts.
- Maintain and promote habitat conditions suitable to meet species of concern life requisites.

TABLE 4. 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			
Patch Size Distribution		X			
Unique Habitats			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 Landuses and Adjacent Watershed Patch Location			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	
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
Exotic Species Control					X
Species Specific Habitat Management				X	X

Desired Future Conditions

Desired future conditions will be described in terms of forest structure. For the purposes of this section, forest structure is characterized by the following three essential attributes:

- range of tree sizes.
- density of trees.
- spatial arrangement of trees and stands in the forest.

This is in contrast to the individual *structural elements* of wildlife habitat, such as snags and large woody debris. Varying any of the three forest structure attributes results in different forest structure conditions. By conventional forestry usage, the scale of reference is the stand; i.e. within a stand forest structure is relatively uniform. In biological and ecological terms this spatial unit is often referred to as a habitat patch.

Three general classes of forest structure conditions can be recognized, based on how different parts of the Forest are managed in regard to timber production. One class is the reserved old growth groves. These are remnant patches of the original old growth, forest that has received little or no management treatment. They can be generally described as having a high density of large trees, with a fair amount of spatial diversity. By policy, these areas will not be subject to timber harvesting.

A second class is those special concern areas where, because of some identified public trust resource value, timber harvesting will be constrained to some degree. Examples include WLPZs, neighbor buffers, and late seral development areas. (Special concern areas are discussed in more detail in Chapter Two and Appendix III). In most cases, only light harvesting which retains large trees and a significant portion of the stand density will occur in these areas. However, they are generally capable of sustainable timber production at some level.

The third class is the remainder of the timberland, which is managed primarily for sustained yield timber production. In these areas, forest structure conditions vary across a wide spectrum, depending on the type and timing of past timber harvest.

Dynamics of Forest Structure Classes

Forest structure conditions can change very slowly or very rapidly, depending on forest management treatments. In the old growth reserves the rate of structural change will be so slow that the condition will appear to be static. In fact, in the absence of disturbance, an increase in shade-tolerant understory vegetation in old growth stands over time would be expected. Natural gaps in the canopy will develop slowly as a result of windthrow and mortality. These gaps will become occupied by new vegetation or the expanding crowns of existing trees. Thus, over the long term, a slowly changing structure of large trees, understory vegetation, and occasional canopy gaps will be maintained.

Many of the special concern areas in the western and central parts of the Forest have had little or no harvesting since the original cutting of the old growth 70 to 120 years ago. These stands tend to be densely stocked with little size or species diversity. Where light harvesting occurs in these areas, small openings will be created which will allow for the development of understory and intermediate canopy layers occupied by a larger number of plant species. Because of the low level of cutting, these changes will occur gradually, trending towards a late-seral structure.

Areas managed intensively for sustained yield timber production will display a more rapidly changing mix of forest structure conditions. Each of the planned silvicultural methods and treatments described in this chapter will have a stand-level structural objective as part of each harvest prescription; structural change will be managed. The change in forest structure condition following harvests will be more readily discernible than in special concern areas, since larger proportions of stand volume will typically be cut (in the range of 20 percent to 80 percent or more). Stand development following selection and regeneration harvests will likewise be relatively rapid because of the large number of smaller, faster-growing young

trees that will be established. Observed over periods of several years, and over small spatial scales of planning watersheds or management compartments, the changes in forest structure conditions will be dramatic when and where harvesting is scheduled, and more gradual between harvest entries. Observed over longer periods of several decades, or over the Forest landscape as a whole, the mix of structural conditions will become fairly constant, but the arrangement will shift between each observation and the next.

Desired Distribution of Forest Structure Conditions

Each management compartment has a long term goal for its silvicultural regime and consequent forest structure condition. Each management compartment within the Forest is assigned one of three broad silvicultural systems: even-aged, selection, or group selection. Within each system there is a range of prescriptions and practices that can be applied to generate different forest structures and different spatial distributions of those forest structure conditions.

A range of possible structural conditions in uneven-aged management can be created and maintained by varying the parameters of selection prescriptions: tree sizes, harvest intensity, harvest cycle length, and opening size. In the management compartments designated for group selection, group openings of one to two acres or more will lead to a relatively diverse spatial distribution of forest structure. Compartments designated for single tree and cluster selection will have a more uniform structure distribution.

Uneven-aged management will eventually produce multi-aged stands with varied levels of large trees and structural habitat elements, many of which will be characterized similarly to WHR 6 habitat as currently defined (Mayer and Laudenslayer 1988).

Even-aged management as practiced on the Jackson Demonstration State Forest will generally produce two-storied stands, consisting of a main canopy layer of trees grown to the designated rotation age, and an overstory of a few to several trees per acre retained from the previous stand to provide a legacy of wildlife habitat elements. To provide the full range of possible structural conditions, from the recently regenerated stand to the stand arriving at rotation age, it is important to schedule regeneration harvests so as to achieve a balance of all age classes. Maintaining this balance of age classes will ensure that timber production is sustainable, that representative habitat types are present, and that multiple even-aged forest structure conditions are available for demonstration and research purposes. In the roughly one-third of the Forest managed on an even-aged basis, it is expected that no more than half of the even-aged area (approximately 15 percent of the forest over-all) will be covered by stands that are less than 50 years of age at the end of a one-hundred year period. Approximately 15 percent of the Forest will be occupied by even-aged stands between 50 and 150 years of age.

The old growth reserves, and most of the special concern areas, will be managed to retain or develop relatively high-density, large tree structures with late-seral characteristics. These structure conditions will occupy about 22 percent of the State Forest. An additional three percent will be in non-timber vegetation types, such as pygmy forest, or will otherwise not contribute to the mix of structure conditions. Research areas constitute about four percent of the Forest acreage. The remaining 71 percent, or about 35,000 acres, will be managed for sustained high levels of timber production and will consist of a broadly diversified matrix of forest structure conditions.

The following table shows how much of the Forest will be in each of these general forest structure conditions:

TABLE 6. Distribution of forest structure conditions.

Forest Structure Condition	Acres	Percent
Areas that will develop high density, large tree, late seral characteristics (4)	10,658	22
Uneven-aged single tree/cluster selection	11,941	24
Uneven-aged group selection	7,997	16
Even-aged	15,026	31
Non-timber and other areas with unclassified structure conditions (5)	1,250	3
Research Areas	1,780	4
Total	48,652	100

The desired future condition for the Forest will include a mix of age classes and stand conditions. Existing old-growth groves will be preserved, and approximately 3,000 additional acres outside of the stream protection zone will be managed to develop late-seral characteristics. Structural elements will be maintained or recruited in all watersheds and management areas. Stream zones will be managed to produce late-seral characteristics.

Growth and Harvest

The continuous forest inventory (CFI) plot system is the most reliable evidence of forest growth on JDSF. The plot system was measured in 1989 and again in 1999. The difference between the measurements, accounting for harvest, produced an unconstrained estimate of annual growth of approximately 65 million board feet, or approximately 1,300 board feet per acre per year. This estimate is supported by growth projections of the current IFI volume estimates using the CRYPTOS growth model.

A conservative estimate of growth as constrained by current management can be had from the strategic planning process for JDSF (see Title 14 CCR 913.11(a)). One of the alternatives in the Option A plan development simulated current management into the future, producing a growth estimate of approximately 39 million board feet per year available for harvest.

The sustainable average annual harvest for the Forest has been estimated in the Option A document for JDSF. This estimate takes into account management constraints and modeling parameters (see Option A document). Long term sustained yield can be achieved with an annual harvest of 39 million board feet (net) of conifer timber during the first decade, gradually increasing to 43 million board feet by the end of a 120-year planning interval. The growth model was calibrated downward substantially to produce a conservative estimate of growth, thereby allowing for potential projection error during the planning interval. Also, the Option A plan was constrained to the timber land base, projecting growth and harvest only in the acreage of the Forest that is available for timber production.

4 Old growth groves, Class I and II streams riparian zones, Woodlands Special Treatment Area, late seral development areas.

5 Cypress groups, pygmy forest, Jughandle Reserve, eucalyptus, powerline right-of-way, conservation camps.

There is still a significant level of operational uncertainty in some of the constraints that controlled the availability of timber for harvest in the Option A plan modeling. For example, the modeling effort was constrained to preclude harvest within 25 feet of all Class I watercourses, and further constrained to limit harvest within 200 feet of neighboring residential parcels and 300 feet of campgrounds and trail corridors. During actual implementation, environmental conditions may dictate a wider average uncut buffer adjacent to Class I watercourses, or buffers adjacent to residences may remain uncut. It is prudent to maintain a conservative approach when estimating the area available for harvest, as well as the intensity of harvest that is likely to occur. Since a range of possibilities may occur, it is estimated that this may affect available harvest levels by as much as 15 to 20 percent in one direction or the other.

The average annual allowable harvest on the Forest will be 31 million board feet. Within the initial decade of the long term sustained yield estimate, the target allowable cut will be set as a range, between 15 and 20 percent below the modeled estimate of 39 million board feet from the Option A plan. This yields an allowable cut of 31 to 33 million board feet (net) of conifer timber.

This allowable cut estimate stays the course of historical conservative harvest levels on the Forest. It is believed that this approach constitutes erring on the side of caution, recognizing the inherent limitations of modeling, and keeping options open as information and management context changes over time. Constraints will be quantified more precisely as information becomes available.

Planned Management to Achieve Desired Future Conditions

The primary forest management tool for affecting the structure of forest stands and its distribution on a landscape basis is commercial timber harvesting. The elements of harvest treatments that most influence forest structure are intensity (the proportion of the stand that is harvested or left), tree selection criteria (species, size, condition), silvicultural treatment (even-aged regeneration, thinning, selection), harvest unit characteristics (size, shape, orientation on the terrain, proximity to other stands), and incidental activities (treatment of non-commercial vegetation, burning, planting). The distribution of forest structure conditions, the spatial pattern, is the result of how harvest units are sequenced and how they are placed in relation to each other.

The current distribution of forest structure conditions has not yet reached the desired future conditions. After several decades of adaptive management we anticipate being able to more closely approach desired future conditions, and maintain a steady-state distribution of forest stand conditions. In the mean time, however, the task will be to gradually cultivate an irregular distribution of stand conditions toward desired future stand conditions.

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 in the short term. The silvicultural allocation plan provides site-specific silvicultural direction for the next two to three decades. The short-term harvest schedule is a five-year allocation of harvest units.

Silvicultural Allocation Plan

The silvicultural allocation plan provides a comprehensive guide for assigning silvicultural methods to actual stands on the ground across the forest for the next few decades. A map of the Silvicultural Allocation Plan can be found in Figure 6. The objectives of this silvicultural allocation plan are to 1) create diverse forest stand structures across a wide variety of site classes and environmental conditions in order to facilitate future research opportunities, and 2) create a mosaic of diverse habitats at the landscape level in order to maintain functional forest ecosystems and support biological diversity.

Implementation of this plan will create a diverse mosaic of forest age-class structures at the landscape level that will contribute to habitat stability, maintenance of biodiversity and functional forest ecosystems:

- Sizes and shapes of created forest openings will range from canopy gaps to large openings. Small stands have more edge per unit area. Larger forest stands have more interior habitat.
- Structural complexity will be retained and recruited at a landscape level for all silvicultural systems employed under this plan. These features will include snags, woody debris on the forest floor, multiple canopy layers, and varied sizes and conditions of live trees. A mixture of aggregated and dispersed structural elements will be retained and studied.
- Forest diversity and connectivity will be maintained and enhanced by retention and creation of late-seral forest and watercourse protection zones.
- A range of rotation ages will be implemented and evaluated.

Planning watershed boundaries were utilized to delineate silvicultural systems 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 specified age-class and structure goals provides for long-term continuity of land management practices where environmental effects can be measured and monitored.

Timber stands have been classified on the basis of age-class composition. The age-classes will become more differentiated over time. This plan provides for the side-by-side comparison of different silvicultural systems.

The assignments of silvicultural systems to management compartments are arranged so that each silvicultural method occupies at least two compartments in both the eastern and western halves of the State Forest. The intent is to create opportunities for researchers to compare experimental results with control areas having similar environmental attributes, as well as providing an opportunity to assess silvicultural systems across a broad cross-section of growing conditions.

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.

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 five or more acres were minimized in management compartments adjacent to certain areas of special concern 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.

Three broad categories of silvicultural systems are described below, single tree/cluster selection, group selection, and even-aged regeneration harvesting:

Uneven-aged Management:

Approximately two-thirds of the area devoted to timber production will be managed under an uneven-aged management system. This is the dominant system utilized by non-industrial forest landowners and others intent upon maintaining visual quality. Uneven-aged stands are generally defined as having three or more distinct age classes. The Forest will be managed to utilize two predominant uneven-aged silvicultural systems, single tree/cluster selection and group 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. Compartments managed under this silvicultural system will ultimately have the narrowest range of structure conditions. 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, largest

tree to be managed for (exceptions will be allowed for habitat structure recruitment), and the ratio of large trees to smaller trees (q-ratio) will be adjusted on a site-specific basis. The objective of this variability is to demonstrate a range of silvicultural options under uneven-aged management, and to provide multiple future research opportunities.

Each of these management compartments was designated for this silvicultural method to minimize potential conflict with recreation uses and with local public interest values. These management compartments also share boundaries with private lands along the western edge of the State Forest and developed recreation sites, or form viewshed from Highway 20. The single tree/cluster selection method will also be practiced in the portion of the South Fork Noyo and Berry Gulch Compartments (even-aged compartments) that are immediately adjacent to Highway 20. The intent is to provide near-by a view of continuous forest cover for travelers on Highway 20.

Many selection harvest units 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, or have had only one partial cut that may or may not have resulted in successful creation of a new age class. Nowhere is there a stand that displays the full range of vigorously growing trees of all sizes and ages that is the ultimate structure of the regulated selection stand. Within the region, the practice of selective harvest of second-growth stands began only 40 to 50 years ago. A complete transition to an uneven-aged structure is largely theoretical, 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 well-growing age classes. Evaluation characteristics and examples of potential treatment options include:

- Existing regeneration. Where a number of age and size classes are already established, it will likely be sufficient to continue a series of partial harvests of the overstory. In an even-aged stand with no regeneration, it will be necessary to create openings in the canopy large enough to allow sunlight to reach regeneration.
- Stand density. An open stand tends to receive light at the level of the regeneration, so a light harvest of the overstory would seem appropriate. A closed stand will require a more intensive harvest of overstory trees.
- Competing vegetation. Stands with large components of brush or low-value trees will benefit from a more aggressive harvest and regeneration effort.

The management compartments assigned to single tree/cluster selection are indicated below (see Figure 6):

A. West End

1. Simpson
2. Lower Caspar
3. Russian Gulch
4. Lower Big River
5. Camp One
6. Thompson
7. Hare Creek

B. East End

1. Camp 20
2. Seven Mile

Group Selection:

Group selection management will create stands with a large amount of structural diversity but little variability between stands. Group selection differs from clearcutting because the size and shape of group openings maintains significant influence from the surrounding stands (i.e. shade, seed, etc.), and by maintaining continuous forest cover at the landscape level. Stands are considered to be larger than group openings. Stands managed under this system will eventually contain groups at multiple stages of development, from recently regenerated to mature. The cutting cycle for an area designated for group selection will be 10 to 25 years. The goal is to establish three to five separate age classes by the time the management compartment is regulated.

The sizes of group openings will typically range from ¼ acre to 2½ acres, except in the 14 Gulch compartment where openings will be as large as five acres. Within stands, group sizes will remain fairly constant 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. One and one-half times adjacent tree height is considered as the extent of biological influence from a tree beyond the edge of a forest opening. A five-acre opening roughly corresponds to the limit of influence from trees that are 180 feet tall.

Forest Practice rules define group selection as openings one-quarter acre to two and one-half acres in size; any regeneration harvest unit greater than two and one-half acres is considered even-aged regeneration. The State Forest will follow any rules applicable to even-aged regeneration methods if group openings are created which are greater than two and one-half acres in size. Most areas dedicated to group selection will utilize group openings under two and one-half acres in size.

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

- Height of trees surrounding the opening. Smaller openings can be accommodated when surrounding trees are relatively short.
- Logging system. The logistics of cable logging can be simplified by having groups that reach the full length of the cable setting. This may require a larger total opening size on longer slopes.
- Shape. Long openings may require additional size to maintain sufficient levels of light.
- 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.

The management compartments dedicated to group selection are:

A. West End

   1. Jug Handle
   2. Caspar Orchard
   3. Brandon
   4. 14 Gulch

B. East End

   1. Dunlap
   2. Park Gulch
   3. Upper James Creek

Even-aged Management:

Even-aged regeneration harvests will involve the treatment of areas between 5 and 40 acres in size, although harvest units over 30 acres will be uncommon. 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:

- Density and growth rate. The production of a heavily stocked stand whose growth is being limited by tree-to-tree competition can benefit from thinning.
- Species mix. Different species reach maturity at different ages. In mixed stands, cutting species that mature more quickly increase overall stand performance.
- 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:

- 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.
- Demonstration needs. A research or demonstration project may require the acceleration or postponement of an even-aged regeneration harvest.

Approximately one third of the area devoted to timber production will be managed for one of three different types of even-aged forest structures: reserve-form stands, storied stands, and one-aged stands. Reserve-form stands are stands where a few trees are retained in an area during regeneration harvesting to maintain wildlife habitat structure while developing a new age class beneath them. This stand structure is often produced naturally by severe fires or windstorms where all but a few of the hardiest individuals survive. Storied stands have two distinct age-classes and are often created under a modified shelterwood method where the overstory is not harvested until the regeneration is in the pole stage. One-aged stands have only one age class present. They are created in managed forests by clearcutting or by seed tree cuts where the seed trees are harvested shortly after the new age class of trees is established.

The type of age-class structure to be created in most even-aged management compartments will be a combination of reserved-form and storied stand conditions. Five to thirty trees per acre will remain following most regeneration harvesting. These trees may be uniformly spaced, clumped, or retained in combination to achieve site-specific land management and habitat objectives. The use of the one-aged forest structure will be minimized due to the need to produce structural habitat elements for wildlife and to reduce adverse visual impacts. One-aged stands are expected to be limited to research projects and for timber stands with very difficult conifer regeneration issues.

These even-aged structure conditions will be created in harvest units from five to 40 areas in size. Sufficient sunlight reaches the forest floor in each of these three silvicultural conditions for newly established shade intolerant conifer species to grow vigorously, and influences from surrounding stands will be minimized due to the size and configuration of the harvest unit. The selection and placement of structure trees will be varied through ongoing adaptive management to learn how best to spatially allocate wildlife structural elements.

Two rotation age ranges will be applied based on average site class: short to medium and medium to long rotations. The western portion of the State Forest generally averages Site II. Short to medium rotation ages on the West End are considered to be 60 to 90 years. Medium to long rotation ages are characterized as 90 to 120 years. The eastern portion of the forest has lower growth potential, with site class generally averaging either III or IV. Short to medium rotation ages on the East End are considered to be 90 to 120 years, while medium to long rotation ages are 120 to 150 years.

The intent was to find a range of ages that might bracket the age of culmination of mean annual increment (CMAI) within the medium to long rotation alternative. Culmination of mean annual increment is that point in the life of an even-aged stand where total growth divided by stand age is at its greatest point. CMAI is currently unknown for coast redwood of Site Class II and below. The rotation age approximations indicated above are based on projections made from *Empirical Yield Tables for Young-Growth Redwood* by Lindquist and Palley (1963) and *Yield, Stand and Volume Tables for Douglas Fir in California* by Schumacher (1930).

Yield tables for California conifers indicate that yield curves tend to flatten as site quality decreases. This means that these increment curves become less sensitive to changes in stand age as site quality decreases, and that CMAI may extend over a range of ages with only minor differences in total productivity. The range of rotation ages given in this management plan for CMAI of coast redwood are the best information known for this forest type at this time and will likely become more defined as better information is developed.

Rotation ages longer than the estimated culmination of MAI were not included for operational management in areas allocated to financially viable forest management, outside of research projects and special concern areas. This is consistent with JDSF's mandate which is to demonstrate management practices that are both biologically and economically sustainable. Structural complexity is an important element in the development of silvicultural prescriptions. Individual trees retained within even-aged and uneven-aged harvest units as structural habitat elements will be allowed to develop for at least twice the projected rotation age.

The use of rotation age as a management variable is intended to serve as a simple planning tool in the scheduling of harvests. Each even-aged alternative incorporates a range of rotation ages, so the estimated acres of regeneration harvesting will also be represented as a range. This range of regeneration acres provides needed flexibility for adaptive management during transition to desired future conditions over the coming decades. The management compartments proposed for even-aged management, and the rotation age range assigned to each are listed below:

A. West End

1. Short to Medium Rotation Ages (60 to 90 years)

    a. Berry Gulch (a portion of the compartment adjacent to Highway 20 will be managed under the single tree/cluster selection method.)
    b. Parlin Creek

2. Medium to Long Rotation Ages (90 to 120 years)

    a. Bunker Gulch
    b. South Fork Noyo (a portion of the compartment adjacent to Highway 20 will be managed under the single tree/cluster selection method.)

B. East End

1. Short to Medium Rotation Ages (90 to 120 years)

    a. Three Chop

b. Upper Big River

2. Medium to Long Rotation Ages (120 to 150 years)

   a. Western Chamberlain
   b. Two Rock

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 three largest management compartments with no assigned silvicultural system are North Fork Caspar, South Fork Caspar, and the Mendocino Woodlands Special Treatment area.

The two Caspar management compartments make up the CDF – 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 both of these management compartments during the next ten years.

Most of the Mendocino Woodlands Special Treatment Area will be managed as a late-seral habitat recruitment 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 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 and the California Department of Fish and Game 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, included in this Forest-wide management plan. State Forest staff will provide technical assistance and advice to the CDF Assistant Chief at Parlin Fork 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 spatial allocation plan.

Short Term Harvest Schedule

This section describes JDSF's short term harvest schedule, a companion document to the silvicultural allocation plan. This five-year harvest schedule lists the locations of proposed harvest units and the general silvicultural treatments to be applied. This information for the years 2002 through 2006 is shown in Table 5 and displayed in Figure 6.

TABLE 5. Short-Term Harvest Schedule; 2002-2006.

Year of Harvest	Sale Area Name	Planned Silviculture	Approximate Acres to Harvest(6)	Management Compartment
2002	Helms	Selection	270	Woodlands STA
	Northfork Spur	group selection / selection	616	Brandon / Bob Woods
	14 Gulch North	group selection	399	14 Gulch
	West Chamberlain	commercial thin	675	West Chamberlain
2003	Hare Creek HIJK	selection	204	Simpson
	Hare Creek G	selection	28	Hare Creek
	Upper Hare Creek	selection	85	Hare Creek
	Volcano #2	group selection	504	Brandon
	Park Gulch	group selection	320	Park Gulch
2004	Berry Flat	even-aged regen.	31	Berry Gulch
	23-D	even-aged regen.	31	South Fork Noyo
	Switchbacks	even-aged regen.	19	South Fork Noyo
	Elk Ridge	even-aged regen.	57	South Fork Noyo
	Riley Ridge	group selection	598	Brandon
	Waldo	even-aged regen.	133	Parlin Creek
	Water Gulch #1	commercial thin	278	West Chamberlain
2005	Pleiades #4	selection	43	Camp 1
	Frolic #2	even-aged regen.	211	Parlin Creek
	Scissors #2	even-aged regen.	93	South Fork Noyo
	Dunlap West	group selection	345	Dunlap
2006	Orchard	selection / group selection	521	Lower Caspar / Caspar Orchard
	Walton Gulch #2	even-aged regen.	102	Hare Creek
	Thompson Gulch	late seral develop.	251	Thompson
	Water Gulch #2	commercial thin	477	West Chamberlain

The following issues were considered in the allocation of actual harvest units on the Forest during the first five years:

- A cross-check against the management objectives and operational constraints as articulated in this Management Plan. Since there are more acres available in each vegetation type than are scheduled for harvest in the first decade, it was possible to select harvest units that follow the Option A schedule while serving the stated management objectives and without violating any of the constraints.
- 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. A stand which is poorly stocked or which is growing slowly, for example, might be a better candidate for harvest than one that is vigorous and well stocked.
- Spatial distribution within the Forest. In addition to the effects of limitations on adjacency imposed by the Forest Practice Rules, it is both practical and preferable to avoid having simultaneous, side-by-side harvest operations because of the complications that arise in such areas as shared road use and the assignment of maintenance and rule compliance responsibilities to different operators, and interference between cable line locations, or between cable lines and helicopter flight paths.

6 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.

- 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 mitigate some potential 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 workload 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.

The short term harvest schedule will not be rigid, but will be subject to modification through adaptive management. It will be reviewed and updated annually to maintain a five-year plan of future harvest activity. This is important for several reasons:

- 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.

Special Concern Areas

No timber harvesting will occur in the old growth reserves. However, some actions such as understory burning or snag creation may be considered in order to simulate the kinds of natural disturbances that occur in and sustain old growth forests. In other special concern areas, i.e. the areas managed for late seral characteristics, timber harvesting and other stand treatments may be used in some instances to study and demonstrate methods to accelerate the development of late seral conditions. For example, a light thinning of understory trees might be prescribed to increase the growth rate of the larger trees or to stimulate the development of understory vegetation and multiple canopy layers. Some of these special concern areas allow specific types of operational timber harvesting, such as thinning or single tree selection, so long as the aesthetic, habitat, or other resource value associated with the special concern area is protected.

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. If the specific management objective for the area and the current condition of the area both suggest that a management action is appropriate, then that action will be considered for inclusion as a part of the adjacent timber operation. 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.

Species Mix

Recent, current and foreseeable future market conditions rank the State Forest's merchantable conifer species in the following order of value:

1. Redwood.
2. Douglas-fir.
3. Hemlock and grand fir.
4. Bishop pine.

Although there is a fledgling tanoak lumber industry in Mendocino County, there is no indication yet that it will create sufficient demand for raw products to make the species anything more than a break-even 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, it is locally limited in extent and confined 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 so that their composition does not increase. Bishop pine, an aggressive pioneer species following stand disturbance, will be managed to keep it as only a minor species where it occurs in commercial stands.

In selecting silvicultural prescriptions, thinnings, and other partial harvests, and in cases where there is no other reason to favor retaining one future crop tree over another (*e.g.* position, size, vigor, soundness, or potential wildlife habitat value), the decision about which tree to keep will be based on the ranking of merchantable conifers as listed above.

Where artificial regeneration is used following a timber harvest, both redwood and Douglas-fir seedlings will 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. On the east end, hardwoods make up approximately 30 percent of the basal area on average. No particular treatment beyond competing vegetation control in plantations is anticipated to be necessary within most stands on the west end of the Forest. On the east end, combined commercial thinning, selection, and hardwood removal prescriptions will be implemented as part of a strategy to gradually shift the species mix toward the former conifer dominated condition.

Timber Sale Program

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 normally fall between about five million and ten million board feet, although sale-specific requirements may result in occasional sales as small as one or two million board feet or as large as 15 million board feet.

Three to five sales each year will usually be required to sell the average annual harvest of 31 million board feet. 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.

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 log rather than standing stumpage sales.

The Forest will pursue opportunities to market small blocks of timber to individuals, small businesses, and other non-traditional timber purchasers. 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.

Exotic 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 or not genetically suited to the State Forest.

IWM is a prevention-oriented, ecologically based approach to managing weeds cost-effectively and 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 exotic 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.

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

- Promptly detect and directly control new infestations of any exotic weeds before the seed bank can build up or spread over a larger area;
- Control existing infestations to minimize conflicts with important management objectives and to maintain natural ecosystem processes;
- Prevent dispersal of exotic weeds into new areas; and
- Prevent reestablishment of infestations in areas that were formerly infested.

Planned actions:

1. Staff will consider the impacts of exotic weeks to native vegetation during the normal course of project development if there is a high likelihood of weed spread due to a nearby infestation. Mitigation should be considered where appropriate and consistent with IWM to minimize the spread of exotic weeds.

2. Reestablishment of native vegetation will be considered in disturbed open areas adjacent to forest roads in order to minimize weed spread. A cooperative program should be developed with the CDF nursery system to develop seed supplies for appropriate native cover species. High planting densities of native conifers will be considered along forest roads and in timber harvest units where ground skidding equipment is used, in order to shade out exotic weeds.

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

4. Weed infestations on the State Forest will be periodically evaluated, including the weed species present, location, probable causes of infestation, control treatments recommended or applied, and the effectiveness of the treatments.

5. The spread of exotic weeds is a shared concern by many individuals and organizations within Mendocino County. JDSF should adopt a policy of cooperation 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 Exotic Plant Pest Council, and the Mendocino County Weed Management Group to control exotic weeds.

6. State Forest Staff will attempt to periodically examine harvest units and forest roads coincident with erosion control and forest stocking inspections to identify post harvest emerging weed populations and determine their need for treatment.

7. JDSF will continue to support the International Broom Initiative to investigate biological control agents for French broom, Scotch broom, Spanish broom, Portuguese broom, and Gorse. This is a program that was initiated on the State Forest in an effort to find a cost effective herbicide free alternative to controlling these related species. This program is a cooperative effort among the Commonwealth Scientific and Industrial Research Organization of Australia, U.S. Department of Agriculture, and CalEPPC, to develop environmentally safe biological control agents for these weed species.

8 Staff will remain aware of exotic weed species currently infesting, or with potential to infest the Forest. The list of "most invasive wildland pest plants" compiled by the California Exotic Plant Pest Council may be used as an aid for identifying weeds species of concern. Exotic weeds of particular concern at JDSF include French broom, Scotch broom, gorse, Andean pampas grass, yellow star thistle, cape ivy, blue gum eucalyptus, and Monterey pine.

Wildlife and Ecological Processes

Future management of the State Forest will provide protection for all resources. The overall objective for wildlife and other non-timber resources is to protect habitat, habitat elements, and uncommon forest attributes. Discussed here are some of the principal areas of concern and proposed management direction. Due to the research and demonstration mandate for JDSF, a range of possible species and habitat management measures are possible. The measures that follow represent generally accepted habitat and species conservation practices that may be modified where appropriate for research and demonstration purposes.

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 exotic species will contribute to the protection of biological diversity from both a local and regional perspective.

Old-growth Stands and Trees

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. A related objective is to retain selected individual old-growth trees and small aggregations within larger young-growth stands to maintain and enhance the ecological value of these stands for native species.

An old growth tree is any live tree, regardless of age, size, or species, that was present in the original stand before the first historic logging on JDSF (1860) and is identifiable based upon structural characteristics. 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.

The following characteristics will be used to define an old growth tree on the Forest:

a. 48" or greater DBH
b. Goose-pen (an opening one foot in diameter or greater inside and above the top of the trunk opening).
c. Platform branches 8" or greater in diameter.
d. Exfoliating, flanged bark which may provide potential bat roosting habitat.
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:

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 siting, 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 Reserves:

Known old growth stands have been identified and will be retained. Some of these old growth stands are bordered by augmentation areas (see below) 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.

Recruitment of Late-successional 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-successional 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-successional forest characteristics will also be managed for 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.

Portions of other special management zones, such as WLPZs, may have designated zones where silvicultural activity will not occur. This 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-successional or old-growth characteristics in areas that enhance the ecological effects of forests with these structural characteristics. Trees with old-growth or late-successional 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.

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 recreational activities.

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.

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

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 watercourse and lake protection zones (WLPZs) to promote their ecological succession to late-seral 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 LWD to improve habitat values.

Habitat Elements and Structure

Snag Retention, Recruitment:

The desired future condition for snags in all wildlife special concern 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. 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. 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. Snag retention policies are designed to provide the habitat needed to maintain viable populations of cavity-dependent and facultative snag-using species, and to provide for recruitment of large woody debris on the forest floor. JDSF will also recruit snags through indirect measures, such as retention of larger conifers (at least 30 inches DBH) in select areas to provide wildlife habitat.

Large Woody Debris:

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.

Plant Species of Concern

The following plant species of concern occur on JDSF:

Pygmy Cypress
Bolander's Pine
Pygmy Manzanita
Coast Lily
Humboldt Milk Vetch
Swamp Harebell

JDSF will provide site- and species-specific protection measures that contribute to maintenance or improvement of long-term conservation of population viability of these plant species 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.

Species Protection:

- A qualified botanist or trained staff will conduct surveys, as necessary, at appropriate time of year to assess plant occurrence in potential habitat subject to management activities.
- Surveys may 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 results will be documented and provided to CDFG.
- JDSF will provide for, on an as-needed basis, a sensitive plant identification training program for field

personnel.

Habitat Management Practices:

- Limited removal of pygmy manzanita, pygmy cypress, or Bolander's pine may occur as a result of habitat development projects for the lotis blue butterfly.

Aquatic and Riparian Ecosystem Dependent Species of Concern

Target species include Pacific Lamprey, Coho Salmon, Steelhead, Southern Torrent Salamander, Tailed Frog, Northern Red-legged Frog, Foothill Yellow-legged Frog, Northwestern Pond Turtle, Yellow Warbler, Olive-sided Flycatcher.

Desired future conditions are to provide site- and species-specific protection measures that contribute to maintenance or improvement of long-term conservation of population viability of aquatic and riparian dependent species of concern and enhance habitat values over existing conditions.

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 be affected by planned operations and choose the measures that specifically reduce the risk of stream and riparian habitat degradation.

Habitat Protection:

- Class I and II streams: stream shade and canopy cover of overstory trees shall be maintained at a high level to provide for continued recovery of aquatic habitat and riparian forest condition.
- Natural springs and seeps that may provide habitat for non-fish aquatic species are provided the same protections as Class II streams.
- Class III streams with side slopes of less than 30 percent will be protected with an Equipment Limitation Zone (ELZ) of 50 feet and an ELZ of 100 feet for slopes greater than 30 percent following an assessment of site specific conditions.
- For Class I and Class II streams, the inner 50 feet of the WLPZ will be an Equipment Exclusion Zone (EEZ). In addition, the remaining portion of the WLPZ will be an ELZ.
- Prescribed fires will not be ignited within the WLPZ for Class I or II watercourses. Similarly, there will be no ignition within 50 feet of a Class III watercourse.

Habitat Management Practices:

- The 10 largest trees per 330 feet of stream channel are retained within 50 feet of the watercourse transition line and will be left uncut.
- Reentry will be no more frequent than every 20 years in Class I WLPZs.
- Areas of mineral soil greater than 100 ft^2 created by forest management activities in the WLPZ will be treated if necessary to prevent soil detachment.
- Large woody debris (LWD) within the WLPZ will be retained and recruited to the stream system unless it presents an imminent risk to drainage structures.
- 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.

- 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.

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. The following strategies will be effective where they overlap with stream environments:

- Retain all native hardwoods in the WLPZ.
- 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.

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. Activity sites are considered a nest or primary roost site occupied by a pair of birds irrespective of their reproductive success. Activity sites represent a confirmed pair or primary roost site at least one year in three years. Activity sites are protected with a 1,000-foot radius disturbance buffer and other measures to prevent take as described in the Forest Practice Rules.

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 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 described in the Forest Practice Rules (919.9 and 919.10).

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 0.7mile 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).

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 (CDFG).
- 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 CDFG. 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. CDFG 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.

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 forest openings as necessary. See snags and large woody debris objectives above.

Marbled Murrelet

The marbled murrelet is not currently known to inhabit JDSF, but the species has been detected nearby and may be present on the Forest.

JDSF was designated by the US Fish and Wildlife Service as Critical Habitat for the marbled murrelet on May 24, 1996 (Federal Register Vol. 61, No. 102 26256-26320). JDSF was selected primarily due to its geographic position and ownership status. The term "Critical Habitat" refers to specific areas in which the physical and biological features essential to the conservation of the species are found.

Although the federal Endangered Species Act (ESA) does not specify management obligations on non-federal lands designated as Critical Habitat, it does place an obligation on federal agencies. Section 7 of the ESA requires federal agencies to ensure that activities they fund, authorize (e.g. granting of an incidental take permit), or carry out are not likely to jeopardize the survival of a listed species or to destroy or adversely modify its Critical Habitat. Take as a result of JDSF management activities is not expected to occur given the protections provided by JDSF to suitable nesting trees and adherence to surveys conducted to accepted protocol where necessary prior to project implementation.

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 by consultation between CDF and CDFG.

Short Term (Conditions are met within the term of the management plan):

Habitat Protection

- Augmentation areas composed of second-growth forest will be 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).

Species Protection

- Surveys to protocol endorsed by CDFG 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 effect 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

- CDF will consult with an interagency prescription team that includes representation from the USFWS, CDFG, and CDF 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 (Condition is not met within the term of the management plan):

Habitat Management Practices

A portion of the Mendocino Woodlands Special Treatment Area (2,224 acres excluding the 286-acre Railroad Gulch Research Area and Caspar Creek Watershed as defined by County Road 408) will be managed during the term of the management plan to increase the potential for recruitment of late-seral habitat. This area provides the largest contiguous block of large second-growth forest potentially recruitable as marbled murrelet habitat.

Northern Goshawk and Cooper's Hawk

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

Species Protection:

- Northern goshawk and Cooper's 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 Hawk nest sites will be provided protections after consultation with CDFG.
- 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. CDFG will determine the need for modification of seasonal closure dates and those required for Cooper's hawk.
- Disturbance buffers (within which the seasonal closure will apply) specific to management activities will be established in accordance with the Forest Practice Rules.
- CDFG will be notified when nesting northern goshawk or Cooper's hawks are detected to facilitate enforcement of falconry laws.

Habitat Management Practices:

- Vegetation structure of an active northern goshawk nest site and 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 CDFG and CDF.
- 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 by retaining large fir trees as part of the stand component. Snag recruitment trees will be clustered if practicable and will only occur in areas that are considered important to purple martin: ridge lines, adjacent to ponds or other natural forest openings, or areas of prevailing wind.

California Red Tree Vole

Red 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:

- CDF will encourage a research effort to examine red 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 and Animal Species of Concern Possibly Present on JDSF

The following plant and animal species of concern, although not currently known from JDSF, may occur in areas of suitable habitat. For some of the species below, necessary habitat relationship information, high likelihood of occurrence during the term of the management plan, potential negative impact from forest management activities, and opportunities for proactive habitat management have allowed incorporation of species requirements into the management strategies described above. For others, as resources allow, additional research, forest and watershed inventory, and pre-project survey and preparation/layout work in areas of suitable habitat will, over time, enhance our knowledge base concerning presence of these species and help inform the development of appropriate management strategies.

- Roderick's Fritillary, Leafy Reed Grass, North Coast Semaphore Grass, Blasdale's Bent Grass, Thurber's Reed Grass, Leafy Reed Grass, California Sedge, Mendocino Coast Indian Paintbrush, Clustered Lady's Slipper, Oregon Fireweed, Waldo Gentian, Hayfield Tarplant, Bolander's Hookeri, Point Reyes Hookeri, Stebbin's Lewisia, Anthony Peak Lupine, Great Burnet

- Lotis Blue Butterfly, Behren's Silverspot Butterfly, Pomo Bronze Shoulderband Snail, Ground beetle (Scaphinotus behrensi), River Lamprey, Great Blue Heron (nest sites), Great Egret (nest sites), Sharp-shinned Hawk, Golden Eagle, Bald Eagle, American Peregrine Falcon, Bank Swallow, Loggerhead Shrike, Yellow-breasted Chat, Tricolored Blackbird, Yuma Myotis Bat, Long-eared Myotis Bat, Fringed Myotis Bat, Long-legged Myotis Bat, Pacific Western Big-eared Bat, Pallid Bat, Humboldt Marten, Pacific Fisher

Guidelines for Species Surveys and Avoidance of Significant Impacts

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 may also 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 CDFG.

Scoping—the scoping process would normally begin with the identification of sensitive species and their habitats that may be effected 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 impact, measures to minimize the impacts, and an analysis of the 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.

Surveys—When suitable habitat is present within or immediately adjacent to the project area, project planning documentation will include a discussion of the efforts made to determine presence or absence of the species in question. Avoidance measures and other necessary mitigation will be specified.

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.

Watersheds

Riparian 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 (7) and numerous springs and seeps with aquatic habitat values. Wetland habitat quality and hydrologic function will be protected.

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 concepts (partially based on the approved BOF July 2000 Threatened and Impaired Watersheds rule package):

1. Class I – 150 to 200 foot WLPZ; class II – 50 to 100 foot WLPZ. Zone widths are to be expanded where appropriate (e.g., unstable areas, etc.).
2. Timber operations within channel migration zones will not occur (except as allowed in the Forest Practice Rules).
3. Class I inner band– 0 to (25 – 200) feet from 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– 0 to 125 additional feet: High basal area and canopy retention zone. Basal area retention will remain high through the use of the all-age large tree and 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.
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– 0 to (10 – 100) feet from 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 – 0 to 90 additional feet: High basal area and canopy retention zone. Basal area retention will remain high through the use of all-age large tree and single tree selection silvicultural systems. Overstory canopy will be retained to prevent water temperature increases and allow for adequate canopy recovery where required.
8. Reentry -- No more frequently than every 20 years for Class I WLPZs.
9. 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.
10. 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.

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 with steep slopes 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

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

limit management related input of sediment into stream channels to a level below that which would adversely 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 inner gorge areas for JDSF have been mapped by CDMG (largely from aerial photographs), they will be field verified prior to logging. Road construction and ground-based yarding activities in inner gorges and will not take place without CEG advice.

Where road building is proposed in potentially unstable areas, the 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) SHALSTAB model results (computer model of shallow landslide potential based upon digital elevation information), 2) DMG landslide hazard maps (maps of geomorphic features related to landsliding used to identify likely inner gorge and deep-seated features), 3) aerial photographs, and 4) 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).

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.

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, 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. Equipment can be equipped with grapples or a winch. 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 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 being skidded. 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 involves use of a suspended cable controlled by a stationary yarder to provide lift to the logs being skidded. Nearly all cable logging done on the State Forest is 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 are in general limited to operating from truck roads or spur roads. Cable yarding is most effective on concave or only slightly convex slopes; it is much more often done with the yarder positioned 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 the choker setters 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 cheaper than tractor logging.

In helicopter logging, the helicopter lifts the logs clear of the ground and flies them to a roadside landing. This system provides the most protection in 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 landings larger than for cable or tractor logging.

Almost all future road construction on the Forest will be to access new landings to serve one of these three logging systems. Thus, the designs of logging and road systems go hand-in-hand. The most restrictive system for landing locations is cable. Yarders must be positioned so that the skyline cable can be rigged well above the terrain and lift logs clear of watercourses and other sensitive areas. Helicopter operations benefit from landings that are slightly lower in elevation than the harvest unit and as short a flight distance as possible. Tractor operations can often use landings constructed for other systems, or build new landings along existing roads.

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 in the western part of the Forest.

Road Management Plan

The objective of the Road Management Plan is to ensure that the design, construction, use, maintenance, and surfacing of JDSF roads will minimize sediment delivery to aquatic habitats. 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, including the JDSF rapid sediment budget work discussed in Chapter 2, have shown that forest roads are a major source of management-related stream sediment. The Road Management Plan for JDSF, included as Appendix VI, 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 six major components:

Inventory:

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: 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. During the first five years, all existing roads will be inventoried (approximately 75 miles per year). 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.

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: a) no truck hauling when greater than 0.25 inch of precipitation has fallen during the preceding 24 hour period (applies to the entire year); b) no hauling/vehicle access when road rutting is occurring at a rate greater than that found during normal road watering, c) resumption of hauling only after rain has ceased for 24 hours and no turbid water produced from road surface runoff is observed in inside ditches along the roads where hauling may occur, and d) 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. Active roads and crossings will be inspected at least 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 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.

Abandonment:

Information for identifying and prioritizing road segments requiring abandonment will come from the road inventory, which will be completed over the first five 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: 1) unstable areas, 2) roads in close proximity to a watercourse

(particularly class I watercourses with anadromous fish habitat), 3) roads not needed for management purposes, and 4) roads with excessive amounts of perched fill.

Schedule:

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, work to be completed includes repair of problem road, landing, and crossing location sites, and proactive abandonment of appropriate roads.

Water Quality

Lowering turbidity and reducing suspended sediment concentrations 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 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-1980's to early 1990's, with water quality improving considerably in the past 10 years. Turbidity levels are currently much like they were in the late 1970's to early 1980's. 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.

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.

Operational Implications of Watershed Analysis (Day-to-Day Guidelines)

Roads:

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. New roads are to be outsloped with dips where possible and appropriate.
3. 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.
4. Winter storm inspections are to be used in sample and high-risk areas to insure that road drainage structures are properly functioning.
5. 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.
6. Road segments near watercourses that are to remain in the permanent transportation network with inadequate road surfacing are to be surfaced with competent rock to reduce surface erosion.
7. Placement of road spoils within the WLPZ will be avoided.
8. Roads, landings and crossings are to be built according to the standards described in the JDSF Road Management Plan (see Appendix VI).
9. Road use restrictions, road inspections, and road maintenance are to be conducted according to the standards described in the JDSF Road Management Plan.

Riparian Zones:

10. Watercourse and lake protection zones are to be managed to provide high levels of large wood input for fish bearing waters.
11. 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 that area that includes a watercourse's channel at bankfull stage and a watercourse's floodplain, encompassing the area between the watercourse transition lines.]
12. 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:

13. Large woody debris may be added to fish bearing waters found to be deficient in wood loading (this work is to be coordinated with the California Department of Fish and Game).
14. Watercourse crossings are to be inventoried to insure that adequate fish passage is present; problems are to be corrected as needed.
15. Watercourse crossings are to be inventoried to locate high-risk crossings; identified crossings are to be upgraded or abandoned.
16. New and replacement watercourse crossings are to be sized for 100-year discharge events, as well as for passage of woody debris and sediment.
17. Adequate protection (i.e., Class II watercourse protection measures) is to be provided for seeps, springs, and small class II watercourses.
18. Water drafting specifications according to the Forest Practice Rules are to be used during timber operations.

Hillslopes:

19. Inner gorge areas are to be evaluated in proposed timber sales.
20. Aerial yarding systems (e.g., skyline cable, helicopter) are to be utilized where possible and appropriate on slopes steeper than 40 percent.
21. 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.
22. Winter period timber operations (November 15 to April 1) are to be avoided, except for timber falling and erosion control maintenance.

Recreation, Aesthetics, and Public Use

In accordance with Board of Forestry and Fire Protection policy, recreational facilities will be maintained with minimal development, preserving the rustic and informal characteristic of the Forest.

A defined recreation corridor will be established to manage the area within the corridor giving strong consideration to values associated with recreation. The corridor width will be determined by aesthetic considerations from the point(s) of concern. For example, at a minimum, the defined corridor will encompass the vicinity around the two main camping areas, i.e. Camp One and along the bottom of Road 360 and 361, and Dunlap Campground.

A defined corridor width of 300 feet around campgrounds has been incorporated into current planning. Appropriate management options within this corridor have been partially developed. Appropriate timber management options within this corridor will be developed and may include single tree selection, hazard tree removal, or no harvesting. Implementation of timber management options may include restricting the timing of timber operations to avoid conflicts with high visitor-use weekends or restricting operating hours to minimize noise pollution.

The needs of the recreation program will be determined by implementing user and countywide surveys at least every planning period. The survey may include current users, both individuals and special interest groups, county residents, forest neighbors, and California residents. The survey will allow input on potential interest for utilizing the Forest for special events that would bring additional revenue to the area as well as everyday and weekend user interests.

Once an updated user-survey has been completed, the Recreation Corridor will be defined explicitly where possible to provide for integrating the Recreation program with timber management, resource protection, demonstration and education, and the neighboring community. Recreation should offer a degree of control and protection to the Forest. Public use includes access for hunting and fishing in accordance with State Fish and Game regulations.

<u>Planned Management</u>

1. Improvements
   a. Camp Host sites will be improved to enable recruitment of the best candidates for the position. For example, a shower will be considered for each location.

   b. There are five multiple-use trails currently located on the free handout map. Additional designated trails will be investigated, including: a loop trail for linking the Trestle trail to Indian Springs (a hike-in campsite), a trail linking various parts of the forest, a differently-abled access trail, and a trail through the Upper James Creek Grove. Route maps for mountain biking and equestrian access will be developed.

c. Individual campsites will be improved with native vegetation where necessary to enhance privacy and reduce compaction. Vehicle parking areas will be rocked to limit vehicle travel within each campsite. Each campground will have a functional fire/barbecue pit, picnic table and vault toilet.

d. The Little Red Schoolhouse located at Camp 20 is a recorded historic site. The schoolhouse will be restored and opened to the public. Hours of operation will be determined based on the public's interest and availability of volunteers to assist in staffing the building.

2. An annual budget and positions (both permanent and seasonal) has been established for the recreation program. Following completion of the user survey, the need for a new budget and personnel proposal will be evaluated. The budget proposal will include provisions for an equipped maintenance vehicle specific to the duties involved.

3. Regular maintenance will be provided to ensure the upkeep and safe conditions of all existing facilities, including picnic tables, vault toilets, signboards, parking areas, and trails. The Camp Hosts will be responsible for regular restroom and general campground maintenance. The Forest staff will perform a periodic inspection of the recreational facilities.

4. 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.

5. 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.

6. JDSF will maintain/update and distribute a free map that includes recreational facilities, points of interest, and main access roads as well as general information concerning the Forest.

7. 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.

8. 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.

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. CDF 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, CDF continues to investigate methods and procedures that will improve and enhance the effectiveness of its heritage resource management program. 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 CDF 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.

CDF 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 CDF 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 CDF 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. CDF should establish a uniform collection policy in consultation with CDF archaeological staff. The minimum collection standards suggested by Betts shall be considered (1999). It is recommended that CDF 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).

CDF 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.

CDF'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 resources. 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. Since most of the previously outlined research questions have yet to be examined, all of the prehistoric archaeological sites on JDSF may be considered potentially significant based on the criterion that they contain information needed to answer these research questions. 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.

Forest Protection

Fire Protection

The Mendocino Ranger 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 CDF 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 CDF 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 man 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 current for the State Forest is partially complete. The local CDF Battalion Chief and Staff 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 area along main ridges, adjacent to high-use roads, and adjacent to rural residential neighborhoods.

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. During this period, JDSF will follow the Ranger Unit's Red Flag Alert Plan. 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 reduce the number of human-caused fires within the State Forest. Target groups may include neighbors, visitors, timber operators, school groups, and local organizations.

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 recourses. 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 Ranger Unit's Emergency Command Center personnel routinely checks the Automatic Lightning Detection System for possible strikes in the Forest.

Communication:

As part of communication, CDF will maintain an adequate radio system and stay in close contact with local fire departments. Local CDF fire control personnel will remain familiar with the pre-suppression plan for the State Forest.

CDF'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. Ranger 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, CDF 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 CDF to protect the State Forest "from damage and to preserve the peace therein." The Mendocino Ranger 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 CDF Battalion Chief will work together to ensure that all relevant state laws are properly enforced. CDF 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 7. There may be other pests of local tree species that are seldom detected or reported.

Staff 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 CDF or other forest pest management specialists to train employees in forest pest recognition and management.

TABLE 7. Common forest pests on JDSF.

Forest Pest	DF	GF	M. Cyp.	West. Hem	RW
Heterobasidion annosum (Annosus Root Diease)	X	X			
Armillaria ostoyae (Armillaria Root Diease)	X	X	X	X	X
Leptographium wageneri var. pseudotsugae (Black Stain Root Diease)	X				
Phaeolus schweinitzii (Velvet Top Fungus)	X				
Phellinus pini (White Pocket Rot)	X	X			
Melanophila drummondi (Flatheaded Fir Borer)	X				
Dendroctomus pseudotsugae (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 sericeus (Silver Fir Beetle)	X	X			
Phloeosinus sequoiae (Redwood Bark Beetle)					X
Rodents: upper stem girdling (e.g. Dusky Footed Wood Rat)					X

Budget and Staffing

Recent Augmentations

The State Forest budget and staffing have been augmented on two occasions over the past three years. These augmentations have added needed resources, including a road program manager, an education program forester, a recreation position, an additional heavy equipment operator, additional seasonal aides, and a GIS technician. The state forest system has benefited from new positions, including a forest research coordinator, a biometrician, a research writer, a surveyor, and a surveyor's assistant. There are also several seasonal aides available at the state-wide level to conduct forest mensuration activities on the various state forests.

Budget augmentations have included annual funds to support research, road maintenance, and timber stand improvement.

Additional Staffing Benefits

In assessing needs for the coming decade, greater biological expertise appears to be the highest priority. While limited assistance is available from CDFG, and there is potential to contract with private consultants, a staff biologist position is needed. Expertise in both fisheries and terrestrial wildlife would be beneficial.

Additional expertise considered potentially valuable includes engineering geology, hydrology, botany, and ecology. It is recognized that existing staff can be trained to perform many of these functions at a significant level, depending upon individual aptitude and available time. Engineering geology requires a license within the state of California. Depending upon progress made on the Learning Center concept, there may be need for additional expertise in the fields of recreation and public education. Additional staff help dedicated to the processes of general administration, finance, contracting, and personnel would increase the effectiveness of the state forest program.

Additional Budget Benefits

As of the date of this writing, there has been no local assessment of budget augmentation needs. However, it is apparent, based upon interest expressed in available research funds, that an augmentation of funds available for research may be an appropriate expenditure of revenues generated from the state forest system.

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 man-caused influences or natural influences that cannot be examined or are beyond the control of management staff.

Purchase of In-holdings

It would be beneficial for the Forest boundaries to extend to natural watershed divides, and to incorporate existing in-holdings into the Forest. Currently, the Forest is fairly contiguous, with a few minor in-holdings. The principal in-holdings considered most desirable for incorporation into the Forest include the McGuire Ranch (currently owned by Soper-Wheeler and Hawthorne Timber Company) in the Upper South Fork Noyo area, a quarter section involving a portion of the Hinsch estate near Mendocino Woodlands, and a string of “40s” located in James Creek (currently owned by Pioneer Resources).

Expansion Through Acquisition

Expansion of the Forest to take in the upper watershed areas of James Creek and the North Fork Big River (Pioneer Resources) 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 (Hawthorne Timber Company and remainder of Hinsch estate). 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 Pioneer Resources has been approached by the State for 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 for passenger and log truck traffic between the main Noyo River drainage, the San Francisco Boys and Girls Club, Camp Noyo Boy Scouts Camp, and Highway 20. Most of this traffic currently uses forest Road 200, which would be a candidate for abandonment due to its somewhat hazardous and potentially damaging inner gorge location.

Chapter 4. Research and Demonstration

Jackson Demonstration State Forest was acquired for the purpose of demonstration of economical forest management. State Board of Forestry and Fire Protection policy states: “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 “. It is the largest publicly owned forest in California with a research and demonstration mandate.

The primary goal of JDSF during the planning period will be to improve the amount and quality of information concerning economic forest management and timber management methods that is available to the public, small forest landowners, resource professionals, timber operators, and the timber industry. 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.

There remains a great deal of uncertainty in the regulation of forest management activities to produce 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, e.g. buffer widths, clearcut sizes, to be able to make scientifically valid comparisons of the effects of various management options. CDF will confer 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 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 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 a continuous exchange of ideas and information forest landowners through 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 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 pre-commercial 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 begun to develop on the Forest. These constitute a valuable demonstration opportunity.

JDSF staff includes three full-time positions dedicated to research and demonstration (Forester II, Forester I, and Forestry Assistant I). In addition, a forest education position (Forester I) was recently added to the staff budget to develop and implement an educational program. A research coordinator is located at CDF's Sacramento headquarters (Forester II), along with a biometrician (Forester II) and research writer position.

Current Research and Demonstration Projects

A number of ongoing and beginning research and demonstration projects that will require action during the planning period are listed and briefly described below.

Ongoing Projects

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.

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 remeasured and was last measured in 1999. It should be scheduled for another measurement in 2009 to assess the stands relationship to culmination of mean annual increment.

Caspar Creek Precommercial Thinning Study:

This young stand of third-growth redwood was pre-commercially 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 1960's. 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 1999. 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 2009.

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 is being remeasured in 2000 for a planned harvest reentry in 2001 or 2002.

Parlin Fork LWD Study:

This demonstration of artificially loading stream channel sections with large woody debris to improve fish habitat was initiated in 1996 and has been remeasured. Periodic remeasurements shall 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. Periodic remeasurements of both 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 will be done during the latter part of the planning period to verify the growth model projections.

Projects Starting In Fiscal Year 2000

Development Of Stocking Guidelines And Growth Response Relationships For Multi-aged Silviculture In Coast Redwood:

The purpose is to develop an alternative to clearcutting that also avoids the complexity of classical selection systems. This entails the creation of stands with two or three-age classes. However, no existing guidelines yet exist for implementation of these structures in the coast redwood type.

A Long Term Pre-commercial Thinning Study In Coast Redwood:

The study objectives include establishing a long term pre-commercial 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.

Assessment And Recommendations For Young Growth Site Index Models And Stand Site Estimation Procedure In California:

The overall study objective is 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.

Third Re-measurement Of Uneven-Age Management Demonstration, Recommendations For 2nd Logging Entry, And Associated Studies At Railroad Gulch:

This phase of this long-term study continues the progression by providing new inventory data both before and after the second harvest entry into this uneven-age management demonstration area. Quantification and timing of release growth after logging; assessment of the occurrence both spatially and temporally, of natural regeneration; and evaluation of younger age class recruitment will be some of the deliverable products from this study phase.

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.

A Multi-Scaled Analysis Of Fire History:

This study reconstructs spatial and temporal information about past fire events to provide baseline data on past fire frequency, timing, severity, spatial patterning, and seasonality that is necessary to develop prescribed fire, silvicultural and management programs.

A Predictive Transport Model For Large Woody Debris In Forest Streams:

The goal of this study is 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.

Genetic Architecture Of Sequoia Sempervirens At Jackson Demonstration State Forest:

This study will determine if the levels of cloning and genetic diversity are significantly different on various sites. This will allow the evaluation of the impacts of harvesting on reproduction and genetic diversity.

Evaluating Long-Term Sediment Storage And Transport In The South Fork Noyo River Watershed:

This study will assess the fluvial geomorphology and the locations and amounts of stored sediment to evaluate the influence of management practices on the past and present distribution of sediment within the basin. This information will then be used to develop better constraints for sediment budget analysis.

Planning for Future Research and Demonstration

Experimental Design – Replications and Controls

As a research and demonstration forest, JDSF is in the unique position of planning for generations of currently 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 as wide a range of conditions as possible 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. The system will be developed in close coordination between the forest silviculturist and the timber sale staff.

This system of replicated stand structure will include a flexible strategy for creating control areas. Some stands may be set aside temporarily as controls to assess baseline change over time, and may be established as components of specific research proposals. The amount of area designated as a control at any one time is not expected to occupy more than ten percent of any management compartment. The assignment of areas and specific locations of experimental controls will be a dynamic process as stand development evolves over time. When a particular timber stand has fulfilled its function as a control, it will become available for harvesting and another area within the watershed may be designated as a new control.

Figure 7, which shows the planned allocation of silvicultural methods for the next few decades, embodies JDSF's plans for replicated stands and control areas across the Forest. As is evident in Figure 7, JDSF has chosen to disperse future management across the Forest so as to maintain maximum flexibility for accommodating future research projects. Silvicultural methods are arranged optimally among planning watersheds across the Forest to keep as many options open as possible for placement of future research installations. This strategy for creating replicated stands and control areas will be able to accommodate the widest possible range of spatial scales in future research installations, ranging from the stand level up to the drainage and watershed level.

Advisory Committee

With potentially conflicting demands for research and demonstration, a process for identification of needs, prioritization, and allocation of funding is necessary. The State Forest Advisory Committee 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. The State Forest Advisory Committee is appointed and serves at the pleasure of the Director, providing a source of counsel on specific issues brought to the committee by the Director or staff on behalf of the Director. The committee represents the entire State Forest system, consisting of individual membership appointments made to represent specific State Forests.

Competitive Research Grants

Beginning in fiscal year 2000, 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 will be administered by the CDF 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. CDF, in conjunction with the state forest advisory committee, will review the proposals. CDF 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.

Forest Learning Center

The construction of a Forest Learning Center is planned for implementation during the coming decade. The Center will include lodging, 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 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 (potential Learning Center location), 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. 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 should include space for the possible siting of a new State Forest headquarters as well. 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 demonstrations program. An interim facility consisting of one of the former residences for Chamberlain Creek Conservation Camp will be used until the new facility is completed.

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.

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 demonstrations programs. Forest visitors will be able to obtain camping permits, maps, trail brochures, wildlife and vegetation lists, 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 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 CDF's Project Learning Tree, and will seek to develop a close working relationship with the Forestry Institute for Teachers and other educational programs.

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 coverages 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.

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. The clientele for this component of the program encompass all grade levels of school up through postgraduate, forest landowners, resource professionals, and the public. The addition of an education forester will provide the staffing to coordinate with other organizations and institutions in providing a forestry education program. 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. The Education Forester would lead this outreach effort. All of these initiatives are examples where the demonstration and recreation programs can complement one another and require cooperation and coordination to maximize the potential benefits.

Additional staffing to fulfill the needs of this component is required. Additional positions have been requested and approved which include an Education Forester and additional personnel funds for seasonal help.

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 PSW Experiment Station, Redwood Sciences Laboratory. The CACTOS and GSPACE cooperatives are examples of industry/university research coops in which CDF has participated. CALFORNET, a new concept of a joint effort by CDF and the three forestry universities in the State is another example of cooperation. This effort is attempting to coordinate research and demonstration projects between CDF 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 CDF should be made where feasible.

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 CDF Forest and Ranger Unit staff as a publication of the Mendocino Ranger Unit. It is currently printed using 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 California Forestry Note has been the CDF publication for state forest activities since 1960 (originally called State Forest Notes). Most research projects should produce at least one California Forestry Note. Reprints from other peer-reviewed publications may also be available and may be re-issued as Forestry Notes. The technical writer in Sacramento will serve as the editor and publisher of the California Forestry Note with technical assistance from State Forest staff. The copyrighting of this name should be investigated. 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.

Numerous professional journals offer the possibility of technology transfer to a wider audience than might be contacted through the internal CDF 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 CDF to publish research results in a CDF publication. CDF 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 more 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.

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 Pre-Commercial thinning Study

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 that are interested in specific research activities being done on JDSF. Other organizations such as the 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.

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 which 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.

Internet Web Page

The exponential increase of Internet use as an information tool by all clientele groups makes it an important public relations and technology transfer medium. In coordination with the ranger 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. Over the planning period, research and other 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 page. Periodic updates to the page will be done as management activities change the status of forest conditions.

Demonstration

Creating opportunities for demonstration of various silvicultural systems, forest structures, and wildlife habitats will be a significant focus of effort.

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 kind 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. 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 areas that are adjacent to the Woodlands Center and to the Pygmy Forest Reserve.

Research and Demonstration Needs

With potentially conflicting demands for research and demonstration, a process for identification of needs, prioritization, and allocation of funding is necessary. An advisory committee appointed by the Director of Forestry and Fire Protection 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.

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?
- 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?

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:

- Fisheries studies that include channel habitat, population dynamics, and off site conditions.
- Young stand management that includes stocking level and pre-commercial 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 relationships that include habitat relationships, forest fragmentation, edge effects, connectivity and forest corridors.
- Silvicultural systems that include even and uneven-aged management systems.
- Vegetation management that includes control of exotic species, brush 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 (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.
- Habitat development modeling, including assessment of habitat availability, habitat connectivity.

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.

JDSF Citizen's Advisory Committee (1997-1998):

In 1997, past 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 Un-evenaged 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:

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 Nonpoint 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

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. Current funding available for State Forest System research is $600,000 per year. Strong interest shown by both the numbers of individuals applying for research funding, 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.

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. Rather than advancing the science of monitoring, this management plan focuses on practical implementation of proven, practical monitoring strategies that can be sustained given limited budget and personnel. 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 changes 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 equate 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 need for monitoring is infinite. Since we cannot monitor everything, this management plan focuses on ecosystem vital signs – parameters that are inexpensive to obtain, statistically robust, and provide 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 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.

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 foresters to guide in implementation of the JDSF monitoring approach on the ground. It is therefore organized in a step-wise fashion, listing for each resource the monitoring goals, followed by parameters and data to be collected, and finally analysis approaches and adaptive management strategies.

Timber Resources

Goal 1: maintain a wide range of seral stages. Increase late seral (CWHR 5 and greater) forest conditions. Normal priority.

Goal 2: Non-declining inventory levels. Harvest less than growth in any rolling five-year period. Harvest 31 million board feet or less in any rolling five-year period. High priority.

Goal 3: Reduce exotic species such as eucalyptus in favor of native vegetation. Increase conifer stocking on the east end of the Forest. Normal priority.

Goal 4: Achieve the maximum possible level of sustained production of high quality forest products while maintaining all other public trust resources. Normal priority.

Parameters and Data Collection, all goals:

Monitoring of all timber-related resources are tied to forest inventory measurements. Several inventory efforts are currently ongoing and will continue to be implemented. The intensive forest inventory (IFI) system is measured annually as a part of the Forest's stand based forest inventory system. In this inventory process, timber as well as forest structure parameters are measured in detail. The following parameters are measured at regular intervals:

Parameter	Unit	How Calculated
Diameter	Tree	Measured
Species	Tree	Measured
Height	Tree	Measured
Health	Tree	Estimated
Crown length	Tree	Measured
10-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
Height growth on trees < 1 inch dbh	Stand	Estimated
Last treatment implemented	Stand	Recorded
Coarse and fine woody debris	Stand	Measured
Fuels	Stand	Measured
Forest type / seral stage	Stand	Measured
Site quality	Stand	Measured
Volume of brush species in cubic feet	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 system has been remeasured at five-year intervals since 1959, and provides a high quality historical record of forest growth and structure characteristics over a 40-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. It will be updated based on management treatments that occur, and new vegetation maps will be developed periodically, along with depletion maps.

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.

Analysis:

Analyses include standard statistics estimated from the IFI 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 all existing timber inventory data, provides the ability to conduct ad hoc queries on any timber-related variable. GIS data will be linked to the data base to provide spatial reference. The forest structure characteristics data permit estimating seral stage using for example the California Wildlife Habitat Relationships system.

Adaptive Management:

Goal 1: Implement silvicultural methods to create a mix of seral stages. Implement silvicultural methods aimed at cultivating late seral conditions in selected managed stands.

Goal 2: Reduce or increase annual harvest levels to achieve the desired five-year rolling average harvest levels and non-decreasing inventory levels.

Goal 3: Implement silvicultural methods that increase conifer site occupancy and selectively removes hardwood species where they are over-abundant.

Goal 4: Implement the guidelines from the JDSF Option A plan.

Watershed Resources

Goal: Hillslope conditions - mitigate road and crossing problem sites. High priority.

Parameters and data collection: As part of the Road Management Plan for JDSF, CDF will survey all of the roads and crossings on JDSF over a 5-year period, identify problem sites, and develop priorities for treating problems (inventory/baseline monitoring). The procedures for the road and crossing inventory are described in detail in Appendix II. 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. Formal inspections will occur every two years using the same protocols as the initial inventory (inventory, trend, and effectiveness monitoring).

The analysis phase will consist of qualitative evaluation of problem areas using professional judgement. Adaptive management approaches include treatment of problem sites and road maintenance. This is described in more detail in the Road Management Plan.

Goal: Hillslope monitoring – minimize erosion impacts resulting from forest management operations. High priority.

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) measurement of WLPZ overstory canopy for class I 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 correlating forest management operations and documented erosion. Adaptive management solutions will be site specific based on professional judgement.

Goal: Minimize landslides associated with roads, landings and harvest units. High priority.

Parameters and data collection will consist of identifying landslides associated with roads, landings or harvest units by both direct observation in the field and with air photos. 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 consists of correlating landslides to timber management activities. As a possible research item, this data will also be useful for the continued validation of the SHALSTAB model of shallow landslide potential and in monitoring the effectiveness of prescriptions designed to minimize the risk of shallow landsliding. Specific tasks include: 1) compilation of landslide frequency, type, and relationship to past and current forest practices on clearcut slopes and adjacent non-clearcut slopes with similar slope characteristics, 2) compilation of data on road-related landslides, 3) calculation of the percent of slope failures missed during non-field related landslide mapping, 4) comparison of the field mapping to landslides predicted by the SHALSTAB model, 5) map of colluvial deposits in topographic hollows (mainly the unchanneled valley upslope of channel heads) in clearcuts and upslope of the study areas and uncut slopes, and 6) determination of the accuracy of remote sensing data (i.e., air photos) on identifying landslides. Complete sets of aerial photographs for JDSF exist from the 1940's to the present, with intervals between sets of photographs averaging approximately 5 years.

The adaptive management solution to achieving this goal is development of silvicultural prescriptions and road and landing construction techniques designed to minimize the risk of shallow landsliding.

Goal: stream channel conditions - maintain or improve aquatic and riparian habitat conditions and minimize sediment delivery to watercourses. High priority.

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 monumented 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

The adaptive management solution relative to this goal consists of developing a set of management prescriptions designed to maintain or improve aquatic and riparian habitat conditions and minimize sediment delivery to watercourses.

Goal: minimize potential cumulative watershed effects resulting from forest management activities. Normal priority.

Parameters and data collection are defined by the research protocol in the ongoing Caspar Creek watershed study, the only long term hydrologic record (37 years) from watersheds located in second growth conifer forests. On August 17, 1999, CDF 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 subwatersheds 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 subwatersheds, 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 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.

Goal: stream temperature - maintain or improve current stream temperature regimes. Normal priority.

Parameters and data collection: CDF has intensively monitored summer water temperatures in JDSF streams since 1993. Annual summer stream temperature monitoring is scheduled to continue. The number of stream temperature monitoring locations has increased from 11 in 1993 to 51 in 1996, and the extent of monitoring has expanded to include locations in all of the major drainage basins. JDSF is monitoring 13 of the 15 planning watersheds that comprise the Forest. 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. The Forest Science Project at Humboldt State University processes raw data and produces weekly statistics, graphs, maps and summaries of temperature data.

Analysis will consist mainly of trend analysis. Adaptive management solutions will consist of modifying forest management prescriptions and manipulating vegetation canopy cover as needed.

Goal: Maintain or improve current fish and amphibian populations on the Forest. High priority.

Parameters and data collection:

Since 1962 CDFG 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 CDFG attempts to count all of the returning coho at the weir and retains approximately 75 percent of the female coho for artificial propagation.

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.

CDFG 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 CDFG 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 was collected on large woody debris loading and fine

sediment in stream gravels in Hare Creek.

CDF has 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.

Analysis will consist of summarizing and projecting 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.

Goal: Protect or improve current populations and habitat. High priority.

Parameters and data collection:

Raptors – CDFG and CDF currently monitor all known Northern Spotted Owl activity centers on JDSF. CDF 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 through 1997. CDF is working cooperatively with neighboring private timber companies in a northern spotted owl monitoring and banding program.

CDF 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 to assess nest site productivity for osprey and survey the general forest for other raptor species of concern (inventory/baseline monitoring). The survey will not exceed 12 hours of flight time and may be conducted ancillary to other management activities if completed at the appropriate time of year and at altitudes suitable for survey purposes. JDSF will conduct ground-based surveys (Northern Spotted Owl, Accipiters) 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 (old-growth groves) 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. CDF 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.

Lotis Blue Butterfly - JDSF will identify and prioritize areas of suitable habitat for survey using protocols endorsed by the California Department of Fish and Game. JDSF will extend survey requirements in the event of a positive survey outcome.

Northwestern pond turtle - JDSF will develop and implement a research project to assess northwestern pond turtle population status and habitat requirements for breeding and over-wintering.

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

Goal: protect and restore the diversity of plant species across the Forest. Normal priority.

Parameters and data collection: CDF 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 or trained forest personnel will conduct surveys 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 judgement about possible adaptive management strategies. This may include modifying the nature and location of management prescriptions.

Recreation Resources

Goal: Improve the utility of the Forest as a recreation destination. Normal priority.

Parameters and data collection:

Visitor-use surveys will be conducted 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 and people camping in the forest.

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 all reported 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 developed by 2002. The web site will include the number of hits on various recreation topics and will provide information as well as an avenue for public comments. The web site will be updated and public comments will be reviewed at least bi-monthly. A review of the overall design will be conducted annually. Comments from the web site will be summarized and included in the five-year recreational trend review.

Public Use Other Than Recreation

Goal: Achieve a sustainable public use of the Forest and all its resources. Normal priority.

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 judgement will be used to devise adaptive management strategies to possibly limit harvest activities to sustainable levels.

Heritage Resources

Goal: 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. High priority.

Parameters and Data Collection:

CDF will establish a systematic monitoring program to evaluate the effectiveness of site protection practices during timber harvest operations. CDF 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 readily apparent. 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, CDF 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. There is currently no mechanism in place where the effectiveness of site protection measures can be directly evaluated by CDF.

Analysis and Adaptive Management Strategies:

CDF will develop a strategy to manage archaeological sites that are bisected by roads in order to mitigate impacts to sites caused by regular road grading and maintenance activities. This plan should be developed by the Forest Manager in consultation with CDF 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 CDF 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 subwatersheds 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 CDF 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 CDFG 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 CDFG, 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 will be extended in the summer of 1999 to include placement of woody debris in Hare and Caspar Creeks and monitoring its effects. As part of an experiment on the effects of enhancing large woody debris (LWD) in JDSF streams, CDFG is monitoring habitat for juvenile salmonids at sites in Parlin, Hare and Caspar Creeks. Habitat monitoring will take place prior to the addition of LWD and after the projects have been completed. LWD was placed in Parlin Creek in fall 1996 following completion of a habitat inventory.

- JDSF in cooperation with the Department of Fish and Game, will develop and implement a research project to assess northwestern pond turtle population status and habitat requirements for breeding and over-wintering.

- The National Marine Fisheries Service (NMFS) in cooperation with the California Department of Fish and Game (CDFG) has begun a study on straying and homing rates for coho salmon in the Noyo River drainage using mark and recapture techniques. The purposes are: 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.

- CDF and USFS Redwood Sciences Laboratory researchers are in the process of developing a long-term study to record information on riparian area silviculture and ecology. The study will include measurement of large woody debris recruitment and its relationship to differing silvicultural practices and protection zone widths in riparian zones. This study will address questions specific to stand growth and development, successional trends, microclimate changes, and amphibian habitat. Study sites will occur on JDSF, as well as in other North Coast locations.

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, and special fund contracts. The $600,000 annual statewide budget for research, demonstration, and monitoring is another source 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. All of the ongoing monitoring activities described here are already funded. 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.

Abbreviations

bf – board feet

BOF – State Board of Forestry and Fire Protection

CAA – Confidential Archaeological Addendum

CDF – California Department of Forestry and Fire Protection

CDMG, DMG - California Department of Mines and Geology

CDPR – California Department of Parks and Recreation

CEG - certified engineering geologist

CFI - continuous forest inventory

(C)MAI - (culmination of) mean annual increment

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 Relationships, a system developed by CDFG to model the interactions between wildlife species and their habitats

dbh – diameter of a tree, outside the bark, measured 4.5 feet above the ground on the high side of the tree

DFG, CDFG – California Department of Fish and Game

FRIF – Forest Resource Improvement Fund, into which state forest revenues are deposited and from which state forest expenses are paid

GIS – geographic information system

GPS – global positioning system

IFI - intensive forest inventory

IPM – integrated pest management

JDSF - Jackson Demonstration State Forest

LWD - large woody debris

Mbf – thousand board feet

MWSTA – Mendocino Woodlands Special Treatment Area, as described in PRC Section 5823

PCT - pre-commercial thinning

PFA - post fledging area

SCA - Special Concern Area

STA - Special Treatment Area

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 recontouring, 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 – 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 evenaged 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 Ranger Unit, the administrative subdivision of CDF 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 pulls 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) MC: 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 definition 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 are" 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, 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 designed 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 form state-owned forests, which have not received primary manufacture to a size sawn on 4 sides to dimensions of 4 inches by 12 inches (10.2cm 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.

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 unreasonable 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 form 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, drip 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 aesthetics 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 (1.83m), 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 order 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.

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.

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 wst 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, T1`7N, 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, T32-N, R2-E, 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.

Board of Forestry and Fire Protection Policies February 21, 2001

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)

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 is 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 healthy 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 discourage.

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 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 will be prepared and maintained current for the Jackson, Latour, Mountain Home, and Boggs Mountain State Forests. All operations on the forests will conform to the management plans. Management plans should include, but not be limited to the following topics:

A. Introduction

Brief history of forest
Purpose - statutory and otherwise

B. General features

Location
Boundaries
Topography
Climate
Soil
Geology
Water Resources

C. Forest description

Area, ownership pattern and adjacent ownerships
Forest types
Site qualities
Growth and yield potential (stock and stand tables)
Accessibility - road system
Ground cover

D. Economic situation
Towns and communities
Markets for forest products
Transportation facilities

E. Management objectives

Statutory
Policy
Local

F. Silvicultural Treatment

Cutting system
Logging conditions
Protection measures
Stand improvement - thinning, pruning, and planting projects

G. Regulation of growing stock

Rotation and cutting cycle
Allowable cut
Cutting budget and order

H. Sales policy - statutory, departmental, and local

I. Demonstrations, experiments, and research

Problems needing study
Active projects
Completed projects

J. Other management factors

Acquisition and exchange - needs and priorities
Grazing and mining (as needed)
Recreation
Fish and wildlife habitat management
Watershed protection
Water management
Road development plan
Fire protection
Insects and disease
Cooperation with adjacent ownerships
Historical and archaeological sites

K. Appendix

Stock and stand tables
Growth data
Various maps - base, topographic, ownership, types, sites, soils, geologic and cutting order

Appendix II. Detailed Goals and Objectives

<u>Goal #1 - RESEARCH & DEMONSTRATION</u>: Improve the amount and quality of information concerning economic forest management and timber management methods that is available to the general public, small forest landowners, resource professionals, timber operators, and the timber industry.

Objectives:

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.

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, and other public and private researchers in conducting research and demonstration projects. Enter into cooperative agreements for investigations of mutual interest. Make the State Forest available to educational institutions and other agencies for research and demonstration projects.

<u>Goal #2 - TIMBER MANAGEMENT</u>: 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.

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, and set a forest-level allowable annual cut that will lead towards achievement of the desired future condition. Project the short term, site-specific harvest schedule at least 10 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.

<u>Goal #3 - WATERSHED AND ECOLOGICAL PROCESSES</u>: 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.

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

<u>Goal #4 - FOREST RESTORATION</u>: Work towards achieving a balanced mix of forest structures and attributes in order to enhance forest health and productivity.

Objectives:

Restore and decommission roads to minimize WLPZ and unstable roads.

Minimize sediment production from roads.

Increase the amount of late seral forest.

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

Add forest structural elements to stands (snags, large trees, large diameter limbs, cavities, flat tops).

Minimize the influence of exotic plants and animals.

Cultivate conifer stands capable of producing high quality sawtimber, on the east end of the Forest.

<u>Goal #5 - RECREATION and AESTHETIC ENJOYMENT</u>: Plan for and provide low impact recreational opportunities that are compatible with forest management objectives and healthy ecological processes, and that are consistent with historic recreational use characteristics.

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.

Demonstrate that recreation and timber management are compatible land uses through the integration of recreational development and use with timber harvest activities. Utilize this opportunity to explain forest 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.

<u>Goal #6 - INFORMATION & PLANNING</u>: Develop, maintain, and update management plans and other planning documents and processes and keep them current. Manage and support the information needs of all State Forest programs.

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.

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.

Provide opportunities for public and other agency input into planning processes.

<u>Goal #7 - PROTECTION</u>: 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.

Appendix III. Special Concern Areas

The term Special Concern Area is used to denote geographically distinct areas that are in some way unique 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. Figure 5 shows the approximate locations of the Special Concern Areas.

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 in the list 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 a large number of Special Concern Areas on the Forest, a total of 23.

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 - 270 acres. 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 - 2,012 acres. 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.

Shallow landslide potential areas - 1,185 acres. Areas identified by the SHALSTAB model as having a high or chronic shallow landslide hazard potential. These areas are subject to silvicultural limitations, such as no harvest or limited single tree selection if site review during THP preparation confirms instability.

Northern spotted owl nest areas - 199 acres. 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 - 45 acres. 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.

Woodlands special treatment area - 2,511 acres. A special management area adjacent to the Mendocino Woodlands. Silvicultural activities are focused on promoting late-successional forest conditions, maintaining aesthetic qualities, and limiting impacts on the operation of Mendocino Woodlands.

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 - 1,153 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 - 267 acres. Areas adjoining State Parks where the application of silvicultural systems must take the values of the parks into consideration.

Technically infeasible areas - 214 acres. Areas which are inoperable because of inaccessibility or other physical limitations.

Reserved old growth groves - 459 acres. Includes the existing mapped old growth grove reserves. These areas will not be harvested.

Late seral development areas - 780 acres. Includes areas adjacent to three old growth grove reserves. 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.

Campground buffers - 77 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 harvested.

Road and trail corridors - 3,344 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 - 312 acres. An area adjacent to the Parlin Fork Conservation Camp that is used as a demonstration area for small woodland management.

Research areas - 1,454 acres. Areas set aside for various research studies.

Appendix IV. Research and Demonstration Program

Goals and Objectives for the Research and Demonstration Program

- Conduct resource management demonstrations and investigations directed to the needs of the public, small forest landowners, resource professionals, timber operators, and the timber industry.
- Conduct monitoring of resource management activities to gauge their effectiveness in meeting project objectives.
- Demonstrate the compatibility and conflict involved in multiple use of forestland, and investigate methods to mitigate conflict.
- 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 Learning 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. Seek matching funds where appropriate.
- Consult and cooperate with universities and colleges, Federal agencies, and other public and private researchers in conducting research and demonstration projects. Enter into cooperative agreements for investigations of mutual interest. Make the State Forest available to educational institutions and other agencies for research demonstration, and training.
- 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.

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 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 Pre-Commercial 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 have reported on results and results have also been reported on at the Conference On Coast Redwood Forest Ecology And Management in 1996 and a technical session presented in spring 2000

The Whiskey Springs Commercial Thinning Study

This study was started in 1970 and the study objective was to monitor and determine the effects of 3 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 remeasured many times over the life of the study and has evolved to monitoring also the sprout regeneration resulting from the initial thinning under the 2 heaviest thinning treatments. A sub-study evaluating the effects of pre-commercial 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 and a technical session presented in spring 2000. The last remeasurement occurred in 1999 with a report produced in spring 2000.

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 1990's with the anticipation that a 10 year harvest reentry would be done. This was not accomplished so in year 2000 a third remeasurement and subsequent second harvest entry into this stand is planned to move these stands towards eventual regulation. Several newsletter articles and California Forestry Note 97 have resulted 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 masters thesis was completed from the implementation and completion of the initial phase of this project. A third remeasurement is scheduled for summer 2000 prior to the implementing the second harvest entry in the research plots.

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 completed 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 pre-commercial 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 pre-commercial 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 presentations made at the Technical Session in 2000.

Completed Major Research Projects

Investigation of the Black Stain Root Rot Disease

Studies 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 which 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 unlogged 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. A demonstrational trail system was developed with an Accompanying illustrated brochure ("Forest History Trail Guide").

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 done to implement silvicultural study . A contract report is on file.

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 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. Later , 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 throughout the forest representative of local size class distributions and site characteristics were selected 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 6 percent while other whitewoods were underestimated by approximately 3 percent. Appropriate calibration coefficients are now be 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 upon request.

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 JACKSON DEMONSTRATION STATE FOREST. 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 clear cutting 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 clear –cut 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 study with University of California Extension and other forest landowners 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.

Research And Demonstration Projects Starting 2000

Development Of Stocking Guidelines And Growth Response Relationships For Multi-aged Silviculture In Coast Redwood

The purpose is 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 exit for implementation of these structures in the coast redwood type.

A Long Term Pre-commercial Thinning Study In Coast Redwood

The study objectives include establishing a long term pre-commercial 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, herbicides, slope, aspect, age and site; 3)the optimal stand age for conducting the PCT treatment and 4) provides data which may be used to expand the CRYPTOS growth model for ages from 0 to 20 years.

Assessment And Recommendations For Young Growth Site Index Models And Stand Site Estimation Procedure In California

The overall study objective is 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.

Third Remeasurement Of Uneven-Age Management Demonstration, Recommendations For 2nd Logging Entry, And Associated Studies At Railroad Gulch, Jackson Demonstration State Forest

This phase of this long term study continues the progression by providing new inventory data both before and after the second harvest entry into this uneven-age management demonstration area. Quantification and timing of release growth after logging and occurrence spatially and temporally of natural regeneration and recruitment of younger age classes will be some of the deliverable products from this study phase.

Incision Of Low-Order Channels In Jackson Demonstration State Forest

This study will provide for a reconnaissance of a wide range of channels in JDSF to formulate and improve hypotheses concerning the factors that influence the occurrence of gully headcuts and incision in low-order channels and swales.

A Multi-Scaled Analysis Of Fire History, Jackson Demonstration State Forest

This study will for the reconstruction of spatial and temporal past fire events to provide baseline data on past fire frequency, timing, severity, spatial patterning, and seasonality that is necessary to develop prescribed fire or silvicultural or management programs.

A Predictive Transport Model For Large Woody Debris In Forest Streams

The goal of this study is 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.

Genetic Architecture Of Sequoia Sempervirons At Jackson Demonstration State Forest

This study will determine if the levels of cloning and genetic diversity are significantly different on various sites. This will allow the evaluation of the impacts of harvesting on reproduction and genetic diversity.

Evaluating Long-Term Sediment Storage And Transport In The South Fork Noyo River Watershed, Jackson Demonstration State Forest

This study will assess the fluvial geomorphology and the locations and amounts of sediment stored to evaluate the influence of management practices on the past and present distribution of sediment within the basis and use this to develop better constraints for sediment budget analysis.

Appendix V. Timber Resource Information

This appendix contains background and reference information related to forest management.

Inventory

Table A5-1 is a summary of the 1997 IFI inventory. Table A5-2 is based on soil survey data.

Table A5-1. Timber inventory volumes and vegetation types on the east and west ends of JDSF.

	Vegetation Type	Site Class	Acres	Conifer Volume(bf/ac)	Hardwood Vol(bf/ac)	All Species Vol(bf/ac)	Conifer Total (bdft)	Hardwoods Total (bdft)	All Species Total (bdft)
E	BR	3	22.96	10	6	16	229.6	138	367
E	BR	4	7.08	9	5	14	63.72	35	99
E	BR	8	33.1	8	5	13	264.8	166	430
E	DR5DM	2	479.03	26	2	28	12454.78	958	13413
E	DR5DM	3	777.71	25	2	27	19442.75	1555	20998
E	DR5DM	4	364.77	23	2	25	8389.71	730	9119
E	DR5EM	2	191.64	28	2	30	5365.92	383	5749
E	DR5EM	3	169.56	27	1	28	4578.12	170	4748
E	DR5EM	4	216.01	27	1	28	5832.27	216	6048
E	DR5PM	3	288.04	8	3	11	2304.32	864	3168
E	DR5PM	4	545.05	8	2	10	4360.4	1090	5450
E	DR6DM	3	54.48	47	6	53	2560.56	327	2887
E	DR6DM	4	85.6	46	6	52	3937.6	514	4451
E	GRBG	2	32.95	0	0	0	0	0	0
E	GRBG	3	26.88	0	0	0	0	0	0
E	GRBG	4	5.3	0	0	0	0	0	0
E	HC3E	2	123.67	14	6	20	1731.38	742	2473
E	HC3E	3	1056.93	14	5	19	14797.02	5285	20082
E	HC3E	4	523.74	14	5	19	7332.36	2619	9951
E	HR3E	2	269.91	10	3	13	2699.1	810	3509
E	HR3E	3	1186.86	9	3	12	10681.74	3561	14242
E	HR3E	4	1447.74	9	3	12	13029.66	4343	17373
E	MC5DM	2	4.91	19	5	24	93.29	25	118
E	MC5DM	3	49.33	19	5	24	937.27	247	1184
E	MC5DM	4	31.71	19	5	24	602.49	159	761
E	R5MM	2	13.76	6	3	9	82.56	41	124
E	R5MM	3	92.97	6	3	9	557.82	279	837
E	R5MM	4	68.49	6	3	9	410.94	205	616
E	R6DM	2	164.35	33	3	36	5423.55	493	5917
E	R6DM	3	398.78	32	3	35	12760.96	1196	13957
E	R6DM	4	169.44	32	3	35	5422.08	508	5930
E	R6MM	2	6.84	26	2	28	177.84	14	192
E	R6MM	3	93.81	25	2	27	2345.25	188	2533
E	R6MM	4	252.91	25	2	27	6322.75	506	6829

E	RD2M	3	8.57	27	0	27	231.39	0	231
E	RD5PM	2	106.11	17	3	20	1803.87	318	2122
E	RD5PM	3	159.21	16	3	19	2547.36	478	3025
E	RD5PM	4	43.43	16	3	19	694.88	130	825
E	RD6E	2	45.6	42	2	44	1915.2	91	2006
E	RD6E	3	104.82	42	2	44	4402.44	210	4612
E	RD6E	4	24.68	42	2	44	1036.56	49	1086
E	RD6EM	2	41.98	23	4	27	965.54	168	1133
E	RD6EM	3	743.48	23	4	27	17100.04	2974	20074
E	RD6EM	4	720.8	22	3	25	15857.6	2162	18020
E	RD6MM	2	173.75	15	4	19	2606.25	695	3301
E	RD6MM	3	474	14	4	18	6636	1896	8532
E	RD6MM	4	664.95	13	3	16	8644.35	1995	10639
E	RD6PM	2	429.63	24	3	27	10311.12	1289	11600
E	RD6PM	3	1443.78	23	2	25	33206.94	2888	36094
E	RD6PM	4	1161.45	23	2	25	26713.35	2323	29036
W	AL	2	13.07	20	6	26	261.4	78	340
W	AL	3	6.66	19	6	25	126.54	40	166
W	AL	8	37.64	19	6	25	715.16	226	941
W	CPC5E	3	359.12	36	0	36	12928.32	0	12928
W	CPC5E	8	262.96	34	0	34	8940.64	0	8941
W	DR5DM	2	2164.94	61	2	63	132061.3	4330	136391
W	DR5DM	3	926.52	59	2	61	54664.68	1853	56518
W	DR5DM	4	343.63	56	2	58	19243.28	687	19931
W	DR5EM	2	673.97	46	1	47	31002.62	674	31677
W	DR5EM	3	104.69	44	0	44	4606.36	0	4606
W	DR5EM	4	75.99	42	0	42	3191.58	0	3192
W	GRBG	2	93.69	0	0	0	0	0	0
W	GRBG	3	38.46	0	0	0	0	0	0
W	GRBG	8	17.21	0	0	0	0	0	0
W	GSEL	1	7.98	65	0	65	518.7	0	519
W	GSEL	2	1285.99	62	0	62	79731.38	0	79731
W	GSEL	3	75.53	60	0	60	4531.8	0	4532
W	HC3E	2	95.97	39	5	44	3742.83	480	4223
W	HC3E	3	59.76	39	5	44	2330.64	299	2629
W	HC3E	4	17.05	38	5	43	647.9	85	733
W	HR3E	2	461.23	42	6	48	19371.66	2767	22139
W	HR3E	3	124.22	40	6	46	4968.8	745	5714
W	HR3E	4	324.65	39	5	44	12661.35	1623	14285
W	MC5DM	2	37.45	50	0	50	1872.5	0	1873
W	MC5DM	3	113.97	48	0	48	5470.56	0	5471
W	PYGMY	8	612.67	1	0	1	612.67	0	613
W	R6DM	1	25.08	66	2	68	1655.28	50	1705
W	R6DM	2	2055.62	64	2	66	131559.7	4111	135671
W	R6DM	3	1023.77	62	2	64	63473.74	2048	65521
W	R6DM	4	79.07	60	1	61	4744.2	79	4823
W	R6MM	1	22.62	69	3	72	1560.78	68	1629
W	R6MM	2	2362.49	66	2	68	155924.3	4725	160649
W	R6MM	3	478.44	64	2	66	30620.16	957	31577

W	R6MM	4	137.65	62	2	64	8534.3	275	8810
W	RD1	2	94.15	0	0	0	0	0	0
W	RD1	3	16.35	0	0	0	0	0	0
W	RD2EO	2	26.76	27	1	28	722.52	27	749
W	RD2EO	3	33.83	27	1	28	913.41	34	947
W	RD2M	2	1523.82	17	0	17	25904.94	0	25905
W	RD2M	3	99.57	17	0	17	1692.69	0	1693
W	RD3P	2	598.21	5	0	5	2991.05	0	2991
W	RD3P	3	4.65	5	0	5	23.25	0	23
W	RD5PM	2	1462.15	49	2	51	71645.35	2924	74570
W	RD5PM	3	139.44	47	1	48	6553.68	139	6693
W	RD6DM	2	28.34	86	0	86	2437.24	0	2437
W	RD6DM	3	76.05	85	0	85	6464.25	0	6464
W	RD6DM	4	22	84	0	84	1848	0	1848
W	RD6E	2	296.38	49	0	49	14522.62	0	14523
W	RD6E	3	126.16	48	0	48	6055.68	0	6056
W	RD6E	4	15.53	47	0	47	729.91	0	730
W	RD6EM	2	2420.24	70	1	71	169416.8	2420	171837
W	RD6EM	3	1131.56	68	1	69	76946.08	1132	78078
W	RD6EM	4	39.93	66	1	67	2635.38	40	2675
W	RD6MM	2	800.36	33	2	35	26411.88	1601	28013
W	RD6MM	3	223.8	32	2	34	7161.6	448	7609
W	RD6MM	4	231.42	31	2	33	7174.02	463	7637
W	RD6PM	1	119.6	55	1	56	6578	120	6698
W	RD6PM	2	6449.97	53	1	54	341848.4	6450	348298
W	RD6PM	3	2397.05	51	1	52	122249.6	2397	124647
W	RD6PM	4	152.37	50	1	51	7618.5	152	7771
			48652				2002685.50	90577.72	2093263.22

Table A5-2. Acres by site class on the east and west ends of JDSF.

Site Class	West End	East End
1	165.6	0
2	22832.3	2077.1
3	7731.3	7209.3
4	1409.1	6288.1
N	911.2	27.2
Total	33049.5	15601.7

Land Area Summaries

Table A5-3. Special Concern Area acreages.

This table summarizes the acreages in Special Concern Areas and management compartments for convenient reference. Acreages are not exact; all records with less than one acre were dropped. Detailed analyses should use the GIS data from which this summary was derived.

Explanation of Column headings:

CPT	Compartment Number (Railroad Gulch is coded 0)
EUCLYT	1=Eucalyptus, 0=Out
CYPRES	1=Cypress Groups, 0=Out
JUGHDL	1=Jughandle Reserve Area, 0=Out
NEIGHB	1=Neighbor Buffer, 0=Out
LANDSL	1=Modelled Shallow Landslide Potential (SHALSTAB),0=Out
ROW	1=Powerline Right-of-way, 0=Out
H2OSUP	1=Water supply area, 0=Out
PYGMY	1=Pygmy, 0=Out
RESRCH	1=Research Area, 0=Out
CON	1=Conservation Camp, 0=Out
ROAD	1=Road/Trail Scenic Corridor, 0=Out
PARL	1=Parlin Management Unit, 0=Out
GROVE	1=Old Growth Grove, 0=Out
RES	1=Old Growth Reserve, 2=Marbled Murrelet Habitat Augmentation, 0=Out (Note: Late Seral was calculated as: (OGMGMT = 1 or OGMGMT = 2) and (SILVI2 = 'LATE SERAL DEVELOPMENT' or SILVI2 = 'RAILROAD GULCH STUDY'))
WOODLD	1=Woodlands Special Treatment Area, 0=Out (Not the same as LSR)
INSIDE	100=Inside Riparian Zone (all zones), 1=Internal Exclusion, 0=Out
INNER	1=Class 1 Stream Inner Buffer, 2=Class 2 Stream Inner Buffer, 0=Out
OUTER	1=Class 1 Stream Outer Buffer, 2=Class 2 Stream Outer Buffer, 0=Out

*WLPZ Distances are:
Class 1 and 2, inner WLPZ 25 slope feet
Class1, outer WLPZ 150 Slope feet, Class2 100 Slope feet

ACRES	Summary Acres Item

CPT	EUCLYT	CYPRES	JUGHDL	NEIGHB	LANDSL	ROW	H2OSUP	PYGMY	RESRCH	CON	ROAD	PARL	GROVE	RES	WOODLD	INSIDE	INNER	OUTER	ACRES
0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	235.65
0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	100	0	1	3.88
0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	100	0	2	20.66
0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	100	2	0	6.86
0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	1	0	0	17.89
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	560.42
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	1	54.24
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	2	30.44
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	1	0	10.51
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	2	0	11.12
1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	143.57
1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	0	1	47.87
1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	0	2	10.58
1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	1	0	11.25
1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	2	0	3.60
1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	4.62
1	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	0	0	3.85
1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	3.65
1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	1	1.57
1	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	2.04
1	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	100	0	1	2.98
1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	112.61
1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	100	0	1	14.65
1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	100	0	2	6.75
1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	100	1	0	3.12
1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	100	2	0	2.16
1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	18.61
1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	100	0	1	1.80
1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	100	0	2	2.23
1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	10.08
1	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0	1	0	0	1.85
1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	19.95
1	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	4.38
1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	8.16

CPT	EUCLYT	CYPRES	JUGHDL	NEIGHB	LANDSL	ROW	H2OSUP	PYGMY	RESRCH	CON	ROAD	PARL	GROVE	RES	WOODLD	INSIDE	INNER	OUTER	ACRES
1	0	1	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1.75
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	896.63
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	1	80.97
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	2	38.17
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	1	0	16.89
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	2	0	12.95
2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	36.08
2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	0	1	25.59
2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	0	2	2.60
2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	1	0	5.31
2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	2	0	1.18
2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1.29
2	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	3.72
2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	6.45
2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	76.24
2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	100	0	1	6.56
2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	100	0	2	1.72
2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	100	1	0	1.31
2	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	2.97
2	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1.01
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1,347.67
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	1	70.45
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	2	132.98
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	1	0	13.52
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	2	0	45.48
3	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	51.85
3	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	0	1	17.18
3	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	1	0	4.83
3	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	25.36
3	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	2.20
3	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	2.19
3	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	100	0	1	1.03
3	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1.79
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	208.32

CPT	EUCLYT	CYPRES	JUGHDL	NEIGHB	LANDSL	ROW	H2OSUP	PYGMY	RESRCH	CON	ROAD	PARL	GROVE	RES	WOODLD	INSIDE	INNER	OUTER	ACRES
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	1	6.53
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	2	16.11
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	1	0	1.57
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	2	0	5.22
4	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	7.50
4	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	787.54
4	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	100	0	1	49.99
4	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	100	0	2	52.32
4	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	100	1	0	10.29
4	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	100	2	0	17.93
4	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	21.93
4	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	2.66
4	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	1	1.65
4	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	2	1.64
4	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	3.36
4	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	100	0	2	1.29
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1,119.32
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	1	59.89
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	2	69.08
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	1	0	12.36
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	2	0	22.42
5	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	41.27
5	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	61.99
5	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	0	0	8.16
5	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	4.57
5	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	2	1.80
5	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	106.55
5	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	100	0	1	11.61
5	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	100	0	2	11.08
5	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	100	1	0	2.44
5	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	100	2	0	3.67
5	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	7.03
5	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0	1	0	0	2.49
5	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	2.80

CPT	EUCLYT	CYPRES	JUGHDL	NEIGHB	LANDSL	ROW	H2OSUP	PYGMY	RESRCH	CON	ROAD	PARL	GROVE	RES	WOODLD	INSIDE	INNER	OUTER	ACRES
5	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	7.94
5	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	100	0	2	1.37
5	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	122.01
5	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1.57
5	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	28.78
5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	49.12
5	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	5.29
5	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2.57
5	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	59.58
5	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	100	0	2	1.75
5	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	21.25
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	161.61
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	2	3.09
5	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	18.85
5	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	100	0	2	1.77
5	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1.67
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	635.97
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	1	67.12
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	2	60.58
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	1	0	14.26
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	2	0	20.67
6	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	51.60
6	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	19.21
6	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	100	0	1	2.76
6	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	6.73
6	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	0	0	16.90
6	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	16.16
6	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	1	1.81
6	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	2	5.53
6	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	2	0	2.07
6	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	1.37
6	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	45.84
6	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	100	0	1	1.10
6	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	100	0	2	2.07

CPT	EUCLYT	CYPRES	JUGHDL	NEIGHB	LANDSL	ROW	H2OSUP	PYGMY	RESRCH	CON	ROAD	PARL	GROVE	RES	WOODLD	INSIDE	INNER	OUTER	ACRES
6	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	6.92
6	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	5.11
6	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0	1	0	0	7.85
6	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1.54
6	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	6.19
6	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	9.13
6	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	7.25
6	0	1	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	2.05
6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1.46
6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	1	2.16
6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	2	1.19
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	917.04
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	1	98.63
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	2	57.26
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	1	0	21.89
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	2	0	19.69
7	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	16.86
7	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	37.61
7	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	100	0	2	5.06
7	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	100	2	0	1.58
7	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	1.12
7	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	7.25
7	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	7.80
7	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	236.29
7	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	1	7.02
7	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	2	11.22
7	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	2	0	3.37
7	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	3.43
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	739.52
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	1	57.72
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	2	54.75
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	1	0	12.05
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	2	0	19.23
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	45.94

CPT	EUCLYT	CYPRES	JUGHDL	NEIGHB	LANDSL	ROW	H2OSUP	PYGMY	RESRCH	CON	ROAD	PARL	GROVE	RES	WOODLD	INSIDE	INNER	OUTER	ACRES
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	100	0	2	2.46
8	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	60.14
8	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	28.73
8	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	5.78
8	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	11.67
8	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	4.44
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	539.49
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	1	52.08
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	2	29.49
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	1	0	10.64
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	2	0	10.23
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	3.54
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	100	0	2	1.16
9	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	32.67
9	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	7.79
9	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	135.48
9	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	0	0	13.02
9	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1.97
9	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	1	1.66
9	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	137.35
9	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	100	0	1	6.41
9	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	100	0	2	10.86
9	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	100	1	0	1.48
9	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	100	2	0	4.06
9	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	3.22
9	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	10.56
9	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	100	0	2	2.17
9	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	0	0	1.03
9	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	67.37
9	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	100	0	2	1.07
9	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0	1	0	0	16.75
9	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1.08
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	416.34
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	1	10.11

CPT	EUCLYT	CYPRES	JUGHDL	NEIGHB	LANDSL	ROW	H2OSUP	PYGMY	RESRCH	CON	ROAD	PARL	GROVE	RES	WOODLD	INSIDE	INNER	OUTER	ACRES
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	2	31.37
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	1	0	1.79
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	2	0	10.06
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2.61
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	100	0	1	2.16
10	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	102.69
10	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	0	1	1.62
10	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	0	2	5.82
10	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	2	0	1.74
10	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	40.77
10	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	0	0	14.17
10	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	11.74
10	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	2.13
10	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	2	1.69
10	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	65.37
10	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	8.44
10	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	14.47
10	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0	1	0	0	9.34
10	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	26.84
10	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1.83
10	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	1.55
10	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	5.24
10	0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	2.94
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	24.31
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1,255.42
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	100	0	1	34.09
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	100	0	2	97.05
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	100	1	0	6.14
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	100	2	0	30.66
11	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	30.46
11	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	0	1	2.90
11	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	0	2	1.59
11	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	337.06
11	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	100	0	1	37.48

CPT	EUCLYT	CYPRES	JUGHDL	NEIGHB	LANDSL	ROW	H2OSUP	PYGMY	RESRCH	CON	ROAD	PARL	GROVE	RES	WOODLD	INSIDE	INNER	OUTER	ACRES
11	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	100	0	2	24.36
11	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	100	1	0	8.69
11	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	100	2	0	9.80
11	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	10.20
11	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	100	0	2	2.57
11	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	0	83.91
11	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	100	0	1	1.47
11	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	100	0	2	15.86
11	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	100	2	0	5.36
11	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	0	0	6.27
11	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	1	0	0	7.14
11	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1.18
11	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0	10.07
11	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	100	0	1	1.70
11	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	100	0	2	2.85
11	0	0	0	0	1	0	0	0	0	0	1	0	0	0	1	1	0	0	5.80
11	0	0	0	0	1	0	0	0	0	0	1	0	0	0	1	100	0	1	1.63
11	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	1	0	0	2.33
11	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	100	0	2	1.17
11	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	103.38
11	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	100	0	1	7.16
11	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	100	0	2	5.32
11	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	100	1	0	1.44
11	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	100	2	0	1.84
11	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1.53
11	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	0	0	14.26
11	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	100	0	2	1.95
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	209.11
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	1	6.07
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	2	27.41
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	1	0	1.38
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	2	0	9.56
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2.20
12	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	20.91

CPT	EUCLYT	CYPRES	JUGHDL	NEIGHB	LANDSL	ROW	H2OSUP	PYGMY	RESRCH	CON	ROAD	PARL	GROVE	RES	WOODLD	INSIDE	INNER	OUTER	ACRES
12	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	9.16
12	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	1	1.06
12	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	2	4.08
12	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	2	0	1.25
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1,395.42
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	1	114.39
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	2	119.17
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	1	0	23.76
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	2	0	40.77
13	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	98.90
13	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	37.61
13	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	100	0	2	1.34
13	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	2.08
13	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	2.02
13	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	14.52
13	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	1	2.40
13	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	2	5.57
13	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	2	0	1.94
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2,336.91
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	1	174.22
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	2	170.96
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	1	0	38.13
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	2	0	58.31
14	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	74.72
14	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	68.16
14	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	100	0	1	9.12
14	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	100	0	2	5.65
14	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	100	1	0	1.21
14	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	100	2	0	1.96
14	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	5.77
14	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	0	0	3.15
14	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	10.52
14	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	6.16
14	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	6.39

CPT	EUCLYT	CYPRES	JUGHDL	NEIGHB	LANDSL	ROW	H2OSUP	PYGMY	RESRCH	CON	ROAD	PARL	GROVE	RES	WOODLD	INSIDE	INNER	OUTER	ACRES
14	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	1	2.82
14	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	2	2.03
14	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	2	0	1.17
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1,009.50
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	1	45.04
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	2	95.92
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	1	0	8.20
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	2	0	32.98
15	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	263.62
15	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	0	1	67.01
15	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	0	2	22.29
15	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	1	0	15.70
15	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	2	0	8.87
15	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1.87
15	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	3.08
15	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	15.03
15	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	1	1.22
15	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	2	2.55
15	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	2.86
15	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	25.24
15	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	100	0	2	3.93
15	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	100	2	0	1.11
15	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	5.84
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2,861.29
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	1	56.90
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	2	191.11
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	1	0	10.63
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	2	0	61.57
16	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	99.88
16	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	100	0	1	8.74
16	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	100	0	2	4.21
16	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	100	1	0	1.57
16	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	100	2	0	1.41
16	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	13.67

CPT	EUCLYT	CYPRES	JUGHDL	NEIGHB	LANDSL	ROW	H2OSUP	PYGMY	RESRCH	CON	ROAD	PARL	GROVE	RES	WOODLD	INSIDE	INNER	OUTER	ACRES
16	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	18.65
16	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	116.00
16	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	0	1	127.61
16	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	0	2	13.09
16	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	1	0	27.10
16	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	2	0	7.91
16	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	100	0	1	2.47
16	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	63.20
16	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	1	4.32
16	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	2	18.19
16	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	2	0	6.31
16	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	1	0	0	5.70
16	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	8.65
16	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	100	0	1	5.42
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1,751.27
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	1	49.42
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	2	122.30
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	1	0	7.88
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	2	0	39.77
17	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	38.48
17	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	100	0	1	3.01
17	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	100	0	2	1.08
17	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0	312.31
17	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	100	0	1	6.20
17	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	100	0	2	24.29
17	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	100	2	0	8.04
17	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	18.82
17	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	1	0	0	2.57
17	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	74.89
17	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	0	1	71.18
17	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	0	2	1.89
17	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	1	0	19.89
17	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	2	0	2.47
17	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	100	0	1	6.43

CPT	EUCLYT	CYPRES	JUGHDL	NEIGHB	LANDSL	ROW	H2OSUP	PYGMY	RESRCH	CON	ROAD	PARL	GROVE	RES	WOODLD	INSIDE	INNER	OUTER	ACRES
17	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	100	1	0	1.96
17	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	1	0	0	2.73
17	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	100	0	1	6.35
17	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	100	1	0	1.61
17	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	36.73
17	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	1	1.61
17	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	2	7.49
17	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	2	0	2.32
17	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	1	0	0	7.12
17	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	100	0	2	1.59
17	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0	1	0	0	21.54
17	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0	100	0	2	3.34
17	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	1.84
17	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	1.08
17	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	100	0	1	2.94
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2,161.57
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	1	160.49
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	2	167.87
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	1	0	33.15
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	2	0	57.51
18	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	220.42
18	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	100	0	1	17.08
18	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	100	0	2	8.96
18	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	100	1	0	3.16
18	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	100	2	0	2.73
18	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1.41
18	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0	18.72
18	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	100	0	1	7.02
18	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	26.32
18	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	1	1.41
18	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	2	7.60
18	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	2	0	2.42
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	960.98
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	1	78.63

CPT	EUCLYT	CYPRES	JUGHDL	NEIGHB	LANDSL	ROW	H2OSUP	PYGMY	RESRCH	CON	ROAD	PARL	GROVE	RES	WOODLD	INSIDE	INNER	OUTER	ACRES
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	2	84.51
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	1	0	17.12
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	2	0	29.57
19	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	67.84
19	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	2.76
19	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	2.94
19	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	7.41
19	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	1	1.69
19	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	1.14
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	801.48
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	1	20.84
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	2	59.92
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	1	0	3.65
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	2	0	19.65
20	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	27.29
20	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	0	1	12.62
20	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	0	2	5.60
20	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	1	0	1.45
20	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	2	0	2.21
20	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1.67
20	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	1.58
20	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	100	0	1	1.94
20	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	100	1	0	2.22
20	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	3.65
20	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	1	2.24
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2,662.73
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	1	127.82
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	2	189.19
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	1	0	22.69
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	2	0	63.27
21	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	63.41
21	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	100	0	2	3.21
21	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0	15.15
21	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	100	0	2	1.55

CPT	EUCLYT	CYPRES	JUGHDL	NEIGHB	LANDSL	ROW	H2OSUP	PYGMY	RESRCH	CON	ROAD	PARL	GROVE	RES	WOODLD	INSIDE	INNER	OUTER	ACRES
21	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	13.60
21	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	100	0	1	1.01
21	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	100	0	2	1.90
21	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	89.99
21	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	0	1	73.88
21	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	0	2	11.28
21	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	1	0	19.77
21	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	2	0	5.42
21	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	2.28
21	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	1	0	0	5.06
21	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	100	0	2	1.61
21	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1	0	0	9.48
21	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	100	0	1	2.92
21	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	100	0	2	2.09
21	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	100	0	1	2.29
21	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	100	0	1	1.10
21	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	74.44
21	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	1	2.57
21	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	2	13.48
21	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	2	0	4.07
21	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	1.86
21	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	100	0	1	2.66
21	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	100	0	2	1.24
21	0	0	0	0	1	0	0	0	0	0	1	0	1	1	0	1	0	0	1.65
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2,793.34
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	1	168.63
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	2	189.42
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	1	0	35.00
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	2	0	62.84
22	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	19.47
22	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	100	0	2	6.27
22	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	100	2	0	2.27
22	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	91.72
22	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	1	8.17

CPT	EUCLYT	CYPRES	JUGHDL	NEIGHB	LANDSL	ROW	H2OSUP	PYGMY	RESRCH	CON	ROAD	PARL	GROVE	RES	WOODLD	INSIDE	INNER	OUTER	ACRES
22	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	2	39.17
22	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	1	0	1.39
22	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	2	0	14.93
22	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	0	0	3.55
22	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	100	0	2	1.26
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	780.86
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	1	27.36
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	2	50.75
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	1	0	5.75
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	2	0	16.38
23	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	11.94
23	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	0	1	6.33
23	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	0	2	1.20
23	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	1	0	1.25
23	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	31.70
23	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	1	5.92
23	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	2	8.91
23	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	2	0	3.62
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1,288.99
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	1	51.90
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	2	81.32
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	1	0	9.61
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	2	0	25.44
24	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	67.48
24	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	150.68
24	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	0	1	74.98
24	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	0	2	13.93
24	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	1	0	17.90
24	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	2	0	6.19
24	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0	17.80
24	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	100	0	1	1.14
24	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	9.25
24	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	100	0	1	1.52
24	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	1.61

CPT	EUCLYT	CYPRES	JUGHDL	NEIGHB	LANDSL	ROW	H2OSUP	PYGMY	RESRCH	CON	ROAD	PARL	GROVE	RES	WOODLD	INSIDE	INNER	OUTER	ACRES
24	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	2.07
24	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	100	0	1	2.23
24	0	0	0	0	0	1	0	0	0	0	1	0	1	0	0	1	0	0	1.27
24	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	17.64
24	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	1	4.35
24	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	2	4.53
24	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	2	0	1.84
24	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	1	0	0	4.13
24	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	9.08
24	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	100	0	1	6.67
24	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	100	0	2	2.44
24	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	100	2	0	1.12
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	423.55
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	1	28.54
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	2	32.73
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	1	0	5.59
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	2	0	10.96
25	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	2.59
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1,279.92
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	1	23.12
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	2	68.28
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	1	0	6.43
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	2	0	21.02
26	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	24.58
26	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	0	1	5.16
26	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	0	2	5.79
26	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	1	0	1.85
26	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	2	0	1.74
26	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	82.24
26	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	1	13.85
26	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	2	29.62
26	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	2	0	11.16
26	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	3.17
26	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	100	0	1	3.05

CPT	EUCLYT	CYPRES	JUGHDL	NEIGHB	LANDSL	ROW	H2OSUP	PYGMY	RESRCH	CON	ROAD	PARL	GROVE	RES	WOODLD	INSIDE	INNER	OUTER	ACRES
26	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	100	0	2	1.22
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	896.78
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	1	74.30
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	2	50.89
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	1	0	17.05
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	2	0	17.34
27	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	83.55
27	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	100	0	1	10.53
27	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	100	0	2	3.01
27	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	100	1	0	2.53
27	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	100	2	0	1.10
27	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	26.63
27	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	0	1	1.39
27	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	100	0	2	1.98
27	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0	34.12
27	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	100	0	1	9.52
27	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	100	0	2	2.47
27	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	100	1	0	2.28
27	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1.17
27	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	1.35
27	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	3.31
27	0	0	0	0	0	1	0	0	0	0	1	0	1	0	0	1	0	0	3.01
27	0	0	0	0	0	1	0	0	0	0	1	0	1	0	0	100	0	1	1.19
27	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	79.51
27	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	1	5.15
27	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	2	22.96
27	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	2	0	8.34
27	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	1	0	0	19.63
27	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	100	0	1	3.37
27	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	100	0	2	2.94
27	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	100	2	0	1.16
27	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	2.55
27	0	0	0	0	1	0	0	0	0	0	1	0	1	0	0	1	0	0	16.22
27	0	0	0	0	1	0	0	0	0	0	1	0	1	0	0	100	0	1	1.19

CPT	EUCLYT	CYPRES	JUGHDL	NEIGHB	LANDSL	ROW	H2OSUP	PYGMY	RESRCH	CON	ROAD	PARL	GROVE	RES	WOODLD	INSIDE	INNER	OUTER	ACRES
27	0	0	0	0	1	0	0	0	0	0	1	0	1	0	0	100	0	2	1.82
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1,460.85
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	1	63.67
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0	2	130.65
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	1	0	12.34
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	2	0	44.37
28	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	27.52
28	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	100	0	1	4.10
28	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	100	0	2	3.59
28	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	100	1	0	1.02
28	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	100	2	0	1.59
28	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	41.99
28	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	100	0	1	9.24
28	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	100	0	2	10.06
28	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	100	1	0	2.32
28	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	100	2	0	3.61
28	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	21.55
28	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	0	2	5.15
28	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	100	2	0	1.62

Forest Structure Conditions in Managed Stands

There will be many ways to bring each harvest unit to the desired future condition, some of which may not be among the traditional treatments associated with the specified silvicultural regime. For instance, a very poorly stocked unit within a selection compartment may best be treated by a rehabilitation harvest which resembles an even-aged regeneration cut; while a mature, densely stocked unit in the same selection compartment might require group selection openings to allow sufficient sunlight to stimulate the establishment and growth of regeneration of desired shade-intolerant species. In an even-aged compartment, a unit which has reached the designated rotation age may not have achieved its growth potential, and thus would contribute more to maximizing forest yield by being allowed to continue growing than by being regenerated at a pre-determined age.

The factors by which timber harvesting will most affect the structure of forest stands are:

- The sizes of the trees retained in the post-harvest stand.
- The harvest intensity.
- The sizes of openings created.
- The length of time between harvest treatments.

The first three factors directly relate to the three attributes of forest structure listed at the beginning of this section. The fourth factor, time between harvests, will determine the level of growth induced before modification by another harvest event.

Different silvicultural systems and treatments will retain different sizes of trees during each harvest, resulting in different types of stand structures. For example, in typical commercial thinnings the retained trees will generally be in the larger size classes, while many of the smaller trees from the lower canopy layers will be cut. This will produce a stand with relatively little differentiation in tree sizes. By contrast, selection systems retain trees in all size classes, creating stands with greater diversity of tree sizes.

Harvest intensity determines the density of the residual stand. Relatively light cuts such as thinning and selection yield denser stand structures than even-aged regeneration harvests.

Opening size affects the spatial arrangement attribute of forest structure. Openings can be as small as a single tree and as large as the maximum allowed even-aged regeneration unit (8). Small openings such as those created by commercial thinning and by single tree selection cutting will tend to promote structural homogeneity. Larger openings resulting from cluster and group selection and small regeneration units will create stands with more diverse structural distribution. The largest openings may actually create new stands rather than modify the structure of existing stands. Opening size affects not only the immediate post-harvest stand structure, but also how growth of understory vegetation contributes to changes in structure over time. Small openings, particularly in low-intensity harvests, will be slow to develop understory vegetation, whereas regrowth will be much more vigorous following harvests that create larger openings.

Sequences of frequent harvests, such as with short cutting cycle selection systems, allow little opportunity for stand structure to change appreciably between harvest events. Much more significant structural change occurs, on the other hand, between an even-aged regeneration harvest and a first commercial thinning, which may be several decades apart.

8 The Forest Practice Rules currently allow even-aged regeneration units to be as large as 40 acres when justified. The largest units harvested on the State Forest in recent years have typically been in the range of 20 to 30 acres.

Appendix VI. Road Management Plan

Introduction and Background

Forest roads on Jackson Demonstration State Forest 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 1950's to the 1970's. Roads 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,

9 Note that CDF 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.

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. 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.

During the first five years of plan implementation, the existing road network on the Forest will be inventoried (including any unused roads that have not been properly abandoned). JDSF estimates that there are approximately 350 miles of actively used roads on the Forest, with another 150 miles of potentially improperly abandoned roads. CDF or a qualified contractor will inventory all roads currently or formerly used for truck traffic. Therefore, approximately 100 miles of road per year will be inventoried. 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 20 percent of the Forest's roads will be inventoried each year of the plan's first 5 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 (see the attached form as an example of the information which will be collected). 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 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 <u>intended</u> 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 either a Class I, II, or III watercourse will be recorded in feet.

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.

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. (12) "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 (13)

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.

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

12 DMG watershed geologic maps should be consulted to assist in identifying parent material.
13 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.

The attached form shows the information that will be collected at crossings. 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

Some typical culverts are shown in Figure 2. 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). [14]

Entrance Type

Some typical entrance types are shown in Figure 3.

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). [15]

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.

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14 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.

15 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.

Outlet

The dissipation of energy of the water as it leaves the culvert is important in controlling erosion. Figure 4 shows some different types of energy dissipators.

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. 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) (16), 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” 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

16 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.

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, regraded, 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.[17] 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 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.

17 It is necessary to consider the hydraulics of fish crossings in considerably more detail than has been in the past.

- 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 CDF 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 driveability 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, and 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 CDFG and approved by the CDF 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 a winter).[18] The first winter storm event of this intensity generally occurs after the fall period

18 Use the following website to check stage heights at the South Fork Caspar Creek weir: http://www.rsl.psw.fs.fed.us/cgi-bin/get_form.cgi.

when soils are recharged 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).

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 five 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 reestablishing 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 regraded 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 reopened 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.

6. Schedule for Road Network Improvement Activities

The entire road and crossing inventory will be finished within five years, including data entry and report preparation. This will require surveying approximately 100 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 VII. Recreation Data

A. Existing Recreation Facilities

1. Campgrounds (~15 seasonal, 3 year-round)

West-end: Camp One*, Roundhouse, South Fork 1,2, and 3, Red Tail, Southbend, Wagon, Tilley, Trillium, Tin Can, Teacher's, Poison Oak, Camp 4, Camp 6, and Camp 8
*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 (to be re-opened in the future)
*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 differently-abled.

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. The day-use area 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 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 1 and 3 miles loop that traverse through an area that was harvested in the mid-1990's with an initial group selection entry. The area was logged by helicopter. 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, directional arrows to signs on steel posts. This trail was established by the County of Mendocino and is not maintained by CDF.

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 is being 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.

Specific documents in JDSF library that can be referenced for more information:

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Current Recreation Map (1994)

JDSF Annual Reports

Appendix VIII. 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 in any location unless the area is closed.

Personal
Dead and down wood is made available to the public for personal use firewood in designated locations. Designated firewood-cutting areas 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 twice annually (based on harvest seasons) from the State Forest headquarters. 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.

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http://www.rsl.psw.fed.us/projects/water/caspubs.html

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State Forest Notes Pertaining to JDSF

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1/61	Seasonal Diameter Growth in Trees on Jackson State Forest	Richard Bawcom, Robert J. Hubbell, David Burns
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
8/63	Sugar Pine Planting on Jackson State Forest	R. J. Malain, D. M. Burns, J. E. Sindel
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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
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